



Environmental Impact Assessment (EIA) Study for Drilling of Wells and Associated Development Activities in SW Miano-III Block, Sindh



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Executive Summary

ES.1 Introduction

Prime Pakistan intends to carry out drilling operation along with associated development activities in SW Miano-III block that lies within Sukkur and Khairpur districts of Sindh province. The objective of the proposed project activities is to harness the hydrocarbon potential, enhance production rates, and improve recovery from the leased area. **Figure ES-1** depicts a key map illustrating the location of the SW Miano-III block.

In accordance with the requirements outlined in the Sindh Environmental Protection Act 2014, Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021 and the Pakistan Environmental Protection Agency Guidelines for the Preparation and Review of Environmental Reports, 1997, Prime Pakistan has engaged Halcrow Pakistan (HPK) to conduct an Environmental Impact Assessment (EIA) for the proposed drilling and associated development activities. This initiative ensures full compliance with regulatory requirements throughout the project's duration. This report provides insights into the EIA process, its findings, potential environmental impacts, and the mitigation measures to be implemented during the execution of planned activities in the SW Miano-III block. The proposed project area and tentative surface locations of the wells are illustrated in **Figure ES-2**.

Therefore, this EIA report is based on the fact that Prime Pakistan will obtain NOC for the EIA, which covers the drilling of six wells and associated construction activities such as the establishment of well sites, campsites, access tracks, and laying of pipelines from successful wells to the existing hydrocarbons gathering system, from the Sindh Environmental Protection Agency (Sindh EPA). Any further or future planned activities, such as drilling of more than six wells or expansion/installation of the hydrocarbons processing facility, will necessitate separate environmental assessments of that project before the commencement of any activities on ground in compliance to applicable laws & regulations.

ES.2 Objectives of the EIA

The objectives of the Environmental Impact Assessment (EIA) are to:

- Assess the existing environmental conditions in the proposed project area, including the identification of environmental sensitive areas and develop a baseline of its prevalent environmental and socioeconomic conditions;
- Identify and investigate all impacts of the proposed construction, drilling and associated development activities on the physical, biological and socioeconomic environment of the project area;

- Propose mitigation measures that would help Prime Pakistan in conducting the proposed project activities in an environmentally sustainable manner;
- Uncover the construction and operational phase impacts up to microenvironment levels in which project is proposed to be sited; and
- Develop an Environmental Management Plan (EMP) that would assist Prime Pakistan in the effective implementation of the recommendations of the EIA.

ES.3 The Project Proponent

Prime Pakistan has been involved in oil and gas exploration and production (E&P) activities in Pakistan since 1986. The company operates various on-shore facilities, including gas processing plants and fields at Bhit and Kadanwari. Their operations encompass seismic surveys, drilling, and construction activities across several Development and Production (D&P) Leases such as Bhit, Kadanwari, Badhra, as well as in exploration-licensed areas. Prime Pakistan holds ISO 14001, ISO 450001 certifications, demonstrating their commitment to environmental and occupational health standards.

The company's main permits include Bhit/Badhra (40%) and Kadanwari (18.42%). Prime Pakistan also shares permits in Latif (33.3%), Zamzama (17.75%), and Sawan (23.7%). Prime Pakistan contributes significantly to mitigating the declining gas production in the country by maximizing production from existing fields and pursuing aggressive exploration strategies to uncover new resources, focusing on high-grade prospects within its portfolio.

ES.4 History of SW Miano-III Block

The SW Miano-III block spans 495 square kilometers within the Sindh province, with its territory divided between two districts. Approximately 35.39% of the block equivalent to 175.16 square kilometers, is within Sukkur district, while the remaining 64.61% (319.77 square kilometers), lies within Khairpur district. Operational responsibility in the block is shared among key players, each holding a specific percentage share. Prime Pakistan Limited leads with a significant share of approximately 53.625%. Al Haj Pakistan Exploration Limited follows with an ownership stake of around 43.875%, and Sindh Energy Holding Company Pvt Limited holds a share of approximately 2.5% (carried). These percentages reflect the collaborative efforts of multiple operators in the exploration and production activities within the block.

Three protected areas fall within the jurisdiction of the Miano-III block: Nara Desert Wildlife Sanctuary (5%), Nara Game Reserve (33%), and Takkar Wildlife Sanctuary (17%). However, 44% of the SW Miano-III block lies outside the boundaries of these protected areas.

Over the years, the block has been a focal point for exploration activities. The block's operations have been characterized by collaboration among various stakeholders, including international and local companies, pooling resources to unlock its full potential. A brief of exploration activities which have been undertaken in SW Miano-III block are:

- Acquisition of 405 sq. km of 3D seismic data acquisition in 2009
- Drilling of Four exploratory wells;
- Acquisition of total 1394-line kilometers of 2D in different vintages by different companies;

A total of 1,394 line kilometres of 2D seismic data has already been collected within the project area between 1979 and 2006. Additionally, 390 square kilometres of 3D seismic data were acquired for this block in 2009. Furthermore, four exploratory wells, namely Jiskani-1, Misri Bhambro-1, Nara-1, and Michko-1, were drilled in the project area between 2005 and 2014 by OMV Pakistan. Details of these wells are provided in the table below.

Well	Type	Latitude	Longitude	Year	Operator
Jiskani-1	Exploratory	27° 20' 9.6300"	68° 59' 13.8200"	2014	OMV
Misri Bhambro-1	Exploratory	27° 13' 25.8300"	69° 7' 31.9000"	2011	OMV
Michko-1	Exploratory	27° 00' 16.0600"	68° 50' 30.2500"	2006	OMV
Nara-1	Exploratory	27° 5' 38.1200"	68° 58' 32.7700"	2005	OMV

Prime Pakistan plans to drill six more additional exploratory wells, as part of its ongoing efforts to tap into indigenous hydrocarbon resources. The tentative locations of these wells are depicted in **Figure ES-2**, illustrating Prime Pakistan's commitment to further exploration and development within the SW Miano-III block.

ES.5 Overview of Proposed Project & Project Area

SW Miano-III block covers an area of 495 square kilometers (km²) embodying *tehsil* Saleh Pat and Nara in district Sukkur and Khairpur of Sindh province. Proposed project area for drilling and associated developed activities lies within the boundary of Miano block. Surface coordinates of the proposed project area (see **Figure 1-2**) with datum World Geodetic System (WGS84) coordinates are presented in table below:

Corner ID	Latitude	Longitude
A	27° 21' 23.03"	68° 58' 01.09"
B	27° 21' 21.74"	69° 01' 11.44"
C	27° 17' 47.78"	69° 01' 09.57"
D	27° 17' 48.25"	69° 03' 00.00"
E	27° 5' 00.00"	69° 03' 00.00"
F	27° 15' 00.00"	69° 09' 00.00"
G	27° 12' 00.00"	69° 09' 00.00"
H	27° 12' 00.00"	69° 07' 00.00"

I	27° 09' 00.00"	69° 07' 00.00"
J	27° 09' 00.00"	69° 06' 00.00"
K	27° 08' 00.00"	69° 06' 00.00"
L	27° 08' 00.00"	69° 01' 00.00"
M	27° 07' 28.00"	69° 01' 00.00"
N	27° 57' 01.53"	68° 47' 37.12"
O	27° 58' 39.70"	68° 47' 33.19"
P	27° 04' 18.05"	68° 53' 17.98"
Q	27° 04' 42.98"	68° 54' 34.77"
R	27° 09' 44.97"	68° 54' 37.12"
S	27° 09' 46.72"	68° 54' 12.84"
T	27° 17' 10.30"	68° 55' 09.53"
U	27° 17' 11.04"	68° 56' 44.90"

Administratively, project area falls in two union councils namely Lal Juryo Khan Shambani and Sikanderabad. The project area primarily consists of barren lands, flat agricultural land with scattered communities, small commercial activities, and a few watercourses in the nearby vicinity of the proposed well sites. Based on the findings of the current environmental assessment, no resettlement is required for the local population.

The tentative surface locations of the proposed wells with Datum World Geodetic System (WGS84) and the current land status of the proposed well sites are presented in the table below and also shown in **Figure ES-2**.

Proposed Well ID	Tentative Coordinates		Tehsil	District
	Latitude	Longitude		
Prime Well-1	27° 13' 13.36" N	69° 08' 14.32" E	Saleh Pat	Sukkur
Prime Well-2	27° 11' 23.01" N	68° 59' 12.92" E	Nara	Khairpur
Prime Well-3	27° 14' 25.77" N	68° 56' 52.10" E	Saleh Pat	Sukkur
Prime Well-4	27° 18' 57.95" N	68° 58' 19.46" E	Saleh Pat	Sukkur
Prime Well-5	27° 08' 40.05" N	69° 05' 01.19" E	Nara	Khairpur
Prime Well-6	27° 14' 31.96" N	69° 07' 55.40" E	Saleh Pat	Sukkur

The drilling operations for the proposed wells will encompass several stages, starting with the improvement/establishment of well sites, rig camps, construction base camps, and access tracks (if required). Subsequently, the wells will be drilled, and depending on the outcome (success or failure), they will be either abandoned, completed, or suspended, followed by site restoration efforts. In the event of hydrocarbon discovery at any proposed well location, flow lines will be laid to connect producing wells to the existing hydrocarbon gathering system.

The drilling process will entail standard practices, including the mobilization of construction contractor(s) to develop access routes, base camps, rig camps, and well site facilities. Subsequent installation of wellhead facilities falls under the category of

"project activities". Further details regarding these project activities can be found in **Chapter 4** of this EIA report.

Upon the completion of installing all necessary units, equipment and rigs, drilling operations will commence using conventional techniques with a water-based mud system. To enhance the management and disposal of drilling wastes, a specialized waste management system employing Hi-G drying shakers will be implemented. This technique aids in reducing water usage during drilling and minimizing the volume of drilling waste, thereby significantly mitigating environmental impacts.

Resources sourced for the project within the area will primarily include local manpower, land, water, and gravel. In the event of discovering hydrocarbon reserves, the project facilities will remain operational, and the site will be de-manned. Conversely, if no reserves are found, all equipment and personnel will be demobilized, and the location will undergo restoration as per the stipulated requirements outlined in the EIA/EMP.

ES.6 The EIA Methodology

The preparation of the EIA involved several essential steps. These included gaining a comprehensive understanding of the proposed operation, reviewing relevant legislation and guidelines (with detailed information provided in **Chapter 3**), defining the scope and methodology of the EIA, and collecting both secondary and primary data. Secondary data encompassed various aspects such as the physical, biological & socioeconomic environment including cultural considerations. Additionally, primary field data collection was conducted, along with public consultations, impact identification, and formulation of recommendations for mitigation and monitoring measures. Subsequently, an Environmental Management Plan (EMP) was developed, and reporting procedures were established.

This EIA is based on the April 2024 field survey conducted by a team of environmentalists and wildlife experts, along with primary environmental data gathered recently. This EIA is inclusive of both primary data and authentication of available secondary information. Secondary information was sourced from various channels, including Prime Pakistan, in-house sources such as previous environmental studies, and District Census Reports of relevant districts. Applicable environmental assessment rules, regulations and procedures prepared by the Pakistan EPA Guidelines for the Preparation and Review of Environmental Reports, 1997 and Sindh Environmental Protection Act, 2014, Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021, were followed in the preparation of this EIA.

ES.7 Impacts and Mitigation

The EIA comprehensively addresses the potential environmental impacts associated with the proposed project activities within the project area. These potential impacts

include aspects related to the physical, biological, socioeconomic, archaeological, and cultural environments. The examination evaluates the mitigation measures intended to alleviate these impacts, and a summary of these assessments is provided in **Table ES-1**. Overall, the proposed project is expected to yield positive impacts on the economy, local communities, and social dynamics within the project area.

ES.8 Environmental Management Plan

To ensure the efficient implementation and management of mitigation measures, an Environmental Management Plan (EMP) has been carefully developed in compliance with relevant acts and regulations. The EMP serves as a structured framework to address potential environmental impacts of proposed project activities, amplify project benefits, and uphold standards of good practice across all project-related activities. The EMP has been prepared with the objective of defining:

- Legislative requirements, guidelines and the best industry practices that apply to the project;
- Mitigation measures required for avoiding or minimizing potential impacts assessed by the EIA;
- Roles and responsibilities of the project proponent and the contractor/s; and
- Requirements for environmental monitoring and reporting.

In order to ensure that Sindh EPA continues to regulate and oversee the environmental performance of activities within the project area, the EIA has recommended the following environmental approval, monitoring and management protocol:

- Once the activity is initiated, Prime Pakistan will undertake environmental monitoring according to the requirements of the project specific EMP and any additional requirements specified by the Sindh EPA; and
- Prime Pakistan will facilitate visiting officials of Sindh EPA for the purpose of on-site inspections.

ES.9 Conclusion

The EIA has thoroughly examined the proposed project activities, the environmental conditions of the project area, and the potential environmental impacts likely to arise. Overall, the EIA report indicates that the project will adhere to all applicable environmental standards and legislation throughout its lifecycle. Additionally, the EIA has addressed the acceptability of residual impacts from the project and the protection of environmentally sensitive resources. Recommendations for environmental monitoring mechanisms have been made to verify the accuracy of the EIA predictions and the effectiveness of recommended mitigation measures during project operations.

Based on the findings, this report concludes that there will be no significant adverse environmental impacts from the proposed activities in the SW Miano-III block. Any

impacts of lesser significance can be mitigated to an acceptable level through the proper implementation of identified mitigation measures. Consequently, no significant or unacceptable changes in the baseline environmental conditions are anticipated. Moreover, the operation is expected to positively impact the socioeconomic conditions of local residents and significantly boost the area's economy. Recommendations for mitigation measures to alleviate potential impacts have been provided, along with a project-specific Environmental Management Plan (EMP) for their implementation.

Table ES-1: Summary of Impacts and Mitigation

Potential Impact	Sources	Recommended Mitigation Measures
Changes in landscape, topography and soil erosion	■ Land uptake ■ Land clearing ■ Off-road travel ■ Over-speeding ■ Use of dirt tracks ■ Poor compaction ■ Quarrying of sand or gravel	■ Total land uptake if required by the camps, rig sites, access roads and RoW for laying of flow line will be kept to the minimum required ■ Topsoil of the RoW will be separately stored ■ Topsoil will be backfilled after proper compaction ■ All camp facilities will be located in existing clearings and on leveled land ■ Clearing of vegetation and disturbance to the natural soils will be minimized ■ Cuttings of trees/bushes will be avoided ■ The access tracks will be properly gravel topped and compacted ■ Existing access roads shall be used as much as possible ■ Off-road travel will be avoided ■ Vehicles speed will be regulated and monitored ■ Periodic trainings will be provided to drivers on protection of natural environment ■ Movement of equipment will be restricted to work areas only ■ Access roads in the undulating plains and higher elevations will follow natural contours as much as possible avoiding excessive cut and fill ■ Photographs will be taken at regular intervals throughout the project activities to monitor any changes in the soil conditions
Soil and water contamination	■ Domestic wastes ■ Oily wastes ■ Clinical waste ■ Produced water ■ Drilling mud and cuttings ■ Soil and water contamination during operation ■ Wastewater generating during cleaning and hydro testing of pipelines	■ Disposal of sewage in septic system ■ Disposal of grey wastewater directly into soak pits ■ Septic tanks and soak pits at 300m from local water wells or hand pumps ■ Disposal of wastes according to waste disposal procedure ■ Soak pits to be covered to avoid surface runoff water ■ Sprinkling of wastewater will be prohibited ■ No solid waste will be disposed of in the field ■ Combustible, noncombustible and hazardous wastes will be handed over to approved waste contractor ■ Restoration of sites including septic and soak system according to restoration protocol ■ Temporarily store clinical wastes at site and hand

Potential Impact	Sources	Recommended Mitigation Measures
		it over to approved waste contractor for safe disposal ■ Fuel and oil storage tanks will be properly marked with their contents ■ Washing of vehicles in designated areas within campsites ■ Checking of vehicles and fuel tanks for fuel or oil leaks ■ Concrete pad, bunded area and proper marking for all fuel tanks ■ Disposal of all spills including contaminated soil according to waste management protocol ■ At the time of restoration all types of waste will be collected and removed ■ The drill cuttings and WBM will be disposed into an impermeable geo-membrane lined pit ■ Produced formation fluids during testing will be collected inside the lined waste pit at the well sites and disposed through evaporation, re-injection or as per other industrial best practices ■ Wastewater generated during cleaning or hydro testing will be disposed of in to earthen pits (through evaporative disposal) or into nearest municipal drains (after treatment) ■ Waste pits at the well sites will be lined with an HDPE liner of appropriate thickness ■ Drill cuttings and mud pits at the well sites should be kept at a minimum distance of 500m from local water resources ■ All other waste pits or enclosures at least 300m from local settlements and local water resources ■ Proper fuel and oil transfer operations ■ Evaporation pit will be built at a distance of 500m from local water well ■ Spill prevention and contingency plan will be developed and implemented ■ Storage of chemicals on brick masonry pads with periphery drains
Climate and ambient air quality	■ Equipment ■ Machinery ■ Vehicles ■ Emissions during flaring ■ Possible H₂S emissions incase	■ Maintenance of generators and vehicles to keep them in good working condition ■ Adopt best management practices in every aspect of the project ■ Regulation and monitoring of vehicles speed ■ Locate rig site and campsite at a safe distance from the nearest community

Potential Impact	Sources	Recommended Mitigation Measures
	of emergency	- Minimize dust emissions due to road travel by regulating vehicles speed and watering of the access track (where required) - Preferably, access tracks passing through communities will be avoided - If un-avoidable a speed limit of less than 30 km/hr will be observed on the section of the road passing through the community - Emissions should comply national and provincial standards wherever applicable - Burning of wastes and construction of burn pits will not be allowed - Continuous VOCs monitoring - Locating stock piles out of wind direction - Keeping the height of the stock piles to a minimum - While selecting routes of access track maintain a reasonable distance from communities - Flare pit will be kept downwind of the well site and at a safe distance from the nearest community - The duration of flaring during well testing will be kept to the minimum required
Noise pollution	- Equipment - Machinery - Vehicles	- It shall be ensured that generators, vehicles and other potentially noisy equipment used will be in good working condition - Well sites and campsites will be located away from nearest communities - The use of horns by project vehicles will be minimized - The use of pressure horns will not be allowed - Movement of all project vehicles and personnel will be restricted to within work areas - Generators will be kept within enclosures to minimize dispersion of noise - Noise levels at communities nearest to the operational facilities, campsite/s and access tracks shall be monitored - In areas with higher noise levels on longer shifts ear plugs and earmuffs will be provided to the workers
Water abstraction	All activities requiring water	- Water from wetlands or other surface water bodies will not be used for the operational purposes - Local water well will be used for domestic and

Potential Impact	Sources	Recommended Mitigation Measures
		operational needs. Prime Pakistan may install its own water wells after ensuring the available capacity at the local tube well/water well (safe yield minus local demand) is at least 50% greater than the project demand - Record water consumption for each project activity - Adaptation of water conservation policy and avoid water losses - The use of brackish water will be maximized wherever possible - Install new water well at 300m from existing local wells and designed to abstract water from deep aquifer - Utilization of water resources that are in possession of local owners will be compensated as per mutually agreed terms - Abstract water from sources recommended in the EIA report
Blockage of natural drainage	Construction activities	- Area around the well sites and campsites shall be landscaped (if required) to avoid blocking of natural drainage - Causeway crossings and pipe culverts will be provided at all stream (water courses) crossings to avoid blocking of natural drainage - Unnecessary dozing, clearing, excavation or storage of construction material will be prohibited
Clearing of vegetation and loss of habitat	- Land clearing - Off-road travel	- Minimize land uptake for every proposed operation - Periodic training to drivers will be organized - Avoid unnecessary damage to vegetation - All camps will be setup in existing clearings - Apply good management practices in every aspect of the project - Movement of project personnel will be restricted to project areas only - Avoid clearing of trees or tall shrubs - Prohibit use of wood for cooking - Minimize off-road travel - Vehicle speeds will be regulated and monitored
Disturbance to wildlife	- Noise generated from project activities - Movement of personnel and	- Prohibit hunting, killing, trapping, feeding and harassment of wildlife - Proposed activities shall be completed in the shortest possible time - Environmental awareness trainings for

Potential Impact	Sources	Recommended Mitigation Measures
	- vehicles ■ Lights used at the project facilities ■ Clearing of vegetation	contractors and crew personnel engaged in the operation before and during the entire course of operation ■ Minimize vegetation clearing and land uptake ■ Movement of project personal will be restricted to work areas only ■ Food waste will not be disposed of in open ■ Maintain vehicles speed on access road to avoid incidental mortalities of reptiles ■ Lights used at the campsites will be kept to the minimum required ■ Adhere with minimum distances specified in the EIA and EMP for entire course of the operation
Socioeconomic, archaeological and cultural environment	■ Acquisition of lands for project facilities ■ Exploitation of local water sources ■ Improper disposal of wastes ■ Dust and exhaust emissions ■ Noise from project facilities ■ Movement of vehicles on access tracks close to the communities	■ Protect local sources of drinking water ■ Sprinkling of water to avoid dust emission wherever required ■ Re-routing or construction of bypass to all major settlement if required ■ Training will be given to drivers on safe driving ■ Strict compliance on Prime Pakistan's HSE guidelines ■ Priority in employment to local residents living close to the project location as per the local regulations and company's competency criteria ■ Limit the speed of vehicles ■ The rig site and campsites will be located at a safe distance from communities ■ Land acquisition and distribution of compensation must be transparent ■ Apply best management practice in every aspect of the project ■ During project, links with local community and all concerned stakeholders will be maintained ■ Use of local wood as fuel will be prohibited ■ Maintain community complaints register ■ Cultural norms will be respected ■ Pay proper and justified compensation for land and water ■ Dispose of all wastes following the requirements of the EIA ■ Use local water sources only after complying with the relevant EIA requirements ■ Maintain appropriate offsets from sites of religious, cultural or archaeological significance

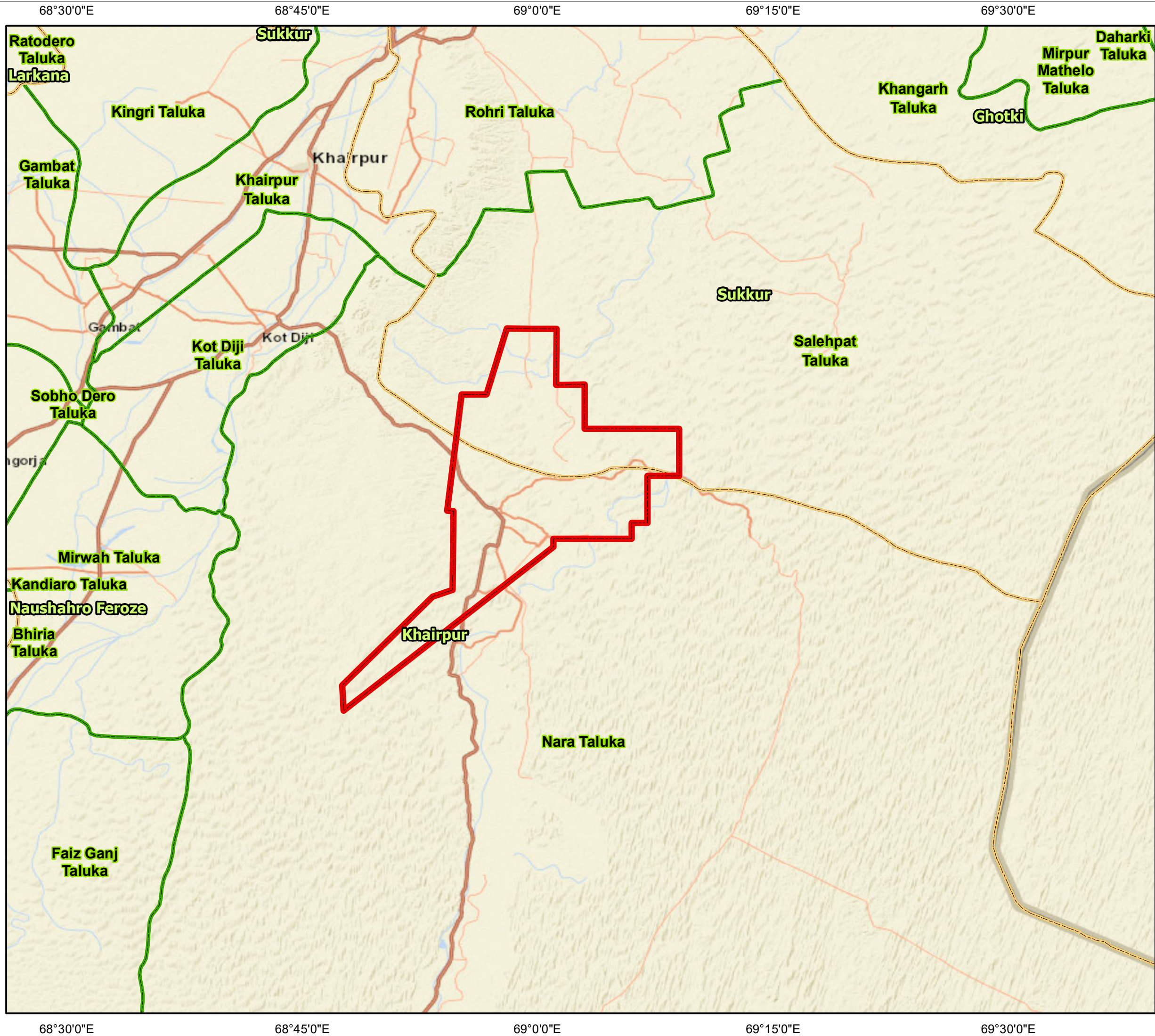
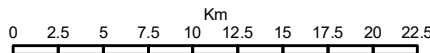
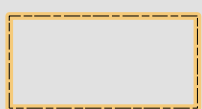
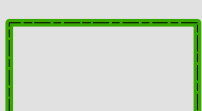


Fig ES-1 Key Map

Environmental Impact Assessment
(EIA) Study for Drilling of Wells and
Associated Development Activities in
SW Miano-III Block, Sindh



Legend

-  Block Boundary
-  District Boundary
-  Taluka Boundary



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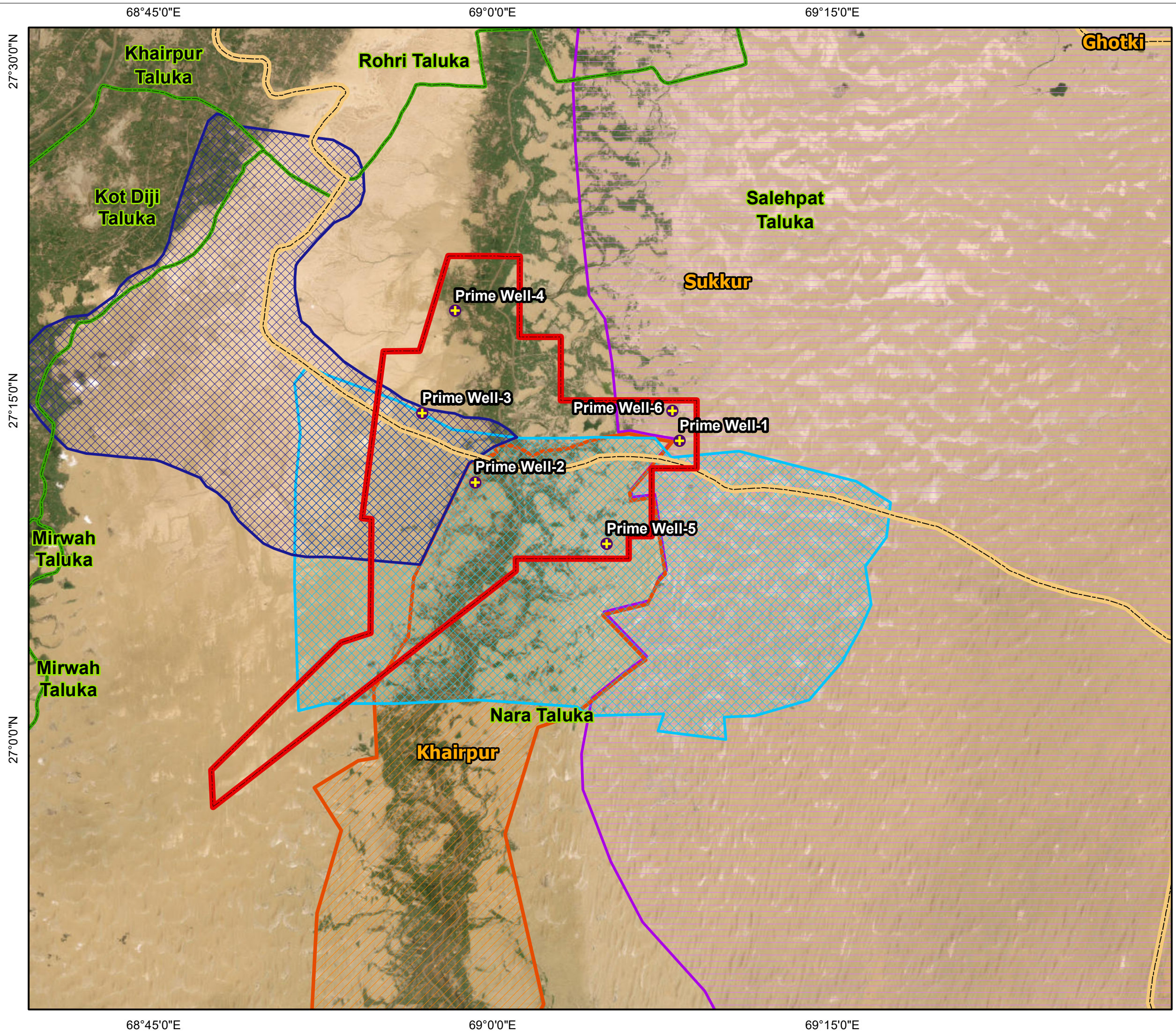
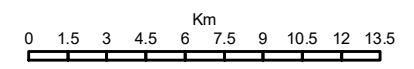


Fig ES-2 Project Area Map
Environmental Impact Assessment
(EIA) Study for Drilling of Wells and
Associated Development Activities in
SW Miano-III Block, Sindh



Legend

- Proposed Well Locations
- Block Boundary
- District Boundary
- Taluka Boundary
- Range Land
- Nara Desert Wildlife Sanctuary
- Nara Game Reserve
- Takkar Wildlife Sanctuary



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List of Acronyms

BAP	Biodiversity Action Plan
BOD	Biological Oxygen Demand
BOP	Blow out Preventer
BAT	Best Available Technology
BATNEEC	Best Available Technology Not Entailing Excessive Cost
CC	Civil Contractor
CITES	Convention on International Trade in Endangered Species
CMS	Convention on the Conservation of Migratory Species of Wild Animals
COD	Chemical Oxygen Demand
DCR	District Census Report
D&PL	Development & Production Lease
DGPC	Director General Petroleum Concessions
DST	Drill Stem Test
E&P	Exploration and Production
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
GoP	Government of Pakistan
HDPE	High Density Polyethylene
HPK	Halcrow Pakistan (Pvt) Ltd
HSE	Health, Safety and Environment
IEE	Initial Environmental Examination
IUCN	International Union for Conservation of Nature and Natural Resources
NCS	National Conservation Strategy
NEAP-SP	National Environmental Action Plan Support Program
NEQS	National Environment Quality Standards
NGO	Non-Government Organization
NOC	No Objection Certificate
O&G	Oil and Gas
PVC	Poly Vinyl Chloride
RoW	Right of way
SEQS	Sindh Environmental Quality Standards
SEPA	Sindh Environmental Protection Agency
STP	Sewage Treatment Plant
SWD	Sindh Wildlife Department
WWF	Worldwide Fund for Nature

1 Introduction

1.1 Preamble

This report presents the findings of an Environmental Impact Assessment (EIA) carried out for the proposed drilling operation and associated construction activities by Prime Pakistan Ltd. within its SW Miano-III block. A key map showing the location of the block is presented as **Figure 1-1**.

Pursuant to the requirements of the Sindh Environmental Protection Act, 2014 and the Sindh Environmental Protection Agency Regulations, 2021; Prime Pakistan commissioned Halcrow Pakistan (HPK) to carry out the Environmental Impact Assessment (EIA) for the intended drilling and associated operation in its SW Miano-III Block that lies within the administrative jurisdiction of Sindh province. This EIA covers the intended drilling of six wells with associated operational requirements that fall within the jurisdiction of Sukkur and Khairpur districts of Sindh. The access tracks and well locations/surface points of proposed wells have been mentioned as the “project area” in EIA. The project area has been marked in **Figure 1-2**.

This EIA report is based on the understanding that Prime Pakistan will secure a No Objection Certificate (NOC) from the Sindh Environmental Protection Agency (Sindh EPA) for the proposed activities, which include drilling of wells and associated construction tasks such as establishing well sites, campsites and access tracks, in SW Miano-III block. Any additional activities beyond the scope of this EIA, such as laying of pipeline, drilling more wells or expanding the hydrocarbons processing facility, will require separate environmental assessments before commencement of project activities.

1.2 The Project Proponent

Prime Pakistan has been engaged in oil and gas exploration and production (E&P) activities in Pakistan since 1986. The company currently operates various on-shore facilities, including gas processing plants and fields at Bhit and Kadanwari. Their operations also encompass seismic surveys, drilling, and construction activities across several Development and Production (D&P) Leases, such as Bhit, Kadanwari, Badhra, as well as in exploration-licensed areas. Prime Pakistan holds ISO 14001 and ISO 450001 certifications, reflecting its commitment to environmental and occupational health standards.

Prime Pakistan's main permits include Bhit/Badhra (40%) and Kadanwari (18.42%). The company also holds shares in the Latif (33.3%), Zamzama (17.75%), and Sawan (23.7%) permits.

1.3 Overview of Project Area and Project Rationale

The SW Miano-III block spans 495 square kilometers within the Sindh province, divided between two districts. Approximately 35.39% of the block equivalent to 175.16

square kilometers, falls within Sukkur district, while the remaining 64.61% equivalent to 319.77 square kilometers, lies within Khairpur district. The distribution of operational responsibility in the block is shared among key players, each holding a specific percentage share. Prime Pakistan Limited (Prime) leads with a significant share of approximately 53.625%. Al Haj Pakistan Exploration Limited follows with an ownership stake of around 43.875%, while Sindh Energy Holding Company Pvt Limited holds a share of approximately 2.5% (carried). These percentages reflect the collaborative efforts of multiple operators in the exploration and production activities within the block.

The Nara Desert Wildlife Sanctuary covers approximately 5% of the SW Miano III Block. Situated in the eastern part of Sindh, it spans parts of the Sukkur, Khairpur, and Ghotki districts. Established in 1980, this sanctuary is a haven for various species of flora and fauna native to the arid desert environment. Its total area is around 6,300 square kilometers. Adjacent to the Nara Desert Wildlife Sanctuary is the Nara Game Reserve, covering approximately 33% of the SW Miano III Block. This reserve serves as a protected area for various wildlife species, providing them with habitats and corridors for migration. Further, the Takkar Wildlife Sanctuary, covering about 17% of the SW Miano III Block, adds to the network of protected areas in the region. This sanctuary is home to diverse wildlife species, including mammals, birds, and reptiles. It plays a crucial role in preserving the natural heritage of the area and promoting ecotourism initiatives. These protected areas highlight the need to safeguard biodiversity and natural ecosystems while pursuing sustainable development practices in the region's oil and gas industry.

Table 1-1: Percentage wise breakdown protected areas in SW Miano-III block

S. No.	Protected Areas	Area Distribution (square kilometres)	Area (%)
1	Nara Desert Wildlife Sanctuary	25.28	5
2	Nara Game Reserve	164.84	33
3	Takkar Wildlife Sanctuary	86.44	17
4	Area outside Protected Areas	218.43	44
Total Block Area		495	100

Over the years, the block has been a focal point for exploration activities. This discovery phase marked the beginning of a concerted effort to develop the block's production capabilities, with drilling operations uncovering valuable resources beneath its surface. The block's operations have been characterized by collaboration among various stakeholders, including international and local companies, pooling resources to unlock its full potential. A brief of exploration activities which have been undertaken in SW Miano-III block are:

- Acquisition of 405 sq. km of 3D seismic data acquisition in 2009

- Drilling of Four exploratory wells;
- Acquisition of total 1394-line kms of 2D in different vintages by different companies;

A total of 1,394 line kilometres of 2D seismic data has already been collected within the project area between 1979 and 2006. Additionally, 390 square kilometres of 3D seismic data were acquired for this block in 2009. Furthermore, four exploratory wells, namely Jiskani-1, Misri Bhambro-1, Nara-1, and Michko-1, were drilled in the project area between 2005 and 2014 by OMV Pakistan. Details of these wells are provided in the table below.

Well	Type	Latitude	Longitude	Year	Operator
Jiskani-1	Exploratory	27° 20' 9.6300"	68° 59' 13.8200"	2014	OMV
Misri Bhambro-1	Exploratory	27° 13' 25.8300"	69° 7' 31.9000"	2011	OMV
Michko-1	Exploratory	27° 00' 16.0600"	68° 50' 30.2500"	2006	OMV
Nara-1	Exploratory	27° 5' 38.1200"	68° 58' 32.7700"	2005	OMV

Prime Pakistan plans to drill six more additional exploratory wells, as part of its ongoing efforts to tap into indigenous hydrocarbon resources. The tentative locations of these wells are depicted in **Figure 1-2**, illustrating Prime Pakistan's commitment to further exploration and development within the SW Miano-III block.

1.4

The Proposed Project

Prime Pakistan intends to carry out drilling operation for six wells along with associated development activities in SW Miano-III block. Proposed well locations have been finalized after detailed reconnaissance and assessment, keeping in view the following constraints:

- Project activities will not disrupt the natural habitat within the proposed project area boundary;
- Location of well sites will be kept at a safe distance, away from the existing communities; and
- The locations of well site will be at a safe distance, away from any existing cultural/heritage site

As mentioned above, the proposed project activities fall in the geographical jurisdiction of districts Sukkur and Khairpur, Sindh. Administratively, the project area falls in *tehsil* Saleh Pat and Nara of two union councils namely Lal Juryo Khan Shambani and Sikanderabad, respectively. The tentative surface locations of the proposed wells with Datum World Geodetic System (WGS84) are presented in the **Table 1-2** whereas, key environmental features have been summarized in **Table 1-3**.

Table 1-2: Details of Proposed Wells in SW Miano-III Block

Proposed Well ID	Tentative Coordinates		Tehsil	District
	Latitude	Longitude		
Prime Well-1	27° 13' 13.36" N	69° 08' 14.32" E	Saleh Pat	Sukkur
Prime Well-2	27° 11' 23.01" N	68° 59' 12.92" E	Nara	Khairpur
Prime Well-3	27° 14' 25.77" N	68° 56' 52.10" E	Saleh Pat	Sukkur
Prime Well-4	27° 18' 57.95" N	68° 58' 19.46" E	Saleh Pat	Sukkur
Prime Well-5	27° 08' 40.05" N	69° 05' 01.19" E	Nara	Khairpur
Prime Well-6	27° 14' 31.96" N	69° 07' 55.40" E	Saleh Pat	Sukkur

A network of canals and associated irrigation channels exist in the project area. Prime Pakistan will construct alternative routes and culverts, if necessary, to maintain the continuous flow of water from these watercourses. Additionally, stringent measures will be implemented to prevent any fouling, disruption, or potential damage to the watercourses due to the proposed project activities. The project area map, illustrating the tentative locations of proposed wells, is depicted in **Figure 1-2**. Details regarding protected areas and prospective well locations are outlined in **Table 1-2** and **Table 1-3**, respectively.

Table 1-3: Key Environmental Features of Proposed Well Sites

Proposed Well	Surrounding Ecological Habitat	Topography
Prime Well-1	Nara Desert Wildlife Sanctuary	Flat
Prime Well-2	Nara Game Reserve & Takkar Wildlife Sanctuary	Flat
Prime Well-3	Takkar Wildlife Sanctuary	Flat
Prime Well-4	Range land	Flat
Prime Well-5	Nara Game Reserve	Flat
Prime Well-6	Nara Desert Wildlife Sanctuary	Flat

The drilling activities for development wells encompass a series of essential tasks. These include establishing well sites, rig camps, construction base camps, and access tracks. Subsequently, the drilling of the wells will commence, followed by procedures such as abandonment, completion, or suspension depending on the outcome of the drilling. In case of discovery of hydrocarbons at any of the proposed well locations, flow lines will be laid from producing wells to existing hydrocarbons gathering system.

To facilitate these operations, customary practices involve mobilizing construction contractors for various tasks such as developing access routes, establishing base camps and rig camps, and setting up well site facilities. Following these initial construction phases, the installation of wellhead facilities is undertaken, collectively referred to as "project activities." Comprehensive details regarding these project activities are elaborated in **Chapter 4** of this EIA report.

After the installation of all necessary units and equipment, including rigging up, drilling operations will commence using conventional drilling techniques with a

water-based mud system. To enhance drilling waste management and disposal, a specialized waste management system employing Hi-G drying shakers will be implemented. This technique significantly reduces water usage and the volume of drilling waste, thereby mitigating environmental pollution impacts.

The project will utilize local resources such as manpower, land, water, and gravel within the project area. If hydrocarbon reserves are discovered, the project facilities will be retained, and the location will be de-manned. Otherwise, all equipment and personnel will be demobilized, and the location will be restored in accordance with the requirements outlined in the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP).

1.5 Proposed Environmental Approval and Management System

While the preparation and approval of environmental assessments covering multiple exploration or production activities is not unprecedented, certain considerations must be ensured in such assessments:

- Comprehensive data collection and assessment of impacts should cover all environmental sensitivities;
- A mechanism should be in place to mandate a site-specific short study before the commencement of each activity. This study should incorporate any additional impacts and mitigation measures that may not have been addressed in the Environmental Impact Assessment (EIA); and
- There should be a mechanism through which the Sindh Environmental Protection Agency (Sindh EPA) can maintain oversight of the proponent's activities and monitor the environmental performance of the operations effectively.

Prime Pakistan and HPK have been fully aware of the issues listed above, and they have addressed them in the Environmental Impact Assessment (EIA) by implementing or proposing the following measures:

- This EIA relies on both primary and secondary data. Primary data collection encompasses all aspects related to physical, biological, and socioeconomic factors;
- Assessment of all generic potentially significant impacts on the physical, biological and socioeconomic receptors due to proposed project activities has been addressed in the EIA. Relevant mitigation measures have also been discussed in detail. However, following methodology shall be adopted to consider the project specific impacts, since at this conceptual design stage exact locations for few of the project facilities are not available; and
- To ensure continued regulation and oversight of environmental performance within the leased areas by the Sindh Environmental Protection Agency (Sindh EPA), the EIA recommends the implementation of the following environmental approval, monitoring, and management protocol:

- Once any activity is initiated, Prime Pakistan will undertake environmental monitoring according to the requirements of the project specific EMP and any additional requirements specified by the Sindh EPA.

1.6 EIA Consultants

This EIA study was carried out by Halcrow Pakistan (HPK) comprising of Environmental Specialists, Social Expert, Wildlife Specialist and GIS Experts having sound technical expertise to perform assignments particular to the oil and gas sector. The details of the project team members appointed in this study are provided below:

No.	Name	Expertise
1.	Abdul Qayyum Aslam, Dr.	Project Manager
2.	Ehsan Mustafa Hashmi, Mr.	Team Lead HSE
3.	Saad Qudrat, Mr.	Manager Environment
4.	Iqra Khan, Ms.	Sr. Environmentalist
5.	Talha bin Umeed, Mr.	Sr. Environmental Engineer
6.	Waiz Ikram, Mr.	Environmentalist
7.	Sarah Shahid, Ms	Jr. Assistant Environmentalist
8.	Abdur Razzaq Khan, Mr.	Wildlife Specialist
9.	Tariq Mehmood, Mr.	Vegetation Expert
10.	Shakeel Khashkheli, Mr.	Plant Taxonomist
11.	Zulqarnain, Mr.	Sr. Sociologist
12.	Azeem Akram, Mr.	Water Resources Expert
13.	Syed Jawad, Mr.	GIS Expert
14.	Ahsan Ullah, Mr.	CAD Operator
15.	Usman Riaz, Mr.	CAD Operator
16.	Imran Khalid, Mr.	Formatting Expert

1.7 Contact Details

In case of further details or clarifications regarding this EIA, please do not hesitate to contact the Proponent or the Consultant at the addresses provided below:

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Table 1-4: Impact Characteristics Criteria

Impact Characteristics	Categories
Duration of the impact	Short term – lasting only till the duration of the project such as noise from the drilling operations. Medium term – lasting for a period of few months to a year after the project before naturally reverting to the original condition such as loss of vegetation due to clearing of well site, contamination of soil or water by fuels or oil. Long term – lasting for a period much greater than medium term impacts before naturally reverting to the original condition such as loss of soil due to soil erosion.
Geographical location of the impact	Local – within the area of project i.e. well site campsite and access road. Regional – within the boundaries of the project area. National – within the boundaries of the country.
Likelihood of the impact	Qualitatively measured on a scale of: Almost certain Likely Possible Unlikely Rare
Reversibility of the impact	Defined as: Reversible – when a receptor resumes its pre-project condition. Irreversible – when a receptor does not or cannot resume its pre-project condition.
Consequence severity of impact	Rated as: Major – when an activity causes irreversible damage to a unique environmental feature; effects entire population or species of flora or fauna in sufficient magnitude so as to cause a decline in species abundance or change in distribution over more than one generation; has long term effects (period of years) on socio-cultural or economic activities of regional significance. Moderate – when an activity causes long term (period of years) reversible damage to a unique environmental feature; effects a portion of a population of flora or fauna causing reversible damage or change in abundance or distribution over one generation; has short term effects (period of months) on socio-cultural or economic activities of regional significance. Minor – when an activity causes short term (period of few months) reversible damage to an environmental feature; slight reversible damage to a few species of flora or fauna within a population over a short period of time; has short term (period of months) effects on socio-cultural or

Impact Characteristics	Categories
	economic activities of local significance. Negligible – when no measurable damage to physical, socioeconomic or biological environment above the existing level of impacts occurs.
Significance of the impact	Categorized as: High Medium Low Based on the consequence, likelihood, reversibility, geographical extent, duration, level of public concern and conformance with legislative or statutory requirements.

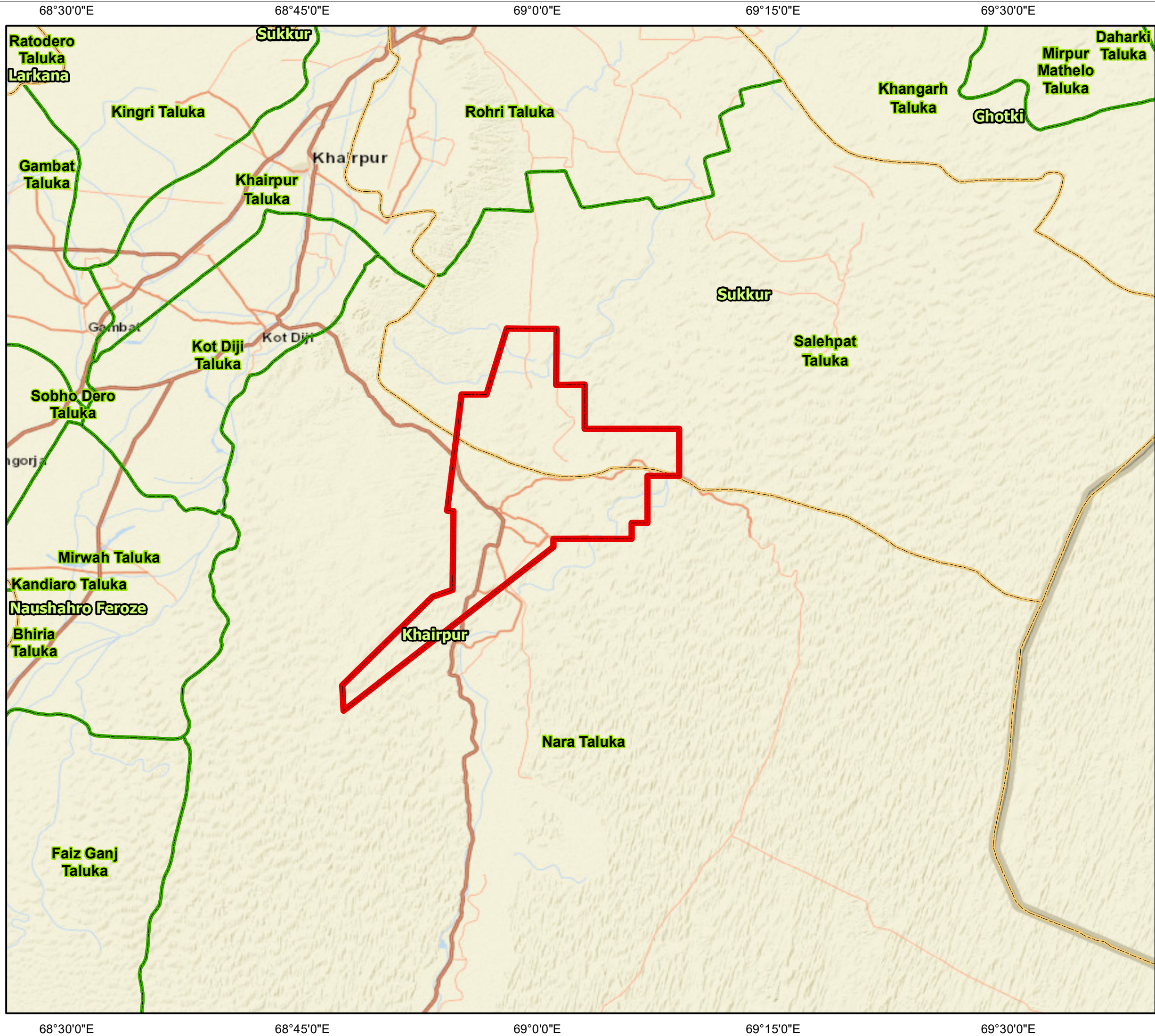
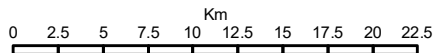
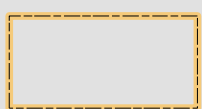
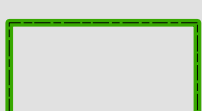


Fig 1-1 Key Map

Environmental Impact Assessment
(EIA) Study for Drilling of Wells and
Associated Development Activities in
SW Miano-III Block, Sindh



Legend

-  Block Boundary
-  District Boundary
-  Taluka Boundary



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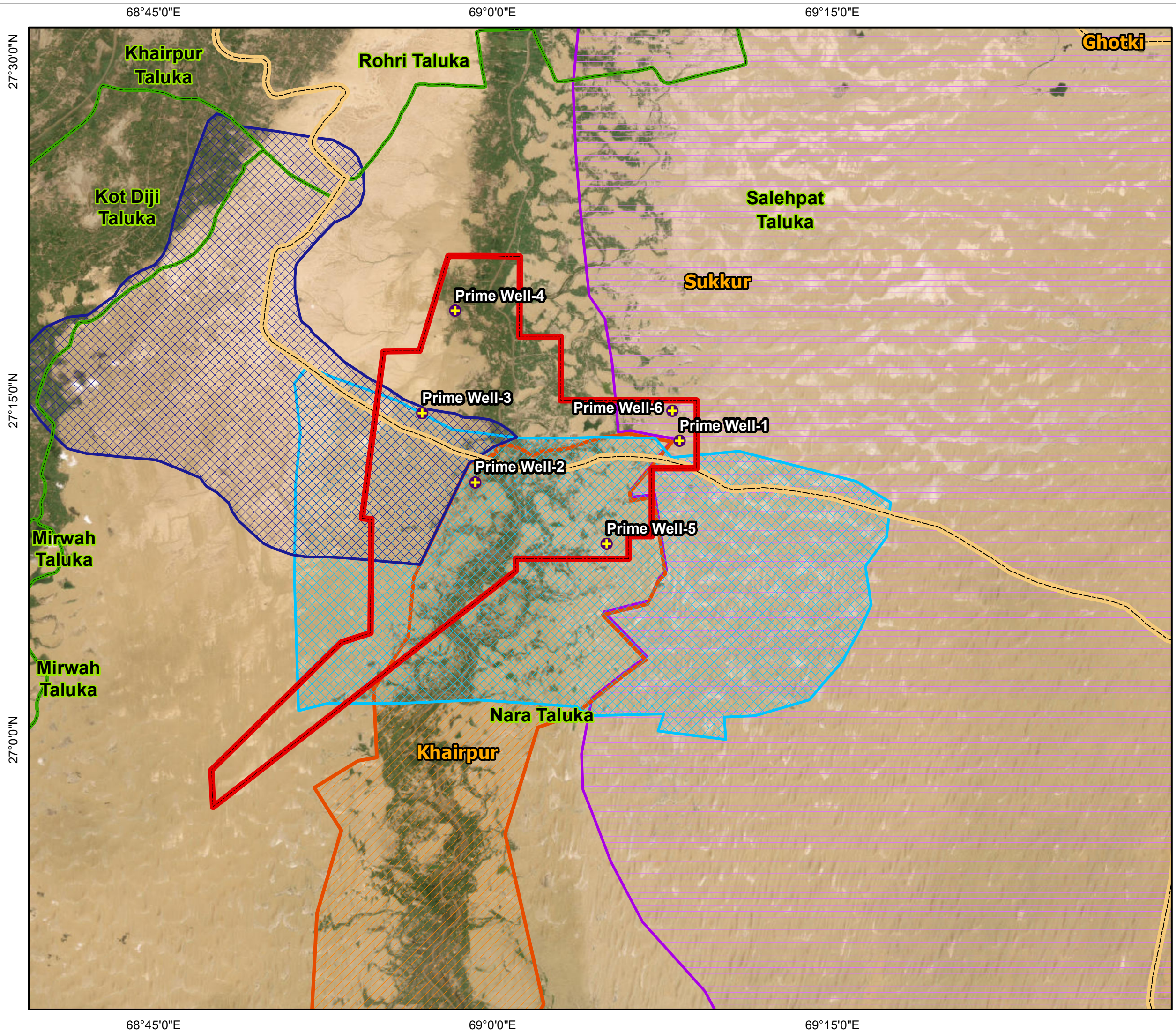
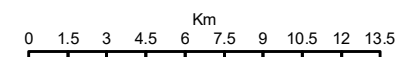


Fig 1-2 Project Area Map

Environmental Impact Assessment
(EIA) Study for Drilling of Wells and
Associated Development Activities in
SW Miano-III Block, Sindh



Legend

- Proposed Well Locations
- Block Boundary
- District Boundary
- Taluka Boundary
- Range Land
- Nara Desert Wildlife Sanctuary
- Nara Game Reserve
- Takkar Wildlife Sanctuary



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2 EIA Scope and Methodology

2.1 Scope of the EIA

This EIA investigates the impacts likely to arise from the proposed drilling operation along with other associated development activities by Prime Pakistan and covers the following activities within the project area:

- Drilling of six appraisal/exploratory/development wells;
- Other associated development activities i.e. construction of base camp/s, well site, access road and laying of flow lines from successful well to existing hydrocarbon gathering system etc.

It is pertinent to mention that proposed project activities (details of activities are provided in **Chapter 4**) fall within wildlife or forest protected areas therefore, this EIA covers the aforementioned activities in both protected and non-protected wildlife or forest areas. Other than those specified in this report, all future planned activities will be subjected to a separate Environmental Assessment (EIA/IEE) study.

This EIA is prepared with an intention to:

- Assess the existing environmental conditions in the proposed project area/s, including the identification of environmental sensitive areas and develop a baseline of its prevalent environmental and socioeconomic conditions;
- Identify and investigate all impacts of the proposed construction, drilling and associated activities on the physical, biological and socioeconomic environment of the project area/s;
- Propose mitigation measures that would help Prime Pakistan in conducting the construction, drilling and associated activities in an environmental sustainable manner;
- Uncover the planning, construction, and operational phase impacts up to microenvironment levels in which project is proposed to be sited;
- Develop an Environmental Management Plan (EMP) that would assist Prime Pakistan in the effective implementation of the recommendations of the EIA.

2.2 The EIA Methodology

The various steps undertaken in the EIA preparation are summarised below:

2.2.1 Understanding of the Proposed Operation

This involved collecting information from Prime Pakistan on the proposed project activities and understanding the activities to identify potential impacts from them.

2.2.2 Review of Legislation and Guidelines

National and provincial legislations, international agreements, environmental guidelines and best industry practices were reviewed to set environmental standards that Prime Pakistan will be required to adhere to during the project.

2.2.3 Secondary Data Collection

All available published and unpublished information pertaining to the background environment was obtained and reviewed. All data sources were carefully reviewed to collect the following information:

- Physical environment – topography, geology, seismology, geomorphology, soils, surface and groundwater resources and climate;
- Biological environment – habitat types, flora and fauna (particularly rare or endangered species), critical habitats, vegetation scenarios within the area;
- Socioeconomic environment – settlements, socioeconomic conditions, infrastructure and land use; and
- Heritage aspects – sites of cultural, archaeological or historical significance.

2.2.4 Data Collection

The EIA team including environmentalist and wildlife specialist visited the project area in April, 2024. During the site visit, primary information on the physical, biological and socioeconomic environment of the project area was gathered. Discussions were also held with the members of community residing within the proposed project area to collect primary information. Secondary information was collected from Prime Pakistan, in-house sources like previous environmental studies and respective District Census Reports (DCRs). Applicable environmental assessment procedures prepared by the Sindh-EPA were followed in the preparation of this EIA.

2.2.5 Impacts Identification and Assessment

Potential adverse impacts arising from each phase of the proposed project activities were comprehensively identified and meticulously documented. These include effects of the proposed project activities on the physical, biological, socioeconomic, archaeological and cultural environments of the area and are presented in **Chapter 6** of this report. Impacts were identified and assessed on the basis of field data, secondary data, experts' opinions and monitoring results of previous oil and gas exploration projects in Pakistan particularly in Sindh region and SW Miano-III block.

2.2.6 Recommendations for Mitigation Measures

Mitigation measures to minimize, eliminate or compensate the potential environmental impacts were recommended. The mitigation measures were recommended on the basis of the past experiences, best industry practices, legislative requirements and professional knowledge.

Environment impacts characteristics criteria pertaining to the purposed drilling and associated activities is given in **Table 1-3**, whereas detailed potential environmental impacts and mitigation or remedial actions are discussed in **Chapter 7** of this EIA report.

2.2.7 Development of Environmental Management Plan (EMP)

A project specific Environmental Management Plan (EMP) has been developed for effective implementation of the recommended mitigation measures. The EMP included controls to minimize the identified impacts and monitoring program to monitor residual impacts, if any, during the proposed operation. The EMP also identifies roles and responsibilities for all concerned personnel during the execution of the project activities.

2.2.8 Layout of EIA Report

The EIA study has been compiled in a report form. The format of the EIA report conforms to the guidelines provided in the Sindh Environmental Protection Act, 2014, Sindh Environmental Assessment Rules, 2021, and Pakistan Environmental Protection Agency Guidelines for the Preparation and Review of Environmental Reports, 1997. The EIA report describes the proposed project, environment of the project area, relevant legislation and guidelines, assessment of the project impacts and recommendations for mitigation measures. The photographic records have been provided in the relevant sections of the EIA report. Environmental Management Plan (EMP) referring to the proposed project activities i.e. drilling of wells and associated construction activities including laying of pipelines in SW Miano-III block is attached as **Appendix-A** of this EIA.

3 Legal Framework

3.1 Introduction

This chapter provides a synopsis of environmental legislations, policies and guidelines that may have relevance to the proposed project. These include:

- Prime Pakistan corporate policy on Health, Safety and Environment (HSE);
- National and provincial environmental policies, legislations and guidelines; and
- International conventions and guidelines.

Prime Pakistan will be required to adhere to the relevant requirements of the policies, legislations and recommendations of the guidelines during the proposed drilling of wells and associated construction activities, which have also been incorporated in the mitigation measures and the EMP provided in the EIA.

3.2 Prime Pakistan Private Limited's HSE Policy

Prime Pakistan's Health, Safety and Environmental (HSE) policy (attached the policy in this document) is the principal policy document and is committed to give priority to health and safety of all its employees and of other personnel affected by its activities. Emphasis is given on the recognition and elimination of risk rather than blaming it to someone. Prime Pakistan also confers its overriding commitment towards minimizing impact of its activities on the natural environment of the area. The policy also encourages an active participation with government and other responsible institutions in meeting applicable national as well as international health, safety and environmental rules and regulations. The policy emphasizes on adaptation of advanced and best industrial practices in order to minimize adverse detrimental impacts on the environmental receptors. The policy highlights a need to seek economic ways to minimize environmental degradation and sustaining the environment. Improvement of business processes, in conformity with defined strategic goals and objectives for achieving technological excellence in day-to-day activities is also accentuated. In addition, maintaining knowledge throughout organization by effective communication of information through education and training of staff and maintaining updated contingency plans is to be exercised throughout the company. In the end, measuring and analyzing the HSE performance and implementation of management systems is stressed to ensure effective feedback of information for continual improvement.

3.3 National Environmental Policy, Legislation and Guidelines

3.3.1 National Environmental Policy, 2005

The National Environmental Policy (NEP) was approved by the Pakistan Environmental Protection Council (PEPC) in its 10th meeting on 27th December, 2004 under the chairmanship of the Prime Minister of Pakistan and thereafter approved by

the Cabinet on 29th June, 2005. NEP is the primary policy of Government of Pakistan that addresses the environmental issues of the country. The broad goal of NEP is “To protect, conserve and restore Pakistan’s environment in order to improve the life quality of the citizens through sustainable development”. The NEP identifies the following set of sectoral and cross-sectoral guidelines to achieve its goal of sustainable development.

a. Sectoral Guidelines

Water and sanitation, Air quality and noise, Waste management, Forestry, Biodiversity and protected areas, Climate change and ozone depletion, Energy efficiency and renewable, Agriculture and Livestock and Multilateral environmental agreements.

b. Cross-Sectoral Guidelines

Poverty, Population, Gender, Health, Trade and environment, Environment and local governance, and Natural disaster management.

The NEP suggests the following policy instruments to overcome the environmental problems throughout the country:

- Integration of environment into development planning;
- Legislation and regulatory framework;
- Capacity development;
- Economic and market-based instrument;
- Public awareness and education; and
- Public private civil society partnership.

NEP is a policy document and does not apply directly to the proposed project however, Prime Pakistan shall ensure that the project should not add to the aggravation of the environmental issues identified in NEP and mitigation measures should be adopted to minimize or avoid any contribution of the project impacts in these areas.

3.3.2 National Conservation Strategy, 1992

Before the approval of National Environmental Policy (NEP) the National Conservation Strategy (NCS) was considered as the government’s primary policy document on national environmental issues. At the moment this strategy just exists as a national conservation program. The NCS identifies 14 core areas including conservation of biodiversity; pollution prevention and abatement; soil and water conservation; preservation of cultural heritage and recommends immediate attention to these core areas in order to preserve the country’s environment.

NCS does not directly apply to Oil and Gas E&P projects however, Prime Pakistan will ensure that the project should not add to the aggravation of the 14 core environmental issues identified in the NCS and mitigation measures should be adopted to minimize or avoid any contribution of the project impacts in these areas.

3.3.3 The Biodiversity Action Plan (BAP), 2000

The BAP, which has been designed to complement the NCS and the proposed provincial conservation strategies, identifies the causes of biodiversity loss in Pakistan and suggests a series of proposals for action to conserve biodiversity in the country.

The Biodiversity Action Plan (BAP) recognizes that an environmental assessment is used as a tool at a project level to identify environmental effects of a proposed project and to plan for reducing adverse effects. The BAP further stipulates that an environmental assessment needs to be initiated at an early stage of project development and that public participation in the review of potential effects is important. The existing EIA fulfils the stipulation of BAP.

3.3.4 National Environmental Legislation

a. Sindh Environmental Protection Act, 2014

After passage of 18th amendment by the parliament, Sindh Government has enacted its own environmental law. The Sindh Environmental Protection Bill, 2014 having been passed by the Provincial Assembly of Sindh on 24th February, 2014 and assented to by the Governor of Sindh on 19th March, 2014 as an Act of Legislature of Sindh.

According to Part-VI, Environmental Examinations and Assessments; no proponent of a project shall commence construction or operation unless he has filed with the Agency an Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) and has obtained from the Agency approval in respect thereof. This EIA is being submitted by Prime Pakistan to Sindh Environmental Protection Agency to fulfil the requirements of the Act.

The Act is quite comprehensive to provide for the protection, conservation, rehabilitation and improvement of the environment, for the prevention and control of pollution, and promotion of sustainable development.

b. Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021

In exercise of the powers conferred by Section 37 of the Sindh Environmental Protection Act, 2014, the Sindh Environmental Protection Agency, with the approval of Government, issued the following regulations, namely 'Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021' which came into force at once.

A proponent of a project falling in any category listed in Schedule I of these Regulations shall file 'Environmental Checklist' with the Agency and the provisions of

Section 17 shall apply to such projects, whereas for projects falling in Schedule II and III will have to carry out IEE and EIA respectively.

Other important features of the Sindh EPA Environmental Assessment Regulations, 2021 relevant to the proposed project are listed below:

- A fee is payable to the Sindh EPA for review of the EIA;
- The EIA submittal is to be accompanied by an application in the format prescribed in Schedule V of the Sindh EPA (Environmental Assessment) Regulations 2021;
- Any report filed by the proponent or applicant shall be returned, if found incomplete and Sindh EPA may require the proponent to submit an additional information at any stage during the review process;
- The Sindh EPA shall make every effort to conclude its review process of the EA, EMP or environmental checklist within fifteen days, of the IEE within thirty days and of the EIA within sixty days after receiving of complete case; and
- If Sindh EPA accords approval, it will be valid for three years from the date of accord.

As per Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021, Schedule-II, (C-2), Oil and gas extraction projects including exploration and production located outside the environmentally sensitive/protected areas require IEE. However, the proposed well locations are situated within the protected areas (Nara Desert Wildlife Sanctuary, Nara Game Reserve, Takkar Wildlife Sanctuary), therefore an EIA study is required to be carried out and should be submitted to Sindh EPA to obtain environmental approval/NOC.

c. Sindh Environmental Quality Standards, 2016

In exercise of the powers conferred under clause (g) of sub-section (1) of Section 6, Sindh Environmental Protection Act 2014, the Sindh Environmental Protection Agency, with the approval of the Sindh Environmental Protection Council, has established the environmental standards for Industrial wastewater, Effluents, Domestic sewage, Industrial air emissions and ambient airs, Noise for vehicles and Drinking water quality standards, 2016. These standards came into force on 28th January, 2016 and are provided in **Table 3-1** to **Table 3-6**.

Prime Pakistan Limited will be required to comply with all applicable standards as prescribed in the law and report to Sindh Environmental Protection Agency as per their requirements or bindings.

d. Self-Monitoring and Reporting Rules, 2014

In exercise of the powers conferred by Section 36 of the Sindh Environmental Protection Act, 2014, Sindh Environmental Protection Agency with the approval of Government of Sindh has established the rules which are called 'Sindh Environmental Quality Standards (Self-Monitoring and Reporting by Industry) Rules, 2014' which came into force at once.

As per rules set by this system, provincial industries have to monitor effluents and emissions in compliance with the SEQS and report it to Provincial EPA. This system classifies industry into three categories A, B and C each corresponding to a specified reporting frequency. Proposed project activities lies under 'Category B' for both liquid effluent and gaseous emissions (priority parameters provided in Table A & B of Schedule-IV of these Rules, 2014) and thus shall submit Environmental Monitoring Reports to Sindh EPA on quarterly basis.

e. The Sindh Occupational Safety and Health Act, 2017

The Sindh Occupational Safety and Health Bill, 2017 having been passed by the Provincial Assembly of Sindh on 17th November, 2017 and assented to by the Governor of Sindh on 26th December, 2017 as an Act of the Legislature of Sindh which came into force at once.

The Sindh Occupational Safety and Health Act 2017, Sindh Act No. I of 2018 is an act to make provision for occupational safety and health conditions at all workplaces for the protection of persons at work against risk of injury arising out of the activities at work places and for the promotion of safe, healthy and decent working environment adapted to the physical, physiological and psychological needs of all persons at work. After enforcement of this Act, Prime Pakistan and all proposed project execution contractors will be bound to abide all provisions defined in the act.

f. Hazardous Substances Rules, 2014

In exercise of the powers conferred by Section 36 of the Sindh Environmental Protection Act, 2014, the Sindh EPA, with the approval of the Sindh Government announced comprehensive rules in 2014, namely 'Hazardous Substances Rules, 2014' which came into force at once.

As per Hazardous Substances Rules, 2014, Prime Pakistan is bound to obtain a license from Sindh EPA for transportation, usage, handling, storage and disposal of hazardous substances as prescribed in Sub-clause (b) of Clause (xxv) of Section 2, Schedule-I of Hazardous Substances Rules, 2014 in exploration & production operations being carried out by the Company.

g. The Sindh Wildlife Protection, Preservation, Conservation and Management Act, 2020

This act provides for the protection, conservation, preservation sustainable use of wildlife for establishment, management and maintenance of protected areas in the province of Sindh. The law empowers the Sindh Wildlife Department (SWD) to declare any estate land, wasteland, and reserved forests a protected area where hunting, shooting, killing, injuring, trapping, snaring and poisoning of wild animals shall be prohibited.

The law specifies three broad classifications of the protected areas: - a). National Parks - Hunting and breaking of land for oil and gas exploration are prohibited in national parks, as are removing vegetation or polluting the water flowing through the park. It

is accessible to public for recreation, education and research in such manner that its natural estate is not disturbed. b). Wildlife Sanctuaries - Wildlife Sanctuaries means an area of land or coast managed by Government for protection of wildlife, especially for their undisturbed breeding or staging and wintering of migratory waterfowl. Cultivation, grazing and residing are prohibited in the demarcated areas. Special permission is required for the entrance of the public. However, in exceptional circumstances, these restrictions may be relaxed for scientific purposes or the betterment of the respective area at the discretion of the governing authority. c). Game Reserves - Game reserves are designated as areas where hunting or shooting is not allowed except under special permits.

The new law empowers wildlife officers to arrest any person without warrant for committing wildlife offence. All acts hurting wild animals — whether intentionally or unintentionally — shall be considered as acts of cruelty and shall be strictly forbidden. Killing or capturing is allowed in case of self-defence whereas, nearest wildlife office should be immediately informed about the same. The law also prohibits the use of wild animals for fighting and baiting. It prohibits causing damage to infrastructures and culturally significant structures in the protected areas. It also prohibits use of the protected areas for cultivation purposes. It bans exploration of oil and gas in protected areas.

The intended activities will be executed inside Takkar Wildlife Sanctuary and Nara Desert Wildlife Sanctuary; therefore, Prime Pakistan will be required to ensure that strict mitigation measures suggested in the EIA are being adhered to avoid contravene with any provisions of the Act.

h. The Sindh Irrigation Act, 1879 and Canal and Drainage Act, 1873

This Sindh Irrigation Act covers the construction, maintenance and regulation of canals for the supply of water and for the levy of rates of water supplied in the province of Sindh. Canals are defined as channels, pipes and reservoirs constructed and maintained by the Government for the supply and storage of water. Under Section 27 of the Act a person desiring to have a supply of water from a canal for purposes other than irrigation shall submit a written application to a Canal Officer who may, with the sanction of the Provincial Government give permission under special conditions. The Act under section 61 also prohibits the damaging, altering, enlarging or obstructing the canals without proper authority.

The Canal and Drainage Act (1873) prohibits corruption or fouling of water in canals (defined to include channels, tube wells, reservoirs and watercourses), or obstruction of drainage.

A network of canals and associated irrigation channels exist in the project area. Prime Pakistan will construct alternative route and culverts to continue water flow from these water courses (if required). It will be also ensured that none of the water course is fouled, disrupted or anticipated to be damaged from proposed project activities.

i. The Forest Act, 1927

This act is applicable to all regions of Pakistan. It includes procedures for constituting and managing various types of forests, such as reserved forests and protected forests. The act empowers the provincial forest departments to declare any forest area as reserved or protected and also prohibit the breaking up or clearing of forest for cultivation, grazing, hunting, removing forest produce, quarrying and felling, lopping and topping of trees, branches in reserved and protected forests. It also defines the duties and roles of forest related public servants and penalties for any infringement of the rules. Provisions of this act apply to all project activities that are planned within the forest plantations or on a forest land.

As per information collected from secondary sources and SOP maps, the project area is located outside any protected forest area therefore, the project will not contravene with any provisions of the Act however, Prime Pakistan shall ensure that all mitigation measures suggested in this EIA are being adhered with to protect the natural vegetation cover of the area and to avoid habitat loss and degradation of biodiversity.

j. Antiquities Act, 1975

The protection of cultural resources in Pakistan is ensured by the Antiquities Act of 1975. Antiquities have been defined in the Act as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, national monuments etc. The act is designed to protect antiquities from destruction, theft, negligence, unlawful excavation, trade and export. The law prohibits new construction in the proximity of a protected antiquity and empowers the Government of Pakistan to prohibit excavation in any area which may contain articles of archaeological significance. Under the Act, the project proponent is obligated to:

- Ensure that no activity is undertaken in the proximity of a protected antiquity; and
- If during the course of the project an archaeological discovery is made, it shall be reported to the Department of Archaeology, Government of Pakistan.

The project area for the EIA does not contain notified archaeological sites as protected under this Act.

k. Legislation on Oil and Gas Exploration and Production

The various regulations related to oil and gas exploration include:

- The Mines Act, 1923
- The Regulation of Mines and Oilfields and Mineral Development (Government Control) Act, 1948
- The Pakistan Petroleum (Production) Rules, 1949
- The Oil and Gas (Safety in Drilling and Production) Regulations, 1974
- The Pakistan Petroleum (Exploration and Production) Rules, 1986

- The Model Petroleum Concessions Agreement, 1994

The Regulation of Mines and Oilfields and Mineral Development (Government Control) Act, 1948 and the Pakistan Petroleum (Production) Rules, 1949 and Pakistan Petroleum (Exploration and Production) Rules, 1986 empowers the Ministry of Petroleum to oversee the petroleum exploration, development and production operations. The 1986 Exploration and Production Rules address environmental concerns and require operators to “prevent pollution, avoid accumulation of trash and prevent damage to the environment and surroundings”.

As for safety, the Model Petroleum Concession Agreement (July, 1994) implementing the 1986 Exploration and Production Rules, specifically requires observance of the 1974 Safety Regulations. The penalties imposed in the 1986 Exploration and Production Rules allow the Director General Petroleum Concessions (DGPC) to revoke a license if the rules are not satisfied by the operator. The Mines and Oil Fields Act also specifies penalties including imposition of fines and/or imprisonment.

The 1923 Mines Act through the Oil and Gas (Safety in Drilling and Production) Regulations, 1974 controls the full range of safety issues in exploration and production from seismic operations to construction, drilling and production.

The 1974 Safety Regulations requires operators to send to the Chief Inspector of Mines, Ministry of Labour and Manpower information on safety issues including provisions of protective equipment and identification of safety personnel and emergency measures, designation of safety personnel including a Welfare and Safety Officer and accident reporting.

1. Pakistan Penal Code, 1860

The Pakistan Penal Code, 1860 authorizes fines, imprisonment or both for voluntary corruption or fouling of public springs or reservoirs so as to make them less fit for ordinary use.

3.3.5 National Environmental Guidelines

a. The Pakistan Environmental Assessment Procedures

The Pakistan Environmental Protection Agency (PEPA) prepared the guidelines for the preparation and review of Environmental Reports in 1997. The guidelines pertaining to the review process of EIAs and IEEs was given regulatory status in the Review of IEE and EIA Regulations, 2000. They are based on much of the existing work done by international donor agencies and Non-Governmental Organizations (NGOs). The package of regulations prepared by PEPA includes:

- Policy and procedures for filing, review and approval of environmental assessments;
- Guidelines for the preparation and review of environmental reports;
- Guidelines for public consultation;

- Guidelines for sensitive and critical areas; and
- Sectoral guidelines – O&G exploration and production.

The guidelines on policy and procedures define the policy context and the administrative procedures that will govern the environmental assessment process, from the project pre-feasibility stage, to the approval of the environmental report. According to the procedures laid out in the policy guidelines, IEEs or EIAs are to be filed with the provincial EPA where the project is to be implemented. The Federal EPA has, however, been given the right to review any environmental report at any time and the power to revoke the decision of the provincial EPA, if it deems this to be necessary.

Projects have been classified in the policy guidelines by expected degree of adverse environmental impacts. All projects proposed in environmentally sensitive areas (including Game Reserves and Wildlife Sanctuaries) require an EIA.

The procedures require proponents to prepare terms of reference for the environmental assessment reports. They require that all environmental assessment studies shall contain baseline data on the area and must contain a detailed assessment of the potential environmental impacts and the recommended mitigation measures. Consultations with the communities that are most likely to be affected as well as relevant NGOs are to be an integral part of the environmental impact assessment process.

The guidelines on public consultation deals with possible approaches to public consultation and techniques for designing an effective program of consultation that reaches out to all major stakeholders and ensures the incorporation of their concerns in any impact assessment study. The guidelines on sensitive areas are more specific in that they identify the officially notified protected areas in Pakistan, including critical ecosystems and archaeological sites.

Lastly, there are guidelines for oil & gas exploration and production. The guidelines state that onshore exploration activities can be carried out without having to submit either an IEE or an EIA. This is subject to the project proponent's adherence to the provisions of the guidelines and provided that such exploration is not taking place within or adjacent to a sensitive or critical area/s. Possible adverse impacts that may arise in due to proposed project activities include damage to flora and fauna and to crops and livestock as well as the production of waste. Project proponents are required to take measures to mitigate such effects.

b. Guidelines for Operational Safety, Health and Environmental Management, (December, 1996)

These guidelines are the outcome of a study commissioned by the Directorate General Petroleum Concessions, Ministry of Petroleum and Natural Resources, Government of Pakistan. The guidelines list down the relevant laws related to the operational health,

safety and environment and also recommends environmental controls and management practices to be adopted in O&G exploration projects.

3.4 International Treaties and Guidelines

3.4.1 International Treaties

Pakistan is a signatory to various international treaties and conventions on the conservation of the environment and wildlife protection. The country is thus obliged to adhere to the commitments specified in these treaties.

a. The Convention on Biological Diversity

The Convention on Biological Diversity was adopted during the Earth Summit of 1992 at Rio de Janeiro, Brazil. The Convention requires parties to develop national plans for the conservation and sustainable use of biodiversity, and to integrate these plans into national development programs and policies. Parties are also required to identify components of biodiversity that are important for conservation, and to develop systems to monitor the use of such components with a view to promoting their sustainable use. Moreover, in accordance with the Article 26 of the convention, parties are also required to prepare national reports on the status of implementation of the convention.

b. The Convention on Conservation of Migratory Species of Wild Animals, 1979 (Bonn Convention)

The Convention requires countries to take action to avoid endangering migratory species. The term "migratory species" refers to the species of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries. The parties are also required to promote or co-operate with other countries in matters of research on migratory species.

The Convention contains two appendices. Appendix I contain the list of migratory species that are endangered according to the best scientific evidence available. For these species, the member states to the Convention are required endeavour to:

- Conserve and restore their habitats;
- Prohibit their hunting, fishing, capturing, harassing and deliberate killing;
- Remove obstacles and minimize activities that seriously hinder their migration; and
- Control other factors that might endanger them, including control of introduced exotic species.

Appendix II lists the migratory species, or groups of species, that have an unfavourable conservation status as well as those that would benefit significantly from the international co-operation that could be achieved through intergovernmental

agreements. See **Table 6-7, Table 6-8 and Table 6-9** for list of recorded species covered under this convention.

c. The Convention on Wetlands of International Importance, Ramsar, 1971

Pakistan is a signatory to the said Convention. The principal obligations of contracting parties to the Convention are:

- To designate wetlands for the List of Wetlands of International Importance;
- To formulate and implement planning so as to promote wise use of wetlands, to make EIA before transformations of wetlands, and to make national wetland inventories;
- To establish nature reserves on wetlands and provide adequately for their wardenship and through management to increase waterfowl populations on appropriate wetlands;
- To train personnel competent in wetland research, management and wardenship;
- To promote conservation of wetlands by combining far-sighted national policies with coordinated international action, to consult with other contracting parties about implementing obligations arising from the Convention, especially about shared wetlands and water system;
- To promote wetland conservation concerns with development aid agencies; and
- To encourage research and exchange of data.

So far, 19 sites in Pakistan have been declared as wetlands of International Importance or Ramsar sites however, none of these sites are located within or in close proximity to the project area.

d. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

This convention came into effect on 03 March, 1973 in Washington. In all, 130 countries are signatory to this convention with Pakistan signing the convention in 1976.

The convention requires the signatories to impose strict regulation (including penalisation, confiscation of the specimen etc.) regarding trade of all species threatened with extinction or that may become so, in order not to endanger further their survival.

The Convention contains three appendices. Appendix I includes all species threatened with extinction which are or may be affected by trade. The Convention requires that trade in these species should be subject to strict regulation. Appendix II includes species that are not necessarily threatened presently but may become so unless trade in specimens of these species is subject to strict regulation. Appendix III includes species which any contracting party identifies as subject to regulations in trade and

requires other parties to co-operate in this matter. See **Table 6-5, Table 6-6, and Table 6-7** for list of recorded species covered under CITES appendices.

e. International Union for Conservation of Nature and Natural Resources (IUCN) Red List

The Red List is published by IUCN and includes those species that are under potential threat of extinction. These species have been categorized as:

- Extinct (EX) – beyond reasonable doubt that the species is no longer extant.
- Extinct in the Wild (EW) – survives only in captivity, cultivation and/or outside native range, as presumed after exhaustive surveys.
- Critically Endangered (CR) – in a particularly and extremely critical state.
- Endangered (EN) – very high risk of extinction in the wild, meets any of criteria A to E for Endangered.
- Vulnerable (VU) – meets one of the 5 Red List criteria and thus considered to be at high risk of unnatural (human-caused) extinction without further human intervention.
- Near Threatened (NT) – close to being at high risk of extinction in the near future.
- Least Concern (LC) – unlikely to become extinct in the near future.
- Data Deficient (DD) – species that may be at risk of extinction in the wild but at the present time there is insufficient information available to make a firm decision about its status.
- Not Evaluated (NE)

In the IUCN Red List, "threatened" embraces the categories of Critically Endangered, Endangered and Vulnerable. The IUCN is the foremost authority on threatened species and treats threatened species not as a single category, but as a group of three categories, depending on the degree to which they are threatened:

- Vulnerable species
- Endangered species
- Critically endangered species

Less-than-threatened categories are near threatened, least concern and the no longer assigned category of conservation dependent. Species which have not been evaluated (NE), or do not have sufficient data (DD) also are not considered "threatened" by the IUCN. See **Table 6-5, Table 6-6 and Table 6-7** for lists of recorded species included in IUCN Red List.

3.4.2 International Guidelines

a. World Bank Guidelines on Environment

The principal World Bank publications that contain environmental guidelines are listed below:

- Environmental Assessment-Operational Policy 4.01. Washington, DC, USA. World Bank, 1999
- Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross-Sectoral Issues. World Bank Technical Paper Number 139, Environment Department, the World Bank, 1991
- Environmental Assessment Sourcebook, Volume III: Guidelines for Environmental Assessment of Energy and Industry Projects. World Bank Technical Paper No. 154, Environment Department, the World Bank, 1991
- Environmental Health and Safety (EHS) guidelines, International Finance Corporation (IFC) World Bank Group, 2007

The first two publications listed here provide general guidelines for the conduct of an EIA, and address the EIA practitioners themselves as well as project designers. While the Sourcebook in particular has been designed with Bank projects in mind, and is especially relevant for the impact assessment of large-scale infrastructure projects, it contains a wealth of information which is useful to environmentalists and project proponents.

The Sourcebook identifies a number of areas of concern, which should be addressed during impact assessment. It sets out guidelines for the determination of impacts, provides a checklist of tools to identify possible biodiversity issues and suggests possible mitigation measures. Possible development project impacts on wild lands, wetlands, forests etc. are also identified and mitigation measures suggested. The Sourcebook also highlights concerns in social impact assessment, and emphasises the need to incorporate socioeconomic issues in EIA exercises.

The Sourcebook dealing with the assessment of industry and energy projects is more specific. It contains a section on onshore development of O&G and identifies the potential environmental impacts of E&P activities. These include surface disturbance from the building of access roads in undisturbed areas, disturbance from explosive charges and possible damage to cultural resources. Possible socio-cultural issues that may arise as a result of an influx of non-locals are also identified in the Sourcebook.

As of 30th April 2007, the documents published in volume III of the Pollution Prevention and Abatement Hand book have been replaced by the new versions of EHS guidelines published by IFC. The EHS guidelines are technical reference documents that address IFC's expectations regarding the industrial pollution management performance of its projects. They are designed to assist managers and decision makers with relevant industry background and technical information. This information

supports actions aimed at avoiding, minimising, and controlling EHS impacts during the construction, operation, and decommissioning phase of a project or facility. The EHS guidelines have become globally applied references for private sector development with their use extending well beyond World Bank Group operations to a diverse external community, such as other international financial institutions, regulators, industry, academics, and commercial banks, including the international banks that have adopted the Equator Principles. Separate sets of guidelines have been prepared addressing general EHS issues as well as guidelines specific to various industrial sectors including onshore O&G development projects.

The EHS Guidelines for Onshore Oil and Gas Development include information relevant to seismic exploration; exploration and production drilling; development and production activities; transportation activities including pipelines; other facilities including pump stations, metering stations, pigging stations, compressor stations and storage facilities; ancillary and support operations; and decommissioning. A full description of industry activities for this sector is also provided in the guidelines.

b. Environmental Management in Oil & Gas Exploration and Production

This document provides an overview of environmental issues in the oil and gas exploration and production processes and discusses potential environmental impacts on the physical, biological and socioeconomic environment.

The document also recommends environmental management practices and environmental protection measures such as waste treatment and disposal techniques, pollution prevention and cleaner production, oil spill contingency planning, decommissioning etc. for oil and gas exploration and production operations.

c. International Regulations and Guidelines for the Disposal of E&P Wastes

These include the following:

- The Resource Conservation and Recovery Act of the United States, 1976 (here after referred to as RCRA);
- Environmental Guidance Document: Waste Management in Exploration and Production Operations, American Petroleum Institute, API E5, 1997 (here after referred to as API guidelines);
- State Wide Order 29 – B, State of Louisiana, Department of Natural Resources, 1990 (hereafter referred to as LSO 29B regulations);
- Colorado Oil and Gas Conservation Commission, Rules and Regulations (hereafter referred to as COGCC regulations);
- The Interstate Oil and Gas Compact Commission guidelines on disposal of E&P wastes (hereafter referred to as IOGCC guidelines);

The United States Environmental Protection Agency (USEPA) under the RCRA Act classifies all drilling fluids, produce water and drill cuttings as non-hazardous. The

API and IOGCC guidelines and LSO 29B and COGCC regulations present various options for the disposal of drilling fluids, produced formation fluids and drill cuttings including land treatment, road spreading, on site burial, and solidification and recommend maximum concentration levels for pH, metals, oil and grease and other inorganic parameters to be met by each option. The most stringent limits of all for two options, land treatment and burial into unlined pits have been provided in **Table 3-7** if the waste exceeds these limits then the disposal should be in lined pits. **Table 3-8** provides the less stringent criteria set by LSO 29B.

3.5 International and National Environment and Conservation Organisations

3.5.1 International and National NGOs

International environmental and conservation organisations such as IUCN and the World Wide Fund for nature (WWF) have been active in Pakistan. Both these organisations have worked closely with government and act in an advisory role with regard to the formulation of environmental and conservation Policies. Since the convening of the Rio Summit, a number of national environmental NGO's have also been formed, and have been engaged in advocacy, and in some cases, research. Most prominent national environmental NGO's, such as the Sustainable Development Policy Institute (SDPI), Strengthening Participatory Organization (SPO), Shehri, and Shirkatgah are members of the Pakistan National Committee (PNC) of IUCN.

As mentioned earlier, environmental NGO's have been particularly active in advocacy, as proponents of sustainable development approaches. Much of the government's environmental and conservation policy has been formulated in consultation with leading NGO's, who have also been involved in drafting new legislation on conservation.

3.5.2 Pakistan Petroleum Exploration and Production Companies Association (PPEPCA)

PPEPCA is an association of private sector companies and semi-autonomous departments concerned with exploration and production of O&G. It provides a forum for such companies to discuss issues, formulate common strategies and convey concerns and demands to the government and to other stakeholders in the O&G business. PPEPCA has also been particularly effective in collecting and disseminating information on current trends in exploration and production to its members, and has been instrumental in informing members of changes in government policy and in formulating a response to such policy changes.

Table 3-1: SEQS for Municipal and Industrial Effluents^a

Parameters	Into Inland Water	Into Sewage Treatment ⁵	Into Sea ⁶
Temperature 40°C or temperature increase*	≤3°C	≤3°C	≤3°C
pH	6-9	6-9	6-9
Biochemical Oxygen Demand (BOD ₅) at 20°C ¹	80	250	80**
Chemical Oxygen Demand (COD) ¹	150	400	400
Total Suspended Solids (TSS)	200	400	200
Total Dissolved Solids (TDS)	3,500	3,500	3,500
Grease and oil	10	10	10
Phenolic compounds (as phenol)	0.1	0.3	0.3
Chloride (as Cl ⁻)	1,000	1,000	SC***
Fluoride (as F)	10	10	10
Total cyanide (as CN ⁻)	1.0	1.0	1.0
An-ionic detergents (as MBAS) ²	20	20	20
Sulphate (SO ₄)	600	1000	SC***
Sulphide (S ⁻)	1.0	1.0	1.0
Ammonia (NH ₃)	40	40	40
Pesticides ³	0.15	0.15	0.15
Cadmium ⁴	0.1	0.1	0.1
Chromium (trivalent & hexavalent) ⁴	1.0	1.0	1.0
Copper ⁴	1.0	1.0	1.0
Lead ⁴	0.5	0.5	0.5
Mercury ⁴	0.01	0.01	0.01
Selenium ⁴	0.5	0.5	0.5
Nickel ⁴	1.0	1.0	1.0
Silver ⁴	1.0	1.0	1.0
Total Toxic metals	2.0	2.0	2.0
Zinc	5.0	5.0	5.0
Arsenic ⁴	1.0	1.0	1.0
Barium ⁴	1.5	1.5	1.5
Iron	8.0	8.0	8.0
Manganese	1.5	1.5	1.5
Boron ⁴	6.0	6.0	6.0
Chlorine	1.0	1.0	1.0

Source: The Sindh Government Gazette, January 28, 2016

Notes:

^a All values are in mg/l, unless otherwise defined.

¹ Assuming minimum dilution 1:10 on discharge, lower ratio would attract progressively stringent standards to be determined by the Sindh Environmental Protection Agency. By 1:10 dilution means, for example that for each one cubic meter of water for dilution of this effluent.

² Methylene Blue Active Substance; assuming surfactant as biodegradable.

³ Pesticides include herbicides, fungicides and insecticides.

⁴ Subject to total toxic metals discharge should not exceed level given at S.N. 25.

⁵ Applicable only when and where sewage treatment is operational and BOD₅=80mg/l is achieved by the sewage treatment system.

⁶ Provided discharge is not at shore and not within 10 miles of mangrove or other important estuaries.

* The effluent should not result in 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 meters from the point of discharge.

** The value for industry is 200mg/l.

*** Discharge concentration at or below sea concentration (SC).

Table 3-2: SEQs for Industrial Gaseous Emission^a

Parameter	Source of Emission	Standard
Smoke	Any	40% or 2 on Ringlemann scale or equivalent smoke number
Particulate matter ^b	Boilers and Furnaces:	
	Oil fired	300
	Coal fired	500
	Cement kilns	300
	Grinding, crushing, clinker coolers and related processes, metallurgical processes, converter blast furnaces and cupolas	500
Hydrogen chloride	Any	400
Chlorine	Any	150
Hydrogen fluoride	Any	150
Hydrogen sulfide	Any	10
Sulfur oxides ^c	Sulfuric acid/Sulfonic acid plants	5,000
	Other plants except power plants operating on oil and coal	1,700
Carbon monoxide	Any	800
Lead	Any	50
Mercury	Any	10
Cadmium	Any	20
Arsenic	Any	20
Copper	Any	50
Antimony	Any	20
Zinc	Any	200
Oxides of nitrogen ^d	Nitric acid manufacturing unit	3,000
	Other plants except power plants operating on oil or coal	
	Oil Fired	400
	Coal fired	600
	Cement kilns	1,200

Source: The Sindh Government Gazette, January 28, 2016

Notes:

^a All values are in mg/Nm³, unless otherwise defined.

^b Based on the assumption that the size of the particulates is 10 micron or more.

^c Based on 1% sulphur content in fuel oil. Higher content of sulphur will cause standards to be pro-rated.

d In respect of the emissions of the sulfur dioxide and nitrogen oxides, the power plants operating on oil or coal as fuel shall, in addition to standard specified above, comply with the following standards.

Table 3-3: SEQS for Motor Vehicle Exhaust and Noise

Parameter	Standard	Measuring Method
Smoke	40% or 2 on the Ringlemann scale during engine acceleration mode	To be compared with Ringlemann Chart at a distance of 6 meters or more
Carbon Monoxide	New vehicles: 4.5% Used vehicles: 6%	Under idling conditions, non-dispersive infrared detection through gas analyzer
Noise	85 dB (A)	Sound-meter at 7.5 meters from the source

Source: The Sindh Government Gazette, January 28, 2016

Notes: ^a For in-use vehicles

Table 3-4: SEQS for Noise

No.	Category of Area/ Zone	Effective from 1 st January, 2015		Effective from 1 st January, 2015	
		Limit in dB(A) Leq			
		Day Time	Night Time	Day Time	Night time
1.	Residential area (A)	65	50	55	45
2.	Commercial area (B)	70	60	65	55
3.	Industrial area (C)	80	75	75	65
4.	Silence zone (D)	55	45	50	45

Source: The Sindh Government Gazette, January 28, 2016

Notes:

1. Day time hours: 6.00 am to 10.00 pm
2. Night time hours: 10.00 pm to 6.00 am
3. Silence zone: Zones which are declared as such by the competent authority. An area comprising not less than 100 meters around hospitals, educational institutions and courts.
4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.
5. dB(A) Leq: Time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

Table 3-5: SEQS for Drinking Water Quality

No.	Properties/Parameters	Proposed Standard Values for Pakistan
Bacterial		
1.	All water intended for drinking (E.Coli or thermotolerant coliform bacteria)	Must not be detectable in any 100 ml sample
2.	Treated water entering the distribution system (E.Coli or thermotolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample
3.	Treated water in the distribution system (E.Coli or thermotolerant 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 sample taken throughout any 12-month period.
Physical		
4.	Colour	< 15 TCU
5.	Taste	Non objectionable/Acceptable
6.	Odour	Non objectionable/Acceptable
7.	Turbidity	< 5 NTU
8.	Total hardness as CaCO ₃	< 500 mg/L
9.	TDS	< 1000
10.	pH	6.5-8.5
Radioactive		
11.	Alpha Emitters bq/L or pCi	0.1
12.	Beta emitters	1
Chemical		
<i>Essential Inorganics</i>		<i>mg/L</i>
13.	Aluminium (Al)	< 0.2
14.	Antimony (Sb)	< 0.005
15.	Arsenic (As)	< 0.05
16.	Barium (Ba)	0.7
17.	Boron (B)	0.3
18.	Cadmium (Cd)	0.01
19.	Chloride (Cl-1)	< 250
20.	Chromium (Cr)	< 0.05
21.	Copper (Cu)	2
<i>Toxic Inorganics</i>		<i>mg/L</i>
22.	Cyanide (CN)	< 0.05
23.	Fluoride (F)*	< 1.5
24.	Lead (Pb)	< 0.05
25.	Manganese (Mn)	< 0.5
26.	Mercury (Hg)	< 0.001

No.	Properties/Parameters	Proposed Standard Values for Pakistan
27.	Nickel (Ni)	< 0.02
28.	Nitrate (NO ₃)*	< 50
29.	Nitrite (NO ₂)*	< 3
30.	Selenium (Se)	0.01
31.	Residual chlorine	0.2-0.5 at consumer end 0.5-1.5 at source
32.	Zinc (Zn)	5.0

Source: The Sindh Government Gazette, January 28, 2016

* Indicates priority health related inorganic constituents which need regular monitoring.

Table 3-6: SEQS for Ambient Air

No.	Pollutants	Time-weighted Average	Concentration in Ambient Air		Method of Measurement
			Effective from 1 st Jan, 2009	Effective from 1 st Jan, 2012	
1.	Sulfur Dioxide (SO ₂)	Annual Average*	80 µg/m ³	80 µg/m ³	Ultraviolet Fluorescence method
		24 hours**	120 µg/m ³	120 µg/m ³	
2.	Oxide of Nitrogen as (NO)	Annual Average*	40 µg/m ³	40 µg/m ³	Gas Phase Chemiluminescence
		24 hours**	40 µg/m ³	40 µg/m ³	
3.	Oxides of Nitrogen as (NO ₂)	Annual Average*	40 µg/m ³	40 µg/m ³	Gas Phase Chemiluminescence
		24 hours**	80 µg/m ³	80 µg/m ³	
4.	O ₃	1 hour	180 µg/m ³	130 µg/m ³	Non dispersive UV absorption method
5.	Suspended Particulate Matter (SPM)	Annual Average*	400 µg/m ³	360 µg/m ³	High Volume Sampling, (Average flow rate not less than 1.1 m ³ /minute)
		24 hours**	550 µg/m ³	500 µg/m ³	
6.	Respirable Particulate Matter. PM ₁₀	Annual Average*	200 µg/m ³	120 µg/m ³	β Ray absorption method
		24 hours**	250 µg/m ³	150 µg/m ³	
7.	Respirable Particulate Matter. PM _{2.5}	Annual Average*	25 µg/m ³	15 µg/m ³	β Ray absorption method
		24 hours**	40 µg/m ³	35 µg/m ³	
		1 hour	25 µg/m ³	15 µg/m ³	
8.	Lead (Pb)	Annual Average*	1.5 µg/m ³	1 µg/m ³	ASS method after sampling using EPM 2000 or equivalent filter paper
		24 hours**	2 µg/m ³	1.5 µg/m ³	
9.	Carbon Monoxide (CO)	8 hours**	5 µg/m ³	5 µg/m ³	Non Dispersive Infra Red (NDIR) method
		1 hour	10 µg/m ³	10 µg/m ³	

Source: The Sindh Government Gazette, January 28, 2016

* Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.

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

Table 3-7: API Standard for On-site Burial of E&P Wastes in Unlined Pits^{a, b, c}

No.	Parameter	Standard
1.	pH	6-9
2.	Total Petroleum Hydrocarbons	< 1% (dry weight) ^d
3.	Arsenic	41
4.	Barium	180,000
5.	Cadmium	26
6.	Chromium	1,500
7.	Copper	750
8.	Lead	300
9.	Mercury	17
10.	Molybdenum	37
11.	Nickel	210
12.	Selenium	100
13.	Zinc	1,400
14.	Boron	2 mg/L ^e
15.	Sodium adsorption ratio (solution phase)	< 12
16.	Exchangeable sodium percentage (solid phase)	< 15%
17.	Electrical conductivity	< 4 mmho/cm

Source: API E5 Second Edition of Environmental Guidance Document, Waste Management in Exploration and Production Operations (February 1997), Section 5.5.4

Notes:

^a All values in mg/kg unless otherwise stated

^b Waste exceeding the following limits should be buried or land-filled in lined pits (provided the limits of pH, TPH and EC are complied with)

^c The standards also require that the top of the burial cell must be at least five feet below ground level and the bottom of the burial cells must be five feet above seasonal high water table

^d Dry weight

^e Based on the soluble concentration with units of mg/L rather than total concentration

Table 3-8: LSO 29B Criteria for On-site Burial in Unlined Pits

No.	Parameter	Standard
1.	pH	6-9
2.	Oil and Grease	< 3% (dry weight)
3.	Arsenic	10 ppm
4.	Barium (Upland area)	40,000 ppm
5.	Cadmium	10 ppm
6.	Chromium	500 ppm
7.	Lead	500 ppm
8.	Mercury	10 ppm
9.	Selenium	10 ppm
10.	Silver	200 ppm
11.	Zinc	500 ppm
12.	Electrical Conductivity	< 12 mmho/cm
13.	Moisture Content	< 50 % by weight

Source: State wide order No. 29-B (June 2010)

Notes:

The top of the burial cell must be at least five feet below ground level.

The bottom of the burial cells must be five feet above seasonal high water table.

4 Project Description

4.1 The Proposed Project

Prime Pakistan's strategic initiative to enhance production within the SW Miano III block involves the drilling of six appraisal/exploratory/development wells. This comprehensive attempt includes various developmental activities such as constructing or improving well sites, campsites, access tracks, and installing flow lines to link successful wells with the existing hydrocarbon gathering and production system.

The designated project area lies within the administrative boundaries of *tehsil* Saleh Pat in district Sukkur and *tehsil* Nara in district Khairpur, Sindh province. Spanning 495 square kilometers, the SW Miano-III block is divided between these two districts, with 57% (equivalent to 286 square kilometers) located in Sukkur and the remaining 43% (210 square kilometers) in Khairpur. The surface coordinates of the proposed project area, as depicted in **Figure 1-2** and referenced to the World Geodetic System (WGS84) datum, are provided in the table below

Table 4-1: Proposed Project Area Coordinates in SW Miano-III block

Corner ID	Latitude	Longitude
A	27° 21' 23.03"	68° 58' 01.09"
B	27° 21' 21.74"	69° 01' 11.44"
C	27° 17' 47.78"	69° 01' 09.57"
D	27° 17' 48.25"	69° 03' 00.00"
E	27° 5' 00.00"	69° 03' 00.00"
F	27° 15' 00.00"	69° 09' 00.00"
G	27° 12' 00.00"	69° 09' 00.00"
H	27° 12' 00.00"	69° 07' 00.00"
I	27° 09' 00.00"	69° 07' 00.00"
J	27° 09' 00.00"	69° 06' 00.00"
K	27° 08' 00.00"	69° 06' 00.00"
L	27° 08' 00.00"	69° 01' 00.00"
M	27° 07' 28.00"	69° 01' 00.00"
N	27° 57' 01.53"	68° 47' 37.12"
O	27° 58' 39.70"	68° 47' 33.19"
P	27° 04' 18.05"	68° 53' 17.98"
Q	27° 04' 42.98"	68° 54' 34.77"
R	27° 09' 44.97"	68° 54' 37.12"
S	27° 09' 46.72"	68° 54' 12.84"
T	27° 17' 10.30"	68° 55' 09.53"
U	27° 17' 11.04"	68° 56' 44.90"

Prime Pakistan has finalized the well coordinates based on detailed geophysical survey. The surface locations (coordinates) of the proposed wells are presented in the tabulated below:

Table 4-2: Tentative Locations of Proposed Wells

Proposed Well ID	Tentative Coordinates		Tehsil	District
	Latitude	Longitude		
Prime Well-1	27° 13' 13.36" N	69° 08' 14.32" E	Saleh Pat	Sukkur
Prime Well-2	27° 11' 23.01" N	68° 59' 12.92" E	Nara	Khairpur
Prime Well-3	27° 14' 25.77" N	68° 56' 52.10" E	Saleh Pat	Sukkur
Prime Well-4	27° 18' 57.95" N	68° 58' 19.46" E	Saleh Pat	Sukkur
Prime Well-5	27° 08' 40.05" N	69° 05' 01.19" E	Nara	Khairpur
Prime Well-6	27° 14' 31.96" N	69° 07' 55.40" E	Saleh Pat	Sukkur

A key map displaying the location of the SW Miano-III block is presented as **Figure 1-1**. Additionally, surface locations of the proposed wells are delineated in **Figure 1-2**.

4.1.1 Type and Category of Project

As per Sindh Environmental Assessment Regulations, 2021, Schedule-II, (C-2), Oil and gas extraction projects including exploration and production located outside the environmentally sensitive/protected areas require IEE. However, the proposed well locations are situated within the protected areas (Nara Desert Wildlife Sanctuary, Nara Game Reserve, Takkar Wildlife Sanctuary), therefore an EIA study is required to be carried out and submitted to Sindh EPA to obtain environmental approval/NOC.

4.1.2 Project Objectives

The principle objectives for drilling of these wells are to:

- Maximise the economic production and recovery of identified hydrocarbons reserves;
- Improve/add the production of Miano field and ultimately expanding the reserves of national grid network; and
- Fulfil the increasing energy demands of the country.

The above objectives will be met by:

- Achieving the planned total depth (TD) of +/- 1,100 m for almost all wells;
- Acquiring petro-physical data of the targeted reservoir by maintaining mud log; and
- Allowing for possible future DST, completion running and production.

4.1.3 Land Use of the Site

The proposed well sites and their surrounding areas primarily consist of agricultural land with a flat topography, interspersed with scattered communities, minor commercial activities, and a few watercourses. Given the nature of the planned project activities, there is no requirement for a resettlement plan for the local population. Similarly, all measures will be taken to minimize the clearing of trees and bushes wherever feasible. Project facilities will be strategically placed in existing clearings and

on level terrain. In unavoidable circumstances, additional trees will be planted as compensation at a ratio of 1:5 in suitable locations. Further details regarding drilling activities and their potential impacts, both positive and negative, are elaborated in the subsequent sections.

4.1 Drilling Operation

4.1.1 Proposed Project Activities

This operation will comprise of drilling of six appraisal/exploratory/development wells which will entail the following activities for each well:

- Phase I – Construction
 - Civil contractor's mobilization
 - Development of access road
 - Rig camp construction
 - Well site construction
 - Civil contractor's demobilization
- Phase II – Well Drilling
 - Rig mobilization and rig camp establishment
 - Well drilling and possible well testing
 - Vertical Seismic Profiling (VSP)
 - Rig demobilization
- Phase III – Site Restoration (depending on the failure or success of the well).

4.1.2 Project Schedule

The entire drilling operation for each well, encompassing civil works through to well commissioning, and eventual plugging and abandonment, is anticipated to span approximately 2 months. The tentative duration for key activities is outlined below:

- Pre-spud civil works: 15 – 20 days
- Mobilization for drilling: 3 – 4 days
- Drilling, testing and completion: 15 – 16 days
- Demobilization: 2 – 3 days
- Restoration: 2 – 3 days

Table 4-3: Key Features of Wells Drilling Activity

Feature	Specification
Rig (hp)	1200 hp – generally for shallow wells
Depth of Wells	±1,000 - ±1,500 meters

Feature	Specification
Project Schedule	Approx. 2 months
Land Uptake	200,000 ft ²
Crew Size	80-120
Truck Loads	80-100
Mud System	Water based mud

4.1.3 Construction

During this phase of the operation, preparations will include establishing a base camp, a well site, a rig/security camp, and access tracks to facilitate the drilling process. The construction contractor will set up a temporary camp on available levelled land for construction activities. Selection of well site locations will be meticulously carried out following detailed reconnaissance, considering the following constraints:

- The selected locations will be away from the existing communities;
- The locations will be minimum 300 m away from any existing cultural/heritage site; and
- The existing water ways i.e. water channels and water courses will not be disrupted by Prime Pakistan during execution of the project.

The proposed well sites are located at an average elevation ranging from 60 to 72 meters above mean sea level (MSL). Out of the six proposed locations, two are enveloped by the Nara Desert Wildlife Sanctuary, two by the Nara Game Reserve, and two lie within the Takkar Wildlife Sanctuary. All well locations share a characteristic flat topography, with minimal cutting and filling anticipated during the construction phase. The footprint of each proposed well, including the well site and mini-camp, is estimated to occupy approximately 160,000 square feet only. Every effort will be made to minimize clearing and levelling at the project site, with landscaping initiatives aimed at establishing well sites conducive to the proposed drilling operations.

The commencement of the proposed drilling operation will entail the mobilization of the civil contractor as the initial activity. Personnel, machinery, and camp equipment will be transported using 40-ft. trailers, ordinary trucks, and pickups. The contractor will engage local individuals for both skilled and unskilled positions. The construction contractor will assume full responsibility for addressing any community-related issues and concerns. Civil construction/improvement works are estimated to require 15-20 days.

Well site construction/improvement works will involve the following:

- Clearing, levelling and compaction with excavators and graders if required;
- Construction/improvement of the drilling rig pad and cellar and ancillary drains;
- Construction of a lined WBM pit, water pit and wastewater pit;
- Construction of septic tanks and soak pits;

- Construction of flare pit;
- Construction/improvement of platform for fuel storage tank with sump and loading/un-loading pad; and
- Installation/repair works of a chain link fence around the well site.

The campsite will comprise portable cabins, kitchens, mess rooms, bathrooms, laundry facilities, and other amenities, necessitating minimal construction work.

Development of campsite includes, but not limited to the following:

- Levelling and compaction of the area for the campsite if required;
- Provision of drainage works in and around the campsite;
- Construction of fuel storage tank with sump and loading/un-loading pad;
- Provision of fence, access and emergency gates;
- Improvement of concrete masonry septic tank units and soak pits; and
- Installation of security guard wooden cabins.

Existing road network would be utilized for the much of the operation however, short access roads from existing roads may be constructed. The construction of access tracks encompasses various tasks, including but not limited to:

- Cutting and filling;
- Levelling, grading and compaction of sub-grade;
- Laying and gravel compaction;
- Construction of culverts and causeways crossing (if required);
- Provision of earthen catch drains;
- Provision of crossing points at every 1,000 m; and
- Provision of milestones, road and safety signs.

Because of the existing network of dirt tracks in the area, the creation of new tracks will be restricted to short stretches only. Existing tracks will be enhanced or constructed to meet the standard necessary for the movement of 40-ft. trailers. During the construction phase, water needed will be sourced from local commercial water wells, with an average daily requirement of 60,000-80,000 liters. Following the completion of construction activities, the majority of machinery, equipment, and personnel not needed for access track maintenance will be demobilized from the area.

4.1.4 Rig Mobilization

After the completion of each well site, rig camp, and access road construction, the mobilization of the rig and associated machinery and equipment will commence. This process will entail the transportation of the following items to the designated drilling location:

- The land drilling rig;
- Ancillary equipment such as power generators, mud pumps, mud tanks, shale shakers, cementing unit, drill pipes and collars;
- Porta-cabin style camp, complete with all catering, power generation, laundry and other facilities;
- Drilling and other necessary support personnel; and
- Drilling materials such as casing and associated accessories, wellheads, drill bits, drilling fluid chemicals, liner hanger equipment etc.

A drilling rig with 1200hp capacity will be transported to the constructed well site. About 80-100 truckload will be required to mobilize requiring about 10-15 days. Upon arrival, the rig will be assembled and erected over the well location.

4.1.5 Drilling

Drilling will be carried out using conventional equipment, techniques and practices for hydrocarbon exploration. A rotary drilling rig will be utilized for this purpose. The derrick, serving as a framework, will be positioned atop a steel platform known as the rig floor, which will serve as the primary working area for drilling operations and personnel.

The rig floor will house a hoisting drum, referred to as the draw works, situated at the base of the derrick. A wire rope, known as the drilling line, will run from the draw works to the top of the derrick through a system of sheaves called the crown block, connecting to another set of pulleys, termed the hook and block. This system of wire rope and pulleys will facilitate the lowering and raising of the top drive or Kelly system.

A drill string, comprising uniform lengths of hollow steel pipes, will be suspended from the hooks. Attached to the drill string will be the drill bit, responsible for penetrating through the formations. The drill bit's drilling action will be achieved through the combined effect of the drill collar's weight and the rotary motion imparted to the bit by a rotary table mounted on the rig floor.

The rotation of the drilling bit and string will be powered by robust electric motors located on the surface. Depending on the specific sections of the well, drill bits with diameters ranging from 26 inches to 6 inches are anticipated to be utilized. As drilling progresses within a particular section of the well, the drill string's length will be augmented by adding new sections of drill pipes.

To strengthen the sides of the well and prevent collapse, steel pipes, referred to as casing, will be inserted into the borehole. Following the completion of each drilling section, these steel casings will be secured in place by injecting cement into the annular space between the casing and the surrounding strata. This drilling and casing process will be repeated for successive sections of the well until the target depth is reached.

The schematic diagram depicting the anatomy of a generic rotary drilling rig is illustrated in **Figure 4-1**.

The drilling operation will be executed continuously, operating on a round-the-clock schedule with two 12-hour shifts. It is estimated that proposed shallow wells will require approximately 30-40 days for drilling and completion phase.

a. Drilling Mud

A water based drilling mud will be used during the operation to serve the following functions:

- Flushing out drilled solids from the bottom of the hole and their transport to the surface;
- Lubrication and cooling of the drill bit and string;
- Deposition of an impermeable layer on the wall of the well-bore so as to seal the drilled formations; and
- Countering the natural formation pressures and preventing uncontrolled flow of fluids from the formations.

The drilling mud will be a slurry consisting of formation cuttings suspended in a liquid phase. At the outset of drilling, the fresh water mud will be composed of bentonite, sodium hydroxide (NaOH), sodium carbonate (Na₂CO₃), and lime mixed in water. Additional additives such as bentonite, barite, and salts will be incorporated into the mud formulation as needed during the operation. The specific constituents and concentrations will be determined and adjusted both before and during each drilling operation.

The quantity of drilling mud utilized and the volume of cuttings produced will vary based on factors such as the geological characteristics of the well, the depth of the well, and other operational considerations. Adjustments to the mud composition will be made accordingly to ensure optimal drilling performance.

b. Management of Drilling Wastes

Conventional drilling waste management involves discharging the mud and cuttings into a lined waste pit. However, Prime Pakistan will use a cuttings segregation and fluid recovery unit in which the cuttings segregated by the shakers are processed through a Hi-G dryer. This will further allow:

- Additional drying of the cuttings making their disposal into the lined waste pit easier;
- Recovery of the excess mud associated with the cuttings. The mud can be re-used thereby reducing the overall water consumption and chemicals usage for mud formulation; and

- Reduction in the size of the waste pit due to the reduction in the mud content associated with the cuttings and due to less water consumption and mud formulation.

The above waste management system is considered to be technologically and environmentally the most preferred option. After completion of drilling, the cuttings remaining in the waste pit will be allowed to dry out. The cuttings will then be encapsulated within the HDPE liner and the waste pit will be backfilled leaving a top soil cover over the pit at the time of site restoration.

c. Coring & Well Logging

In the prospective reservoir section, cores of the rock and strata may be extracted from the borehole, and various well logs will be conducted. These cores and well logs serve to validate the geological formations being drilled through and verify the precision of the previously drilled wells data interpretation. Additionally, coring and well logging aid in identifying potential hydrocarbon presence within the formations.

d. Well Evaluation

After having drilled to the specified depth, a number of logs for hydrocarbon bearing strata will be taken to accurately measure the pressure and fluid content of the reservoir zone. The main objectives of the logs will be to determine the fluid composition (gas, oil or water), whether or not it will flow and its pressure regime.

If test results show that gas has been encountered, it becomes necessary to conduct further tests to determine whether it is feasible to develop the well. Tests are conducted to determine the gas composition and the reservoir's permeability.

Once the temporary or permanent valves are in place, it is ensured that the mud column is more than adequate to counteract any formation pressures that could be released. After that, a mechanical plug is used to plug off the area of the formation being tested, and tubing is run through the plug. A Blow out Preventer (BOP) is kept in place throughout the test.

Once these steps have been taken, hydrocarbons are allowed to flow to the surface and is passed through a 3-phase separator that segregates the formation fluid into water, gas and oil or condensate. Metering devices and valves are used to estimate the gas production rate, after which the gas and associated condensate are flared and water discharged into the mud pit.

e. Well Completion

If data collected from coring, logging and well testing shows that the well can be used as a producing well then a completion string together with a few items of subsurface equipment (such as a down hole plug) to enable production from the well will be installed just above the producing formation. The mud in the well will be displaced by completion fluid, which is expected to consist of potassium chloride brine, containing small volumes of chemicals designed to protect the well. These chemicals will include

a corrosion inhibitor, an oxygen scavenger, biocide and chemicals for pH control. The final design of the completion equipment will depend on the subsurface geology.

f. Well Control and Blowout Prevention

In addition to careful monitoring and control of the mud system and the installation of casing in each section of the well, a surface wellhead consisting of a series of BOPs will be installed at the top of the casing. The function of the BOP is to prevent uncontrolled flow from the well by positively closing in the well bore as and when required. The BOP is made up of a series of hydraulically operated rams and is designed to withstand pressures well in excess of those expected to be encountered.

Photographic record of typical land drilling operation from HPK library is presented at the end of this chapter.

g. Staffing and Supplies for Drilling

It is expected that around 80-120 people will be required for each drilling operation for proposed shallow wells. During the drilling program, the supplies, with the exception of casing, will be transported to the rig in smaller trucks. Casing will be carried to the rig in 40 ft. flatbed trucks. General supplies transported will include camp supplies (food, etc.), fuels, oils and chemicals and equipment maintenance parts. Project personnel will travel to and from the rig in smaller vehicles, mostly four-wheel drive pickups.

Water for rig and rig camp operation will be transported via private bowsters from existing commercial water wells where underground sweet water is not available. For construction activities brackish water will be used for compaction and other activities where it can be used. A maximum of 80,000 litres of water will be required per day during the drilling operation, which may exceed to 150,000 litres during peak drilling activity. Water from existing local water well will be abstracted by Prime Pakistan after adherence all requirements listed in the EIA/EMP. The surface water resources will not be exploited during drilling and construction phase. Average water consumption during construction and drilling activities is shown in **Table 4-4**.

4.1.6 Demobilization & Site Restoration

Upon completion of drilling and testing operations, the rig will be disassembled and removed from the site. The wellhead will remain in place, while all other equipment and materials, including empty drums, used and unused chemicals, fuels, and lubricants, will be cleared from the well site by their respective suppliers.

In the event of permanent closure of a well, Plug & Abandonment (P&A) procedures will be executed. This involves preparing the well for permanent closure, typically initiated when either geological logs indicate insufficient hydrocarbon potential for completion, or after reservoir depletion from production operations. Adhering to regulatory mandates, cement plugs may be installed and tested across any open hydrocarbon-bearing formations, casing shoes, freshwater aquifers, and possibly other areas near the surface, including the upper 20 to 50 feet of the wellbore.

The well designer may opt to employ bridge plugs alongside cement slurries to prevent denser cement from descending into the wellbore. In such instances, the bridge plug would be set, followed by the pumping of cement on top of the plug through drill pipes, subsequently withdrawn before the slurry solidifies. Subsequently, the well site will be restored to its original condition to the extent feasible. Concrete structures will be dismantled and removed, fencing will be taken down, and the area will be leveled. Broken concrete may be transported outside the project area for disposal or reused for backfilling pits or provided to locals for reuse.

All waste products, whether solid or liquid, will be disposed of in compliance with the requirements outlined in the Environmental Impact Assessment (EIA). All pits will be backfilled, and access roads may either remain intact if desired by local residents or be restored to their original state, returning the land to its initial use.

Decommissioning of flow lines will be conducted in accordance with best industrial practices and standards. One of the primary objectives of decommissioning is to restore leased land to landowners in a condition that poses no adverse risk to human health or the environment.

4.2 Flow Lines Laying Activities

Flow lines will be laid to connect the development wells to the pipeline network available in the project area that will ultimately transport the hydrocarbons to gathering/distribution hubs. Laying of proposed flow lines will primarily be done by clearing of RoW from proposed wells to tie-in point. Flow line laying activities will include the following:

- Land survey;
- Right of way (RoW) preparation;
- Transportation of pipes, construction materials, construction machinery and personnel;
- Installation (trenching, laying and backfilling);
- Cleaning, testing, and commissioning;
- Operation and maintenance;
- Site Restoration; and
- Flow line decommissioning.

A brief description of these activities is as follows:

a. Land Survey

Land survey for demarcating the pipeline route will be undertaken by a team of about 5 to 6 persons equipped with computers, survey stations, GPS handsets, levelling instruments, steel measuring tapes and worktables. The following activities are carried out as part of the survey:

- Route reconnaissance;
- Traverse line survey and installation of wooden pegs;
- Topographic survey of pipeline, RoW and terminals;
- Excavation and re-filling of pits for classification and record of soil encountered;
- Determination of subsoil water table in the area, fallow land and cultivated areas;
- Survey of pipeline crossings at roads or water channel etc.;
- Installation of RoW markers; and
- Installation of permanent benchmarks.

b. Right of Way (RoW) Preparation

A 50 ft. RoW along the proposed alignment will be leased from the local landowners. RoW for the proposed flow line will be cleared of vegetation and levelled before the trenching operation is started.

The RoW route will be selected with the following considerations:

- Selection of the shortest possible and environmentally feasible route;
- Maximum usage of existing RoW of access route; thereby minimizing access requirements during the construction period and avoiding acquisition of private land;
- Minimum disruption to the local population, in particular avoidance of any population resettlement;
- Maintaining a safe distance from cultural resources (typically a distance of 50 meters from shrines, graveyards and mosques);
- Minimum disruption to the natural environment of the area.

c. Transportation and Construction Activities

The laying of pipeline will be done by a pipeline construction contractor and is estimated to span over duration of 1 to 2 months. The pipeline construction contractor will employ a crew of around 80-100 people for pipeline laying. Local people will be hired for unskilled jobs as and when required during the project, subject to company's competency criteria and in accordance to all local applicable laws. The construction equipment required during the pipeline laying typically includes bulldozer, trencher, excavator, forklift, pipe layer, grader, compressor, welding machine, radiography equipment, sand blasting machine, pumps; and, pipe-bending machines.

The crew may work in separate teams and may reside at base camp. Levelled land will be utilized by pipeline construction contractor. The camp will consist of tented accommodation, kitchens, mess rooms, bathrooms, laundries, septic tanks and soak pits etc. for which limited construction work will be required. At campsite the contractor may also utilize levelled areas for storage of pipes and other materials and

machinery. The pipes will be transported to the site in up to 40ft sections over flatbed trucks. The construction material and construction machinery will be transported to the site on trucks. Trucks or pick-ups will transport all other supplies to the camps. This will include construction material and consumables, fuel, oil, water and food. At campsite fuel, oil and chemicals will be unloaded in designated areas with impermeable floors and dykes to prevent soil and water contamination from possible spills. Water consumed during pipeline laying (cleaning and hydro-testing) will be transported to the site from the available sources i.e. water wells/tube wells.

d. Flow Line Installation

A trench of 3ft wide by 3ft deep for laying of pipeline will be excavated. The pipeline will be laid along the side of the trench and welded together. Welded sections of the line will then be placed at the bottom of the trench by pipe layers or/and cranes moving along the line. The pipeline will be below the ground along its entire route and will be installed in a trench with a minimum depth of one meter, which will be backfilled to be flushed with the surrounding ground level, with the top soil replaced.

e. Flow Line Cleaning, Testing and Commissioning

Once a section of a pipeline has been installed, it will be cleaned by sending a traceable brushing pig down the section. This will remove some of the debris and water that has accumulated in the pipeline during construction. The line will then be flushed with clean water for further cleaning. The cleansing water may contain some oil, grease and suspended solids. The wastewater will be collected in the purpose-built lined pits where it will evaporate with time or drained into the nearest drainage channel with the prior approval of concerned authorities. Disposal of the residual sludge or solids and the liner will be done following best industrial practices.

The pipeline will then be non-destructive tested by radiography, ultrasonic and magnetic particle inspection and hydro-testing to check its integrity. Hydro-testing involves filling the line with clean water (no chemicals added) and pressurizing the line to 1.25 times the operating pressure. Makeup water will also be required during testing. After final use, wastewater produced during hydro-testing will be collected in purpose built lined pits and evaporated or disposed of into nearby drainage channels with the prior approval of concerned authorities. After the testing phase is over, the pipeline will be commissioned.

As steel pipes are being used, these will be buried at a depth of 3 ft. from the natural surface level and a 1ft sand cushion underneath the pipes for added support. Flow lines shall not cross any irrigation channels or other water bodies.

Existing dirt tracks, gravel top or blacktop roads will be used to access work areas along the pipeline alignment. The development of new tracks may be limited to short reaches only. The dirt tracks used may also need to be upgraded to a standard that is suitable for movement of flatbed trucks carrying pipelines.

f. Well Site Control System

After completion of drilling and proposed discovery of hydrocarbons, wells will be developed through installation of local wellhead control panel (WHP) for equipment status and for local manual control of the wing valve. The Surface Safety Valve (SSV) and Upper Master Safety Valve (UMSV) will have self-contained manual hydraulic systems for opening and closing of the valve.

The proposed wells will be provided with a Remote Terminal Unit (RTU) to provide status, control and shutdown facilities at the Central Processing Facility (CPF) via fiber optic cable.

g. Methanol Injection

Requirement for methanol injection will be reconfirmed upon completion of flow assurance studies to be carried out during conceptual engineering design. If it is required, methanol injection skid will be made available at the wellhead. Methanol will be injected into the wellhead via the service wing valve and it will be used to prevent hydrate formation in the wellhead piping, downstream of choke valve and in the flow line.

h. Corrosion Inhibitor

Corrosion Inhibitor skid and injection facility will also be installed at producing wellhead area. Corrosion inhibitor will be injected into the flow line (unless CRA material is used) to protect these and associated downstream piping system from internal corrosion.

i. Flow Line Operation and Maintenance

Following commissioning, pipeline during operation will be continuously monitored for corrosion, leakages and faulty instrumentation.

Cathodic Protection System

For proposed steel pipelines Cathodic Protection (CP) will be done. Impressed current system will be provided for underground pipeline protection. With a CP system a direct electric current will be induced into the pipe at intervals to maintain a pipe to soil potential in the range of -0.85 to -1.5 volts. The normal corrosion of steel is a process where the electron flows from the steel surfaces towards the surrounding medium (ground). With a CP system this process will be reversed and will result in corrosion prevention. Base plates protection of tanks and sacrificial anodes to be provided for pipeline during construction and internal cathodic protection of tanks.

Pipeline Coating

Pipeline will be protected against external corrosion by a 3-layer fusion bonded epoxy polyethylene factory-applied coating system. The field joint and bends will be coated with heat-shrink sleeves at the site. The above-ground section of pipeline and block valves will be painted.

Isolation Valve Stations

Keeping in view applicable codes & standards requirements, four isolation valve stations on the pipeline shall be developed.

j. Staffing and Supplies

It is expected that around 80-100 people will be required for flow line construction. Local people will also be hired for skilled & unskilled jobs. During the drilling operation, the supplies, with the exception of casing, will be transported to the rig in smaller trucks. Casing will be carried to the rig in 40ft. flatbed trucks. General supplies transported will include camp supplies (food, etc.), fuels, oils and chemicals and equipment maintenance parts. Project personnel will travel to and from the rig in smaller vehicles, mostly four-wheel drive pickups.

Water for rig and rig camp operation will be transported to the well site from available sources i.e. water wells/tube wells. During flow line construction water is required for domestic use and hydro testing only. Approximately 150 litres per capita water will be required during flow line construction phase. Water from the approved water well will be abstracted by Prime Pakistan prior to following all the requirements listed in the EIA/EMP. The surface water resources will not be exploited during drilling and flow line construction phase. Average water consumption during construction, drilling and flow line activities is shown in **Table 4-4**.

4.3 Noise, Wastes and Emissions**4.3.1 Noise**

Sources of noise during construction, drilling and flow line operations are listed below:

- a. Construction (all activities)
 - Operation of generators at construction camp/s;
 - Movement and operation of light and heavy machineries/vehicles; and
 - Construction works at the contractor's base camp, well site, rig camp and along access road.
- b. Drilling
 - Operations of generators at the rig camp and well site;
 - Drilling operation; and
 - Machinery/Vehicle's movement.
- c. Flow Line
 - Machinery/Vehicle's movement; and
 - Sand blasting.

Noise from generators will be minimized by regular maintenance and keeping them within enclosures. Noise from vehicles, dozers, graders, lifters or cranes will be minimized by regular maintenance and reducing effects of project activities on environmental receptors by maintaining minimum safe distances.

4.3.2 Wastes and Effluents

Categories of wastes generated during construction, drilling and flow line laying phases of wells along with their proposed methods of disposal are discussed below:

- Clinical wastes – These will be stored separately from other wastes and provided to an approved waste contractor for appropriate final disposal i.e. incineration.
- Combustible wastes – Combustible wastes will include kitchen wastes, paper, packaging material etc. It will be stored separately in waste segregation containers. Afterwards all combustible wastes will be provided to waste contractor for appropriate disposal. All kind of food waste will be buried properly.
- Recyclable or re-usable wastes – These will include used oil, glass, tin, metals, workshop wastes etc. It will also be stored separately in waste segregation containers. All recyclable wastes will be handed over to waste contractor for recycling or re-use.
- Drill cuttings and mud – Water Based Mud (WBM) will be used during drilling. The drill cuttings and mud will be stored at the well site in the lined reserve pits. After completion, the cuttings will be buried in lined pits while mud will be recycled where possible and utilized for spud/plugging or otherwise buried in lined pits after dewatering.
- Septic tank and soak pits shall be provided at rig site and base camp for handling and disposal of black and grey water. Septic tank and soak pit shall be covered properly to avoid obnoxious smells in surrounding areas.
- Sprinkling of grey water will not be allowed, in case if septic tank gets filled with sludge, septic tank shall be emptied through vacuum truck and sludge shall be transferred to treatment facility or approved municipal drain for appropriate disposal after proper approval from the concerned municipal authority.

The wastewater and the amount of solid waste expected to be generated as a result of the project activities is provided in **Table 4-5**.

4.3.3 Emissions

Emissions during construction, drilling and flow line operations for the proposed project will include:

- Dust emissions during construction (all activities) – these will be controlled by proper water sprinkling and good construction management.

- Dust emissions during road travel (all activities) – these will be controlled by avoiding off road travel, observing speed limits and track maintenance on regular basis.
- Exhaust emissions from light and heavy vehicles, construction equipment and machinery and generators – these will be controlled by proper maintenance of all types of machinery/vehicles/equipment (exhaust emissions from these sources generally meet the NEQS/SEQS).
- Emissions during flaring and H₂S release during drilling and testing – the effects of these emissions will be controlled by maintaining a safe distance of 100 m from communities and adhering to emergency response plans in case of H₂S release.
- Fugitive emissions – the effects of these volatile organic content (VOC) emissions will be controlled by maintaining safe distances. Volatile hydrocarbon levels will be regularly checked/monitored as part of safety program. During operation, areas with higher concentration levels will be identified and appropriately mitigated.

Table 4-4: Summary of Water Usage during Drilling Project Activities

Parameter	Rate^a
<i>Construction Phase</i>	
Domestic water usage	Approximatley 200 liters per capita per day
Construction of the well site	On average 55,000 ^b liters/day
Sprinkling at access track	On average 2,000 liters/day
<i>Drilling Operation</i>	
Domestic and Drilling	80,000 ^c liters per day
<i>Well Head Surface Facility/Flow Line</i>	
Domestic water usage	Approximatley 150 liters per capita per day

Notes:

a: The values have been taken from various construction and drilling operations

b: The values are for total consumption of water for domestic and construction purposes. Usually construction and domestic activities takes up to 80%, and 10% respectively of the total water consumption with the remaining amount of water being used for sprinkling purposes.

c: The values are for total consumption of water for domestic and drilling purposes. Usually drilling and domestic activities takes up to 60%, and 40% respectively of the total water consumption.

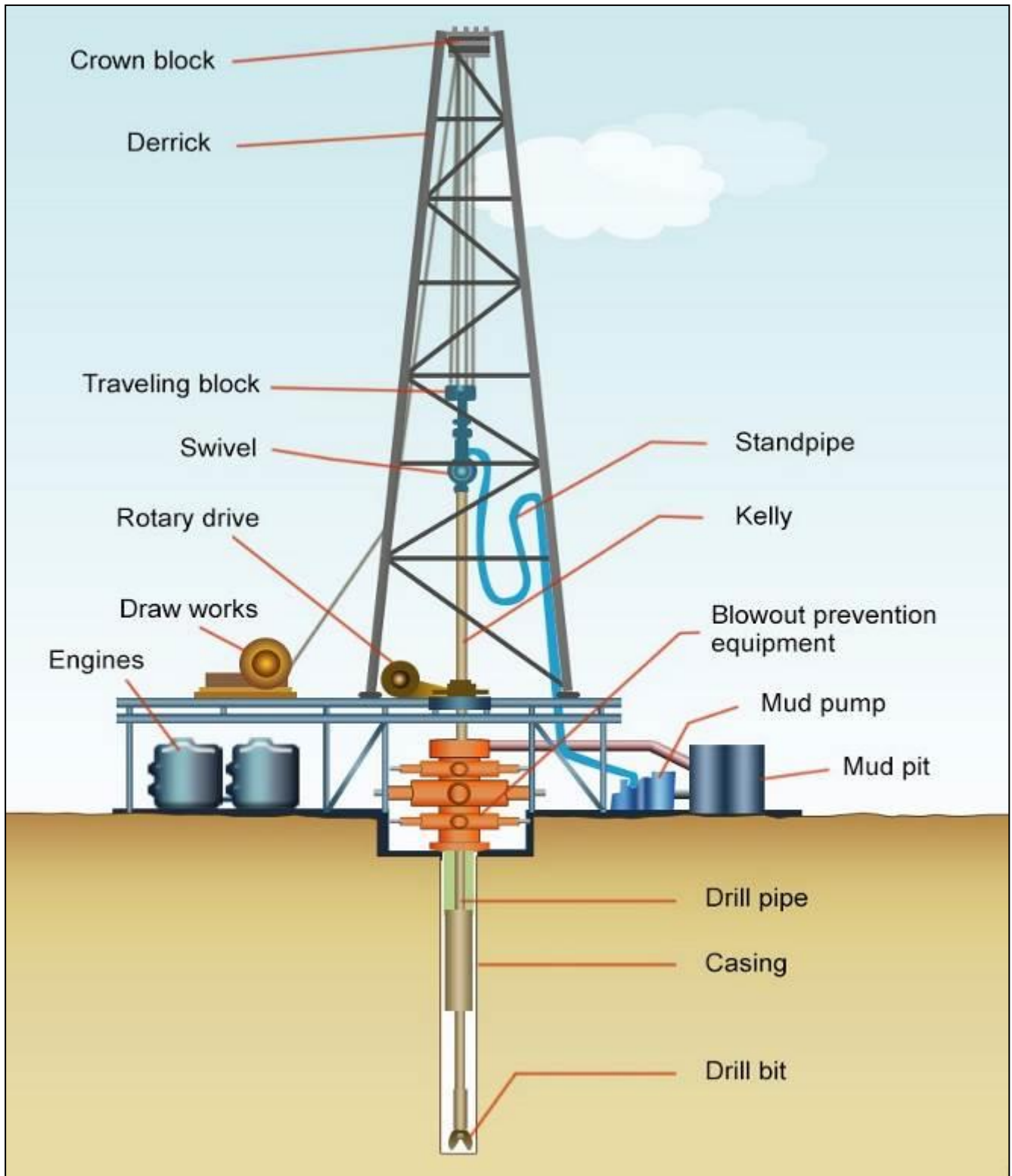
Table 4-5: Summary of Approximate Domestic Wastewater and Solid Waste

Parameter^a	Generation
Domestic Wastewater	
Construction of well site (Liters per day)	6,400
Drilling operation (Liters per day)	32,000
Solid Waste (per month)	
<i>Construction phase (all activities)</i>	
Recyclable solid waste generation (kg)	98
Oil waste produced (Liters)	9
Food waste generation (kg)	60
Other hazardous waste (kg)	7
<i>Drilling phase</i>	
Recyclable solid waste generation (kg)	2,500 – 3,000
Oil waste produced (Liters)	560
Food waste generation (kg)	120
<i>Well Head Surface Facility/Flow Line</i>	
Recyclable solid waste generation (kg)	98
Oil waste produced (Liters)	9
Food waste generation (kg)	60

Notes:

a: Values have been calculated based on HPK environmental monitoring record for various O&G activities.

Figure 4-1: Anatomy of a Rotary Drilling Rig



Photographs: Proposed Drilling & Associated Construction Activities (HPK Library)



Photograph 4-1: A view of land drilling rig in operation



Photograph 4-2: A view of typical drilling rig camp



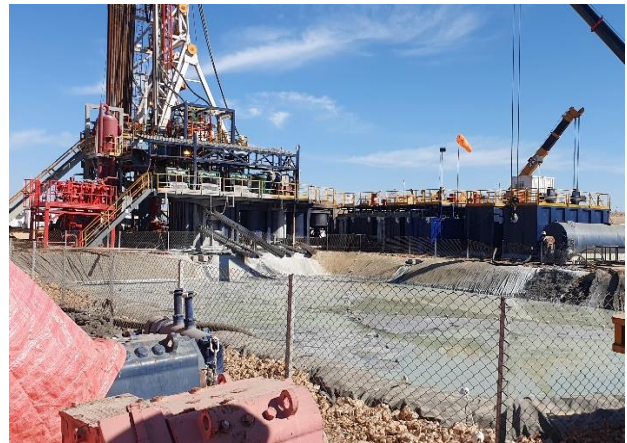
Photograph 4-3: A view of typical rig site mini camp



Photograph 4-4: Generators at well site



Photograph 4-5: Water storage pit on well site



Photograph 4-6: A view of lined drill cutting pit



Photograph 4-7: Properly bunded diesel storage area with loading and unloading pad



Photograph 4-8: Properly barricaded food burial pit



Photograph 4-9: Typical construction of access track



Photograph 4-10: Concrete pouring of rig pad at well site



Photograph 4-11: View of a soak pit for disposal of wastewater



Photograph 4-12: View of flare pit

5 Analysis of Alternatives

An analysis of available alternatives to the proposed exploration activities as described in earlier sections of **Chapter 4** of this EIA have been carried out in this section to ensure that the best possible management and technology options will be employed during project implementation. The analysis of alternatives has been discussed under two separate headings, management alternatives and technological alternatives.

5.1 Management Alternatives

5.1.1 No Project Option

Energy is the prime mover of current day economies and is vital to the sustenance of economic growth, which depends crucially on the long-term availability of energy from sources that are accessible, sustainable, affordable, and environment friendly. The energy sector plays a key role in the development and growth of Pakistan's economy. Through its history, Pakistan's economy has paced an unsteady path with extended phases of low growth following moderate stints of high growth. If one looks at the pattern of energy supplies, Pakistan has remained an energy deficit country, dependent upon imports, mostly oil & oil products.

Pakistan's economy has been growing at an average growth rate of almost 6.19% and demand of energy is increasing rapidly. A number of contemporary studies indicate that Pakistan's primary energy demand is expected to grow at an ACGR of between 5.25 to 7.36 percent over the next 15 years.

Pakistan spends billions of dollars on the import of crude oil and other petroleum products and as a result total import bill is rising for every consecutive fiscal year. To reduce this loss of foreign exchange the government is committed to maximum replacement of imported furnace oil and diesel oil with indigenous natural gas.

In view of Pakistan's current balance of payment difficulties, it has become imperative for the country to explore indigenous resources in the energy sector, as a reliable supply of energy is crucial to the achievement of national development targets in the commodity producing sectors. Natural gas is a particularly attractive option as the environmental effects associated with its usage are also minimal in comparison to other fossil fuels.

An oil or gas discovery in the area of operation will augment the present oil & gas supplies of the country and reduce Pakistan's reliance on imported fuel. In view of the above and high energy demand of the country 'No Project Option' seems to be a highly unfavourable option.

5.2 Alternative Site Option

Several concession areas and exploration sites exist on Pakistan's map and a number of national and international companies are actively engaged in oil and gas exploration in the country in addition to the public sector agencies.

As exploration and development activities involve large investments, the area of operation is carefully selected after assessing that the geological characteristics are conducive to the presence of oil and gas reserves. With the success of discovering oil reserves during past drilling activities within the SW Miano-III Block, the block has been designated as an attractive area for oil and gas development activities. The area has been proposed for drilling of six exploratory/development wells after detail and expensive geological studies. Therefore, an operation in any other area may not be fruitful. Furthermore, strict adherence to the mitigation measures proposed by the EIA will ensure that the residual impacts are reversible, short term and insignificant.

5.3 Technology Alternative

5.3.1 Drilling Technique

Conventional rotary drilling proposed by Prime Pakistan has been historically used for the drilling of oil and gas wells. Other drilling techniques include coiled tubing and slim holes. Despite some environmental gains in the use of coiled tubing and slim holes (reduced well site area, reduced waste volumes etc.) both techniques seem to share a number of technical disadvantages and operational limitations. Moreover, the rigs are not available in Pakistan and in case of a breakdown required backup and service facilities may not be available as readily as for conventional rigs. Advantages of the two techniques therefore do not outweigh their disadvantages. Conventional drilling technique proposed by Prime Pakistan is therefore evaluated to be the best alternative.

5.3.2 Drilling Mud

Generally, two broad categories of mud are used for drilling of oil or gas wells; oil based and water based. Oil based mud is formulated by mixing chemicals with diesel. The generation of oily drilled cuttings will require specialized handling and treatment due to the risk of contamination of subsurface formations during drilling. Oil based mud constitute oil as the continuous phase and water as the dispersed phase in conjunction with emulsifiers, and wetting agents. WBM will be primarily used as preferred option but if necessary, oil based mud can be used and strict measures will be taken to avoid contaminations.

5.3.3 Disposal of Drilling Wastes

Conventional drilling waste management involves discharging the mud and cuttings into a lined waste pit. Prime Pakistan after a review of various waste management alternatives has started using a cuttings segregation and fluid recovery unit in which the cuttings segregated by the shale shakers and processed through Hi-G dryers. This allows:

- Additional drying of the cuttings making their disposal into the lined waste pit easier;
- Recovery of the excess mud associated with the cuttings. The mud can be re-used thereby reducing the overall water & oil consumption and chemical usage for mud formulation; and
- Reduction in the size of the waste pit due to the reduction in the mud content associated with the cuttings and due to less water consumption and mud formulation.

The waste management system is considered to be technologically and environmentally the most preferred option. The drill cuttings and mud will be disposed off at the well site within lined waste pits. Other options such as bioremediation, incineration, re-injection or landfill are either not applicable to the type of waste or their cost or technical and management disadvantages outweigh the little benefits that they may have.

5.3.4 Water Abstraction

Water is without any doubt one of the most undervalued resources on earth. Globally, there is increasing pressures on water resources. In particular, population growth and economic development are putting pressure on available freshwater resources. Water quality is inextricably linked to human health in many ways and poor water quality can lead to diseases, reduced food availability and malnutrition. Improved access to fresh water has a direct positive impact on people and communities leading to significant social, economic and environmental benefits.

The two primary options for obtaining water for project needs are:

- Surface water
- Groundwater

Existing local wells may be used during drilling operation, if these show sufficient capacity to meet the project water requirements. Only those local wells will be used which show an excess capacity of water above the local requirements (domestic and irrigation) and flow rate from these wells will be monitored during the operation to monitor any effect.

5.3.5 New water wells

There is also a possibility that depending on the requirement, Prime Pakistan may install new water wells in an area where availability of groundwater is confirmed. However, this option will be considered if taking water from the existing water wells in is not feasible due to long haul distance.

5.4 Economic Alternative

The proposed project aims to drill six wells in district Sukkur and Khairpur. This project will play a critical role in enhancing the region's energy resources by identifying and utilizing potential hydrocarbon reserves. By improving the supply of

natural gas and oil, the project will contribute to energy security and economic development in the region.

The immediate benefits of the proposed project include the potential discovery of commercially viable hydrocarbon reserves, which will lead to increased energy production and a reduction in energy imports. This will not only generate significant revenue but also provide employment opportunities for the local communities, thereby improving their socioeconomic conditions.

The land use will change from its current state to an active drilling site, which, while having an initial environmental impact, is designed to return substantial economic benefits during the drilling phase. The proposed wells will harness the potential energy resources, contributing to the national energy grid and supporting local industries and households.

The drilling project will incorporate advanced technology and adhere to stringent safety and environmental standards, ensuring minimal disruption to the local ecosystem. The net present value of the future benefits significantly exceeds the initial investment cost, indicating the project's economic feasibility. This analysis assumes that all mitigation measures outlined in the EIA report will be effectively implemented during the construction, drilling all other required operational phases of the project.

5.5 Environmental Alternative

The proposed project area for drilling of wells is located in a rural setting within district Sukkur and Khairpur. There are potential environmental and human health impacts associated with the proposed project during different project phases, including noise, air, and water pollution, as well as disturbances to local wildlife. However, the project has been planned with a focus on environmental sustainability and minimizing negative impacts. Following green features is part of the proposed project.

- Energy Efficiency and Renewable Energy
- Water Efficiency
- Environmentally Preferable Materials
- Waste Reduction
- Toxics Reduction
- Air Quality Management
- Biodiversity Preservation

In conclusion, considering the extensive environmental protection measures and the sustainable features integrated into the project design, it can be inferred that the proposed drilling project will not only mitigate its impact but also contribute positively to the environmental health of project area during its operational phase.

6 Background Environment

In order to assess the impacts of the proposed drilling operation and associated development activities that may have on the environment of the area and to propose mitigation measures a detailed understanding of the background environment of the project area including physical, biological and socioeconomic environment has been established and provided in this chapter.

6.1.1 Topography, Geology and Soils

The project area has three distinct topographic regimes, the Rohri hills, undulating desert and the plain agricultural lands along the Nara canal. The Rohri hills lie in the north-west portion of the area. These hills originate from Rohri in the Sukkur district and extend into the Khairpur district where they merge into the desert area. The hills have a total length of approximately 56 km of which only 10 km lies within the Khairpur district. The hills consist of nummulitic limestone of the Eocene area.

The typical desert habitat along with sand dunes stretched in the north-south orientation rise to a mean elevation of 10-15m. In areas close to the Nara canal in the eastern portion of the project area the height and slope of the sand dunes reduces to 5-10m and 2-10% respectively. Mean elevation within the desert is 70 m. There are typical flat bottomed valleys between the dunes locally referred to as "Tars". The desert surface is stabilised by vegetation and although there are well-developed dune forms, active windblown sand can be noted only on the leeward side of dunes. The Nara canal flows through the eastern extremity of the project area boundary and provides a perennial source of water. Agricultural lands flank the left and right banks of the canal extending some 4 to 5 km on either side of the canal.

The area forms a part of Indo-Genetic Plain formed by the gradual filling up of the trough lying between the foothills of Himalayas and central core of the subcontinent. The alluvium brought by the river Indus lies over the tertiary shale and limestone; granite, schist, gneisses and slates being the other contributing rocks. The rocks belong to Paleozonic, Mezozonic and Tertiary geological time scale.

Soils of the area were formed in aeolian sands originally deposited in Pleistocene age, but reworked by wind until recently to take the form of sand dunes. A minor extent of soils has been formed in a narrow alluvial plain of Nara canal, which has its origin as a small inundation river. The soils in the desert are generally non-saline, non-sodic with a pH of 7.8 to 8.4. All soils are deficient in organic matter, which attains a maximum limit of 0.47%. Salinity, wind and water erosion and water logging are major soil hazards.

6.1.2 Seismicity

Pakistan lies on an active tectonic belt of the earth. Seismic observations indicate that hundreds of seismic shocks originate every year. Mostly these seismic waves are of low intensity and do not have significant effect (as per seismic zoning map of Pakistan developed by Geophysical Centre Quetta which is officially responsible for the collection and dissemination of information regarding natural hazards including earthquakes). The centre has 100 years' record of earthquake history of Pakistan. Based on the seismic zoning map of Pakistan issued by the Centre, the entire Miano III Block falls under the Seismic Zone 1 with minor damage category of earthquakes and a ground acceleration level of 0.05 to 0.08 g. Seismic zoning map covering project area is presented in **Figure 6-1**.

6.1.3 Climate & Meteorology

a. Climate Classification

Pakistan has diverse climatic settings and lies on the western margin of one of the major climatic regions of the earth. Based on the data obtained from NASA Langley Research Center (LaRC) Prediction of Worldwide Energy Resource (POWER) Project, the climate of project area within project area can be classified using the Köppen climate classification system as follows:

The total annual precipitation of project area is 131.0 mm. Total percentage of rain falling between the high-sun half of the year stands at 86.64% of total, therefore:

$$\text{Köppen Threshold} = (29.03 \times 20) + 280 = 860.6$$

$$50\% \text{ of Köppen threshold} = 860.6 / 2 = 430.3$$

Since project area's annual rainfall (131.0 mm) is less than 50% of Köppen Threshold, is located at a low elevation, and coldest month's temperature does not fall below 0 °C, the climate of project area can be classified as BWh Hot Desert Climate.

b. Precipitation

Based on the data obtained from NASA LaRC POWER tool, the project area primarily receives regular monsoon rainfall during the months of July and August. The highest average precipitation occurs during the month of August at about 40.2 mm, followed by July (25.8 mm) whereas lowest precipitation occurs in the month of October (1.0 mm). During the two monsoon months of July and August, the project area receives almost 57.7 % of the total rain that falls throughout the year.

c. Temperature

The project area experiences extremely hot temperature during the summer months. May and June are the hottest months of the summer season, when the daily high temperature can reach up to 48 to 50 °C, whereas mean daily temperature can get up to 42 °C. The daily high diurnal temperature usually exceeds 32 °C for about 167 days between the months of April and September.

January is the coldest month of the year during the winter season, when the lowest daily temperature can reach as low as 0.42 °C, however mean temperature remains around 16.3 °C. During the winters, the daily minimum diurnal temperature never falls below remains below the freezing point.

e. Wind Speed and Direction

The wind generally blows from North to South in January, during the month of February to April the wind direction starts to change. From May to October wind blows in the direction of SW to NE. Then changes abruptly in way that it reverses in direction during the months of November and December.

The wind speeds remain relatively calm throughout the year as remains below 6 m/s. Hot winds blow during the months of May, June and July corresponding to high temperature and low humidity in the afterhours of the day (25%). The wind-speed and wind-direction data has been plotted in the form of wind-rose for the project area and is presented in **Figure 6-6**. The average wind speed remains between 1-6 m/s about 81% of the time

d. Climate Change

Increased frequency of draughts and heavy rainfall events are the key effects of climate change. In order to describe the baseline conditions in this regard, monthly precipitation data of the project location for the period between January 1981 – December 2022 was utilized to calculate the Standard Precipitation Index (SPI). The timescale for the analysis was kept at an optimal value of 12-month span, and SPI was calculated using National Draught Mitigation Centre University of Nebraska's SPI Generator software (v 1.7.6). The results of the analysis are presented in table below:

Severely Dry	Moderately Dry	Very Wet	Extremely Wet
Aug 1987 – Jun 1988	Jan 2005 – Jul 2006	Sep 1994 – Aug 1995	Nov 2019 – Jul 2021
Aug 2000 – Jun 2003	Aug 2014 – May 2015	Sep 2011 – Jul 2012	Jul 2022 – Dec 2022

The above extreme weather events have occurred in the project area within the last 42 years which is likely due to the result of climate change and is occurring throughout the world. The highest precipitation within the project area occurred during the past 42 years in the year 2022 at 1,127 mm followed by that in 2020 at 649 mm, coinciding with the extreme monsoon rains in all of Pakistan in both the instances.

Data of average temperatures, humidity and precipitation of 1991 - 2022 is provided in **Table 6-4**. **Figure 6-2**, **Figure 6-3** and **Figure 6-4** shows monthly temperature, monthly average precipitations and typical daily temperature profile of project area whereas, SPI output of project area based on data from years 1981 – 2022 and wind rose are depicted in **Figure 6-5** and **Figure 6-6**.

6.1.4 Water Resources

This section details the water resources of the project areas. Both, surface and groundwater resources have been summarized in this section of the report. Data was obtained from secondary sources and through field observation i.e. EIA field survey. Surface water resources of the entire SW Miano-III Block focusing project area/s is shown as **Figure 6-7**.

a. Surface Water Channels / Streams

The only perennial surface water channel in the project area is the Nara canal. Some seasonal streams also originate from the Rohri hills. These streams flow during rains, but with limited flows. The Nara canal is one of the fourteen main canal systems in Sindh with the largest Cultivated Command Area (CCA) of all. It originates from Sukkur Barrage and was built in 1932 as part of the establishment of the Lower Indus Irrigation System.

The canal is approximately 361km long and has a design discharge of nearly 13,650 cusecs. It spread out in the area like a river with widths varying between 90-135m. The water depths reach up to 7.5m. The canal is perennial except for a closure/maintenance period from 5-20 January. Highest discharges in the Nara are recorded in May, June and July. Minimum discharge is reported in the month of August. According to irrigation department approximately 2% of the canal water is used by locals residing in the CCA for drinking and domestic purposes, while the rest 98% is used for irrigation.

The canal system comprises of the Upper Nara Canal, which lies between the Sukkur Barrage and Jamrao headworks (the first diversion structure at the canal) and the Jamrao, Mithrao, Khipro, and Thar Canal systems that lie south of the Jamrao headworks. The project area is located within the Upper Nara Canal system. The length of the Nara Canal in the project area is approximately 3km. This portion of the canal serves less than 11% of the GCA of the entire Nara Canal system.

b. Dhands

A few dhands (local term for surface impoundments) can be found along the Nara canal. The source of dhands is seepage water from Nara canal and surfacing of shallow ground water. Few small dhands are also believed to be formed within the desert area after rainfall, however, during field work for the EIA no such dhand was found within the project area. Due to seepage from Nara canal, and monsoon rains, a series of dhands can also be seen on both sides of Nara canal even in desert area. Several dhands are also present within project area including Kanderi, Dubo, Pharyaro, Babu, Berwari and Khayali. The dhands are located in low lying depressions where groundwater surfaces to the ground level. Seasonal rainfall and concomitant runoff also add water to these dhands. The water quality in the dhands varies but only a few have fresh water. Water levels within the dhands fluctuate with regional groundwater availability.

c. Groundwater Resources

Sweet groundwater is found in ample quantity in areas along the Nara canal. These areas being recharged by canal water have aquifer thickness of up to 76 m. The desert area, however, owing to low rainfalls and high evaporation rates has limited supply of fresh groundwater. Due to continuous recharge from the Nara canal, water table in areas along the canal stands at 5 to 7 m. Some areas along the canal are also water logged and are termed as marginal marshlands. With increasing distance from the canal, water table gradually increases, reaching depths of 10 to 18 m in the eastern and western desert margins. Water table also varies with the discharge in the canal. Precipitation being low in the area does not significantly affect the water table. It only benefits the desert dwellers, where rainwater on a limited scale recharges the dhands and the dug wells, but only to sustain their demand for a few months.

Aquifers in the area are generally located in sand deposits and are unconfined except at some places where silt and clay horizons create partial confinement of groundwater. The interpreted lithological column in areas along the Nara canal is shown in Figure 6-8. The columns show sand as the dominant water bearing lithological unit up to depths of about 100 m. Sieve analysis conducted on soil samples in previous research studies collected from a test well also show that the aquifer soil material consists of coarse to medium sand.

On the basis of published literature and electrical resistivity surveys done in previous studies the transmissibility, specific yield and horizontal hydraulic conductivity of the aquifer has been estimated at 0.012 m²/s, 15000 gallons per hour (gph), and 0.0004 m/s respectively. These results have also been confirmed by 72-hours pumping tests done within the Nara game reserve.

d. Groundwater Quality

As part of the EIA study, water quality analysis was conducted in the project area. Three water samples were collected from various groundwater sources used by

locals for drinking: two hand pumps and one tube well. Sixteen parameters were analyzed in each sample and compared with the Sindh Standards for Drinking Water Quality (SSDWQ). These parameters are crucial in determining water quality and suitability for its intended use.

Based on the chemical analysis results, it can be inferred that the water quality in the project area meets the standards for drinking purposes, as all parameters in the three collected samples fall within acceptable limits. The total dissolved solids (TDS) levels in samples from hand pump 1 and hand pump 3 are near the specified limits for drinking water quality, while sample 2 contains a small amount of TDS. The variation in TDS levels can be attributed to differences in geological formations, groundwater flow patterns, and the proximity of each water source to potential contamination sources or mineral deposits. Additionally, variations in the depth of the water sources and the surrounding soil and rock composition can also influence TDS levels.

The laboratory results are provided in **Table 6-1**. Testing was conducted at a SEPA-approved laboratory, and the lab analysis reports are attached as **Appendix E**.

Table 6-1: Water Sample Analysis

No.	Parameter	Concentration	SSDWQ	Water Sample		
				GW (WS-01)	GW (WS-02)	GW (WS-03)
1.	pH	...	6.5-8.5	7.8	7.3	7.7
2.	TDS	mg/l	<1000	886	423.1	998.1
3.	TSS	mg/l	...	18	11	18
4.	Chloride (Cl ⁻¹)	mg/l	<250	25	98.6	48
5.	T. Hardness	µg/ml	<500	263.8	184.2	201.3
6.	Calcium	µg/ml	...	21.6	14.9	34.9
7.	Magnesium	µg/ml	≤0.5	37.4	41.2	56.7
8.	Fluoride (F) ⁻¹	mg/l	≤1.5	4.9	3.2	3.3
9.	Sulphate	µg/ml	...	227	128	112
10.	Lead (Pb)	µg/ml	≤0.05	<0.1	<0.018	<0.0114
11.	Arsenic (As)	ppb	≤0.05	BDL	BDL	BDL
12.	Cadmium (Cd)	µg/ml	<0.01	<0.01	0.0351	<0.0163
13.	Nickel (Ni)	µg/ml	≤0.02	BDL	BDL	BDL
14.	Phenolic Comp.	mg/l	<0.002	BDL	BDL	BDL
15.	Nitrate (NO ₃) ⁻	mg/l	<0.5	3.14	1.32	1.74
16.	Iron	µg/ml	...	0.85	0.32	0.87

GW: Groundwater; BDL: Below Detection Limit; SSDWQ: Sindh Standards for Drinking Water Quality

e. Groundwater balance

As mentioned earlier, availability of sweet groundwater in the desert and the Rohri hills is limited. HPK 2002 estimated the total sweet water volume within the Nara game reserve to be $1.9 \times 10^9 \text{ m}^3$ and the annual recharge from precipitation and Nara canal to be $2.10 \times 10^7 \text{ m}^3$ and $4.25 \times 10^8 \text{ m}^3$ respectively. Several community tube wells present in irrigated areas along the Nara canal and open dug wells in the desert extract groundwater for agriculture and domestic uses. HPK 2002 estimated a total of 126 tubewells and 4000 hand pumps in the game reserve. Hand pumps are used to meet domestic water requirements, whereas tube wells are only used occasionally to irrigate agricultural fields during periods of canal closure or during water shortage period in the Nara canal.

6.1.5 Ambient Air and Noise

Air Quality

The SW Miano-III block is situated within the districts of Sukkur and Khairpur, Sindh. The primary sources of air pollution in this area include vehicular emissions, open agricultural burning, and select industrial units. Despite these industrial facilities adhering to the stack emission standards outlined in the Sindh Environmental Quality Standards (SEQS), the possibility of fugitive emissions persists. Agricultural field burning, though infrequent, contributes to various air pollutants. However, due to the limited frequency of these activities and the absence of extensive industrial and commercial operations, the overall air quality in the area remains relatively good.

Vehicular traffic on unpaved roads generates localized dust emissions, primarily comprising particulate matter, carbon monoxide, sulfur dioxide, and nitrogen oxides. Although these emissions may impact air quality near the roads, the low traffic volume in the project area mitigates significant concerns for nearby communities. Furthermore, during the summer months, prevailing winds contribute to airborne dust levels and sporadic dust storms, albeit of short duration, in the region. It is important to note that continuous monitoring and periodic assessments of air quality are essential to ensure ongoing environmental compliance and the preservation of air quality standards within the project area.

Results from recent air quality monitoring in the project area have been included in this report to assess the local air quality. This evaluation was conducted according to the Sindh Environmental Quality Standards (SEQS) for various pollutants. **Table 6-2** presents a summary of ambient air quality parameters. The concentrations of SO_2 , CO, NO, NO_2 , O_3 , PM_{10} , $\text{PM}_{2.5}$, and SPM were monitored as $1.9 \mu\text{g}/\text{m}^3$, $0.12 \text{ mg}/\text{m}^3$, $3.8 \mu\text{g}/\text{m}^3$, $4.7 \mu\text{g}/\text{m}^3$, $12.4 \mu\text{g}/\text{m}^3$, $39.4 \mu\text{g}/\text{m}^3$, $24.2 \mu\text{g}/\text{m}^3$, and $202.4 \mu\text{g}/\text{m}^3$ respectively. All recorded concentrations comply with SEQS limits.

Table 6-2: Summary of Ambient Air Quality Monitoring in the Project Area

Parameter	SEQS	Unit	Average Concentration
Sulphur dioxide (SO ₂)	120	µg/m ³	1.9
Nitric Oxide (NO)	40	µg/m ³	3.8
Nitrogen dioxide (NO ₂)	80	µg/m ³	4.7
Ozone (O ₃)	130	µg/m ³	12.4
Particulate Matter (PM ₁₀)	150	µg/m ³	39.4
Particulate Matter (PM _{2.5})	75	µg/m ³	24.2
Suspended Particulate Matter (SPM)	500	µg/m ³	202.4
Carbon monoxide (CO)	5	mg/m ³	0.12

Noise

Noise level in the project area are not significant level as most area is free from heavy traffic and large scale industries. Sources of noise during proposed drilling and associated developmental activities will be generators, vehicles, drilling rig, flaring during well testing and construction equipment & machinery. These sources of noise can be categorized as short term and intermittent arising from drilling activities. Increased noise levels during the operations although will not accumulate but can individually be a source of nuisance for locals and a source of disturbance to wildlife.

Instantaneous ambient noise levels were recorded at various locations within the project area during the baseline survey. The noise levels thus recorded are presented in the table below:

Table 6-3: Noise levels at different sampling locations

S. No.	Coordinates		Noise Level dB(A)
1	27° 13' 39.6" N	69° 01' 02.2" E	52.53
2	27° 10' 06.4" N	69° 05' 33.9" E	51.97
3	27° 14' 21.9" N	69° 07' 28.8" E	49.20
4	27° 11' 46.2" N	68° 59' 55.6" E	53.50
5	27° 14' 31.3" N	69° 07' 55.2" E	50.30
6	27° 13' 15.1" N	69° 08' 15.5" E	32.73
7	27° 08' 40.4" N	69° 05' 06.0" E	30.57
8	27° 18' 59.1" N	68° 58' 19.5" E	50.97
9	27° 14' 25.9" N	68° 56' 52.2" E	49.00

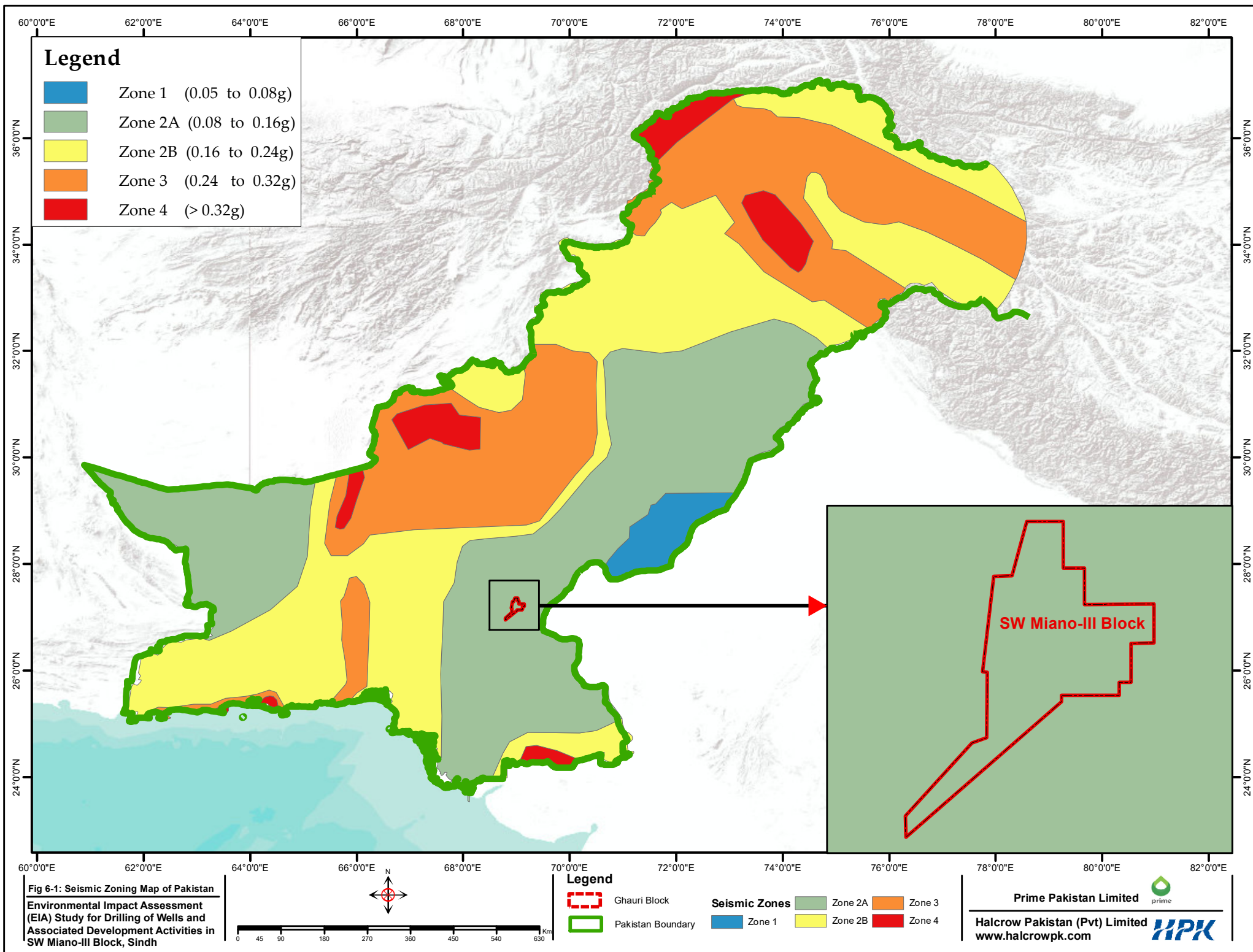


Table 6-4: Metrological Data Records of the Project Area (1992-2022)

Month	Parameters				
	Average Temperature (°C)			Average Rainfall in mm	Humidity in %
	Maximum	Minimum	Average		
January	29.3	4.3	16.4	6.1	30.0
February	34.5	5.9	19.9	2.3	27.4
March	40.9	11.2	26.1	2.5	24.8
April	45.5	17.6	31.9	5.3	23.4
May	48.8	23.3	36.3	12.1	26.4
June	49.1	26.9	37.6	7.7	35.8
July	47.0	27.9	36.4	27.9	44.7
August	45.0	26.1	34.9	46.0	47.0
September	43.8	23.2	33.2	14.5	43.3
October	41.6	17.4	29.5	1.1	27.3
November	36.4	11.6	23.5	2.5	24.8
December	31.0	6.1	18.1	3.0	26.8

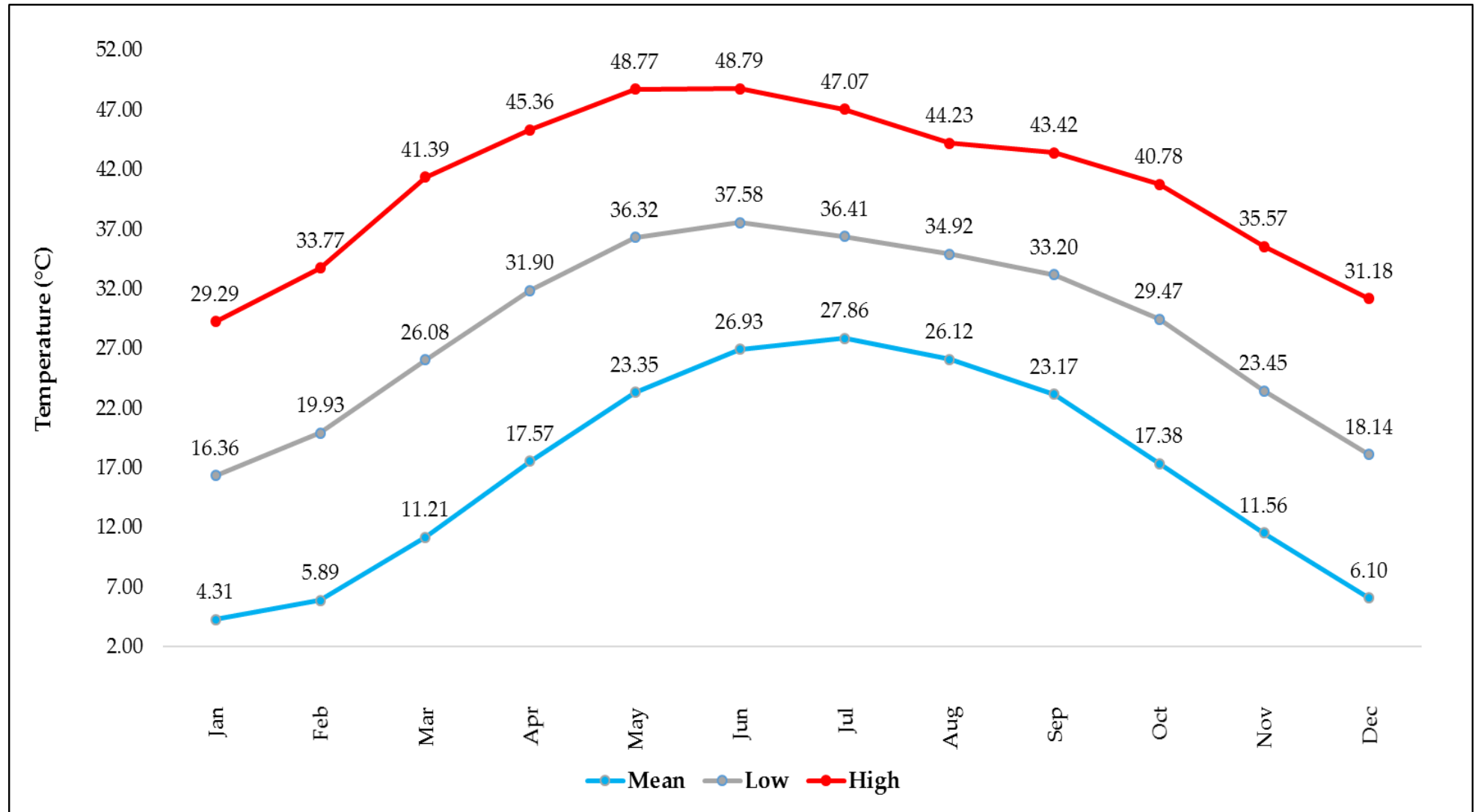
Figure 6-2: Graphical representation of project area's diurnal temperature variation (2012 – 2022)

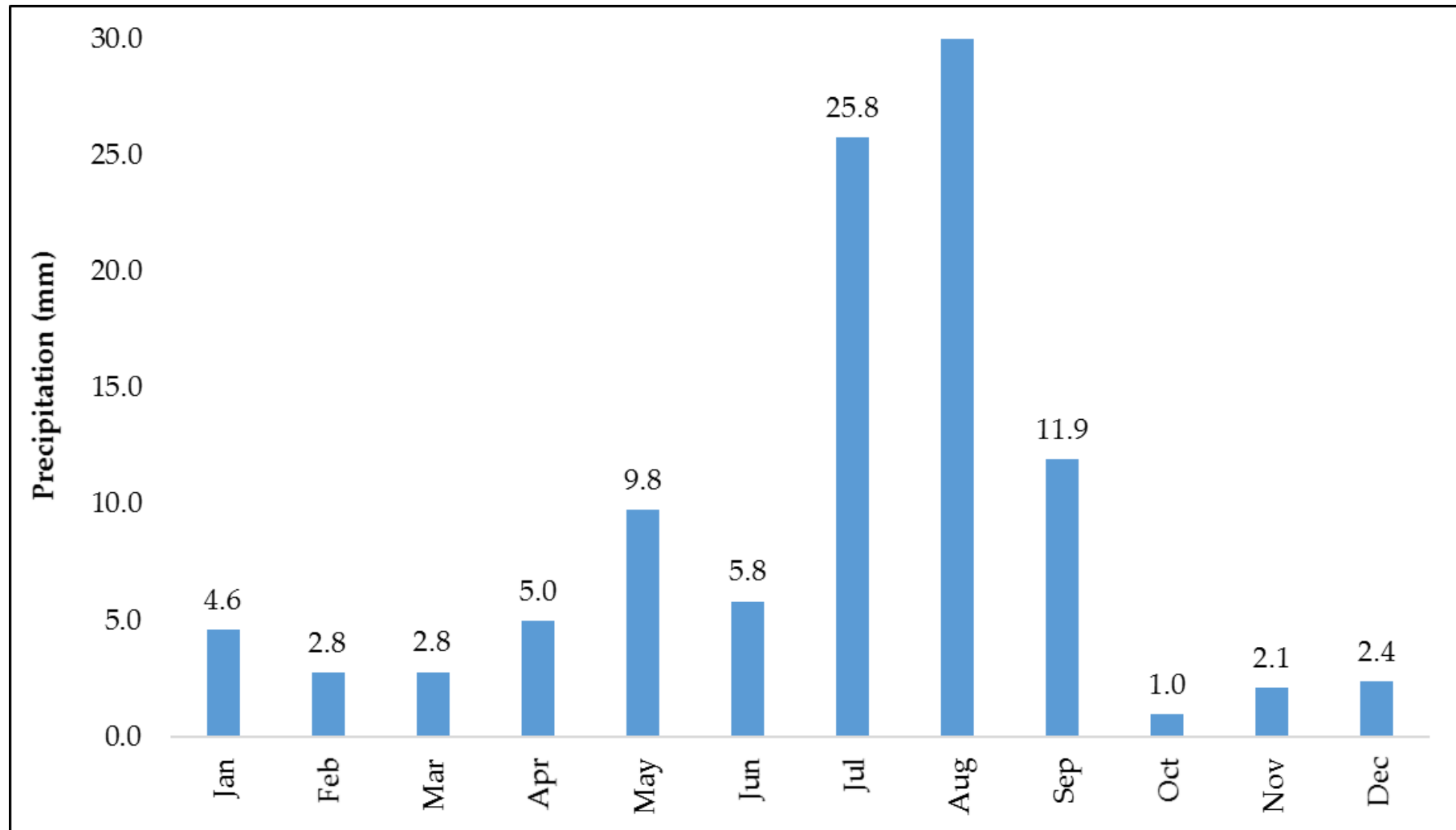
Figure 6-3: Monthly Average Precipitation (Rainfall in mm) 2012 – 2022

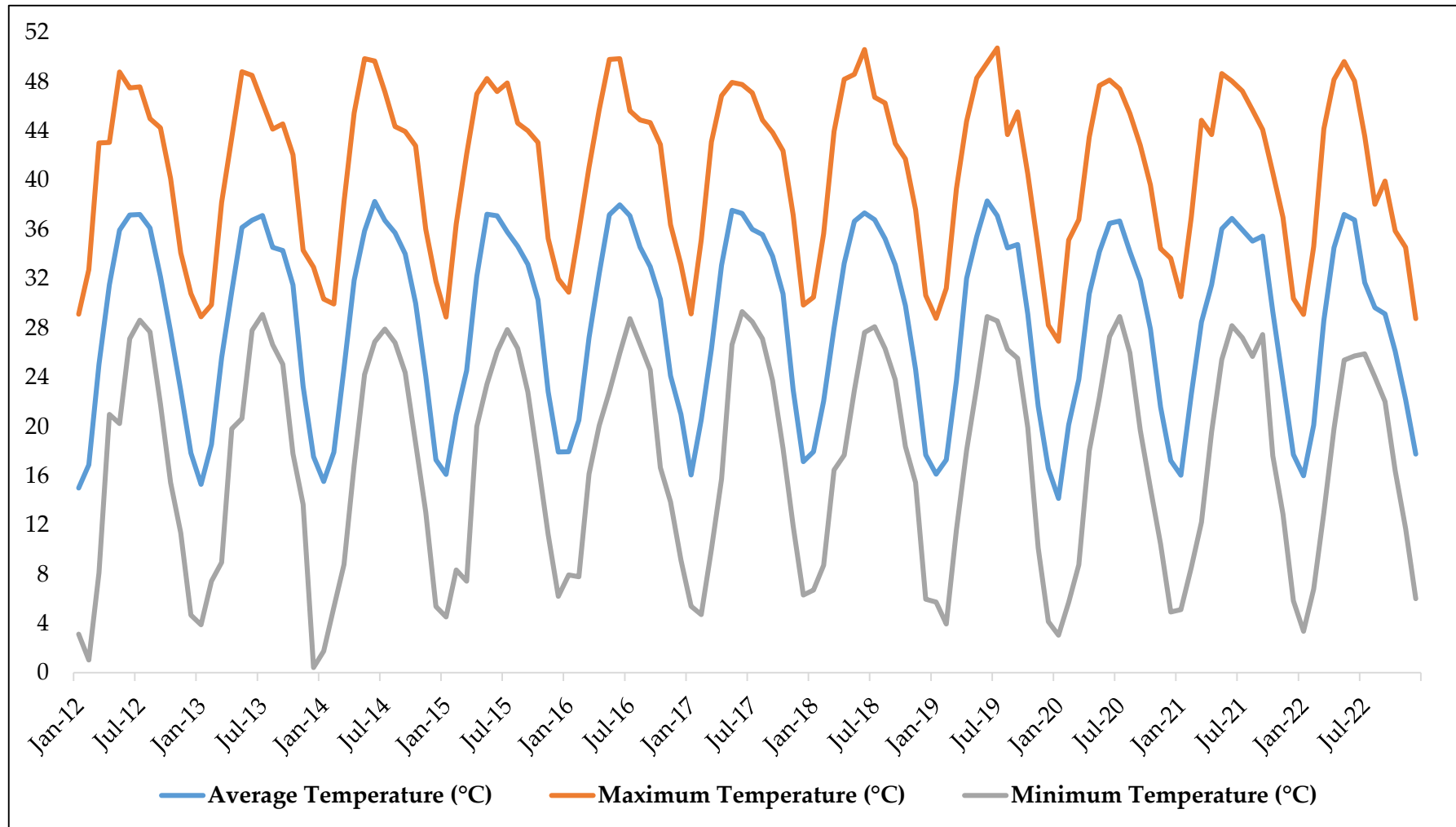
Figure 6-4: Typical daily temperature profile of project area (2012 – 2022)

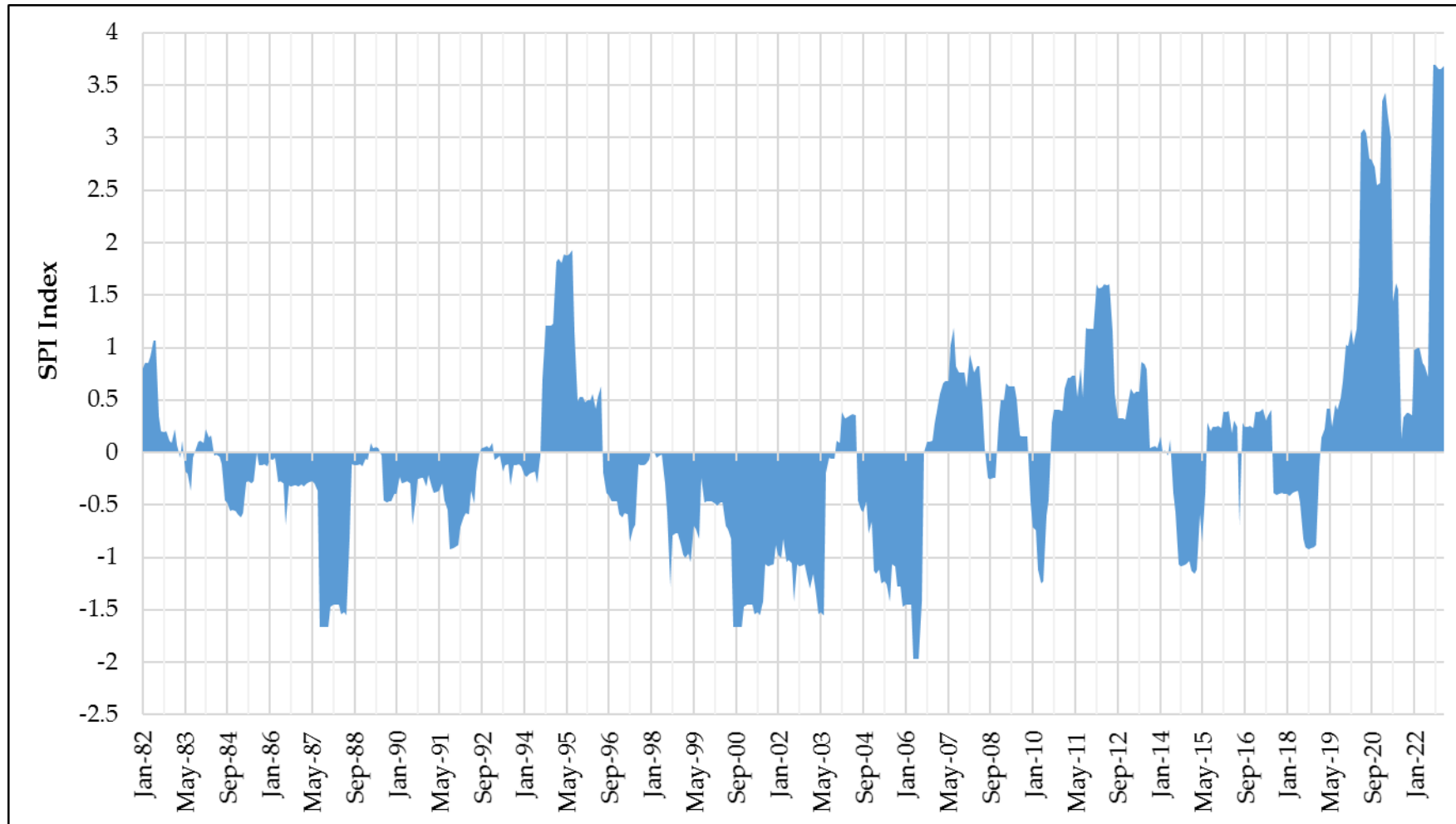
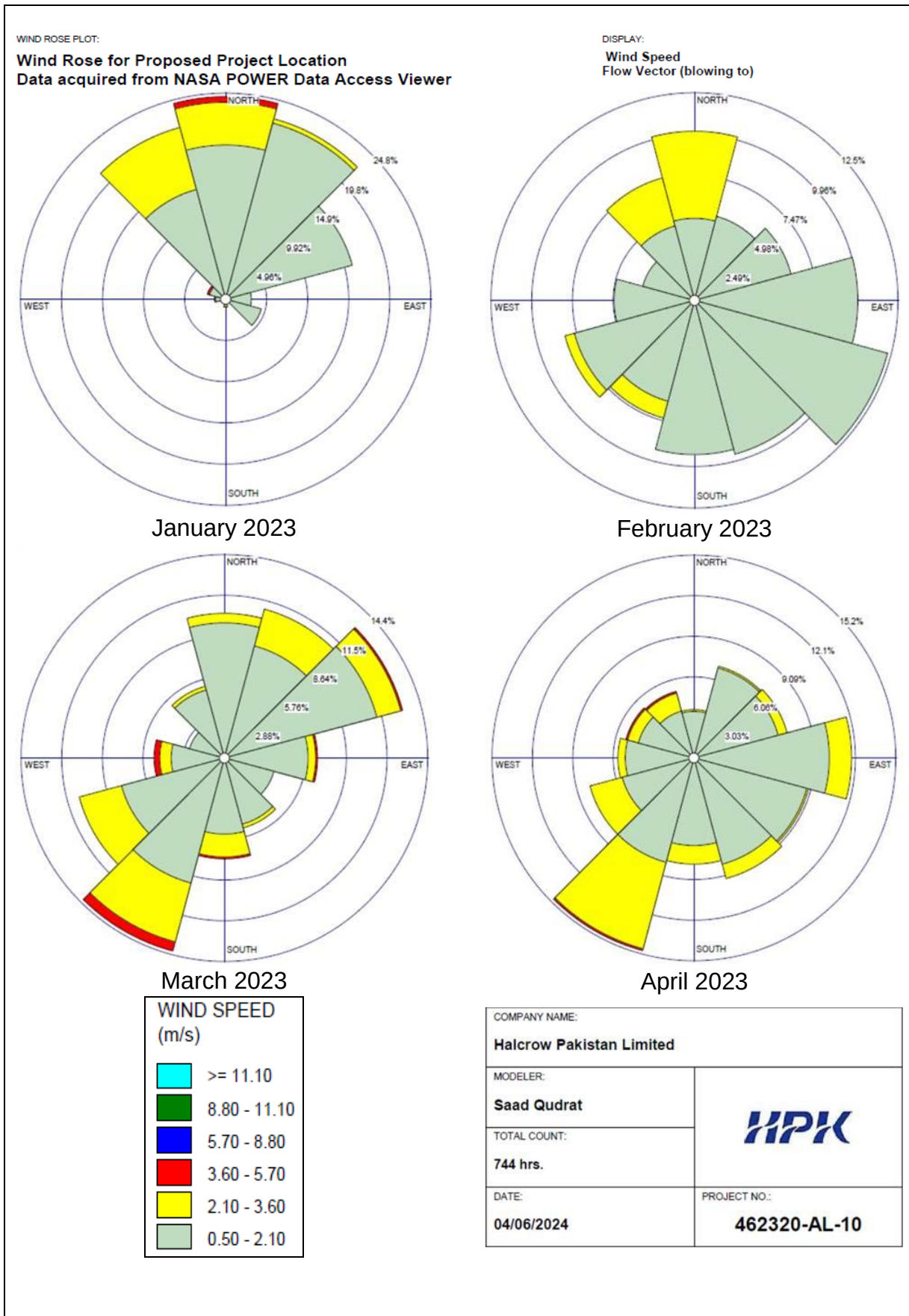
Figure 6-5: Output of the SPI calculation based on data from 1981 – 2022 of project area

Figure 6-6: Wind rose of the project area based on data from January 2023 – December 2023

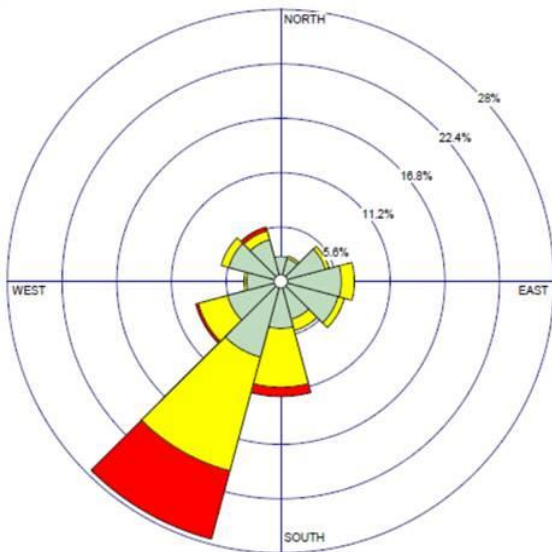


WIND ROSE PLOT:

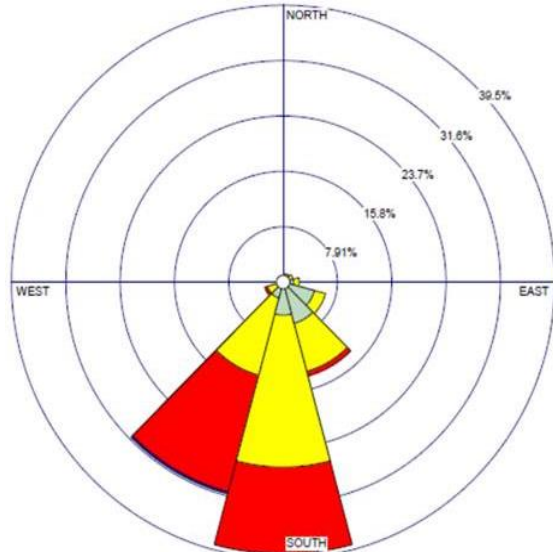
Wind Rose for Proposed Project Location
Data acquired from NASA POWER Data Access Viewer

DISPLAY:

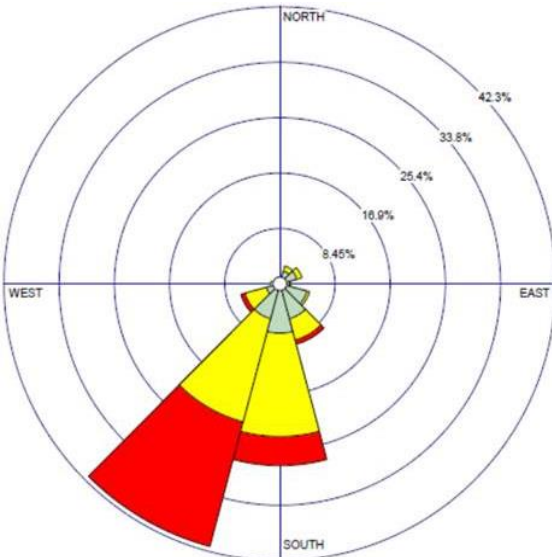
Wind Speed
Flow Vector (blowing to)



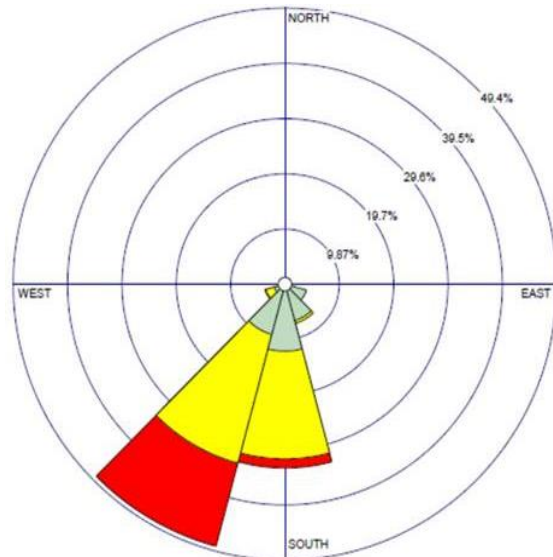
May 2023



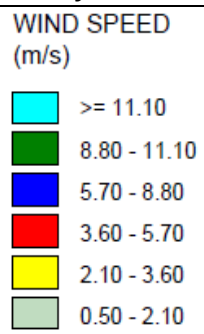
June 2023



July 2023



August 2023



COMPANY NAME: Halcrow Pakistan Limited	
MODELER: Saad Qudrat	
TOTAL COUNT: 744 hrs.	
DATE: 04/06/2024	PROJECT NO.: 462320-AL-10

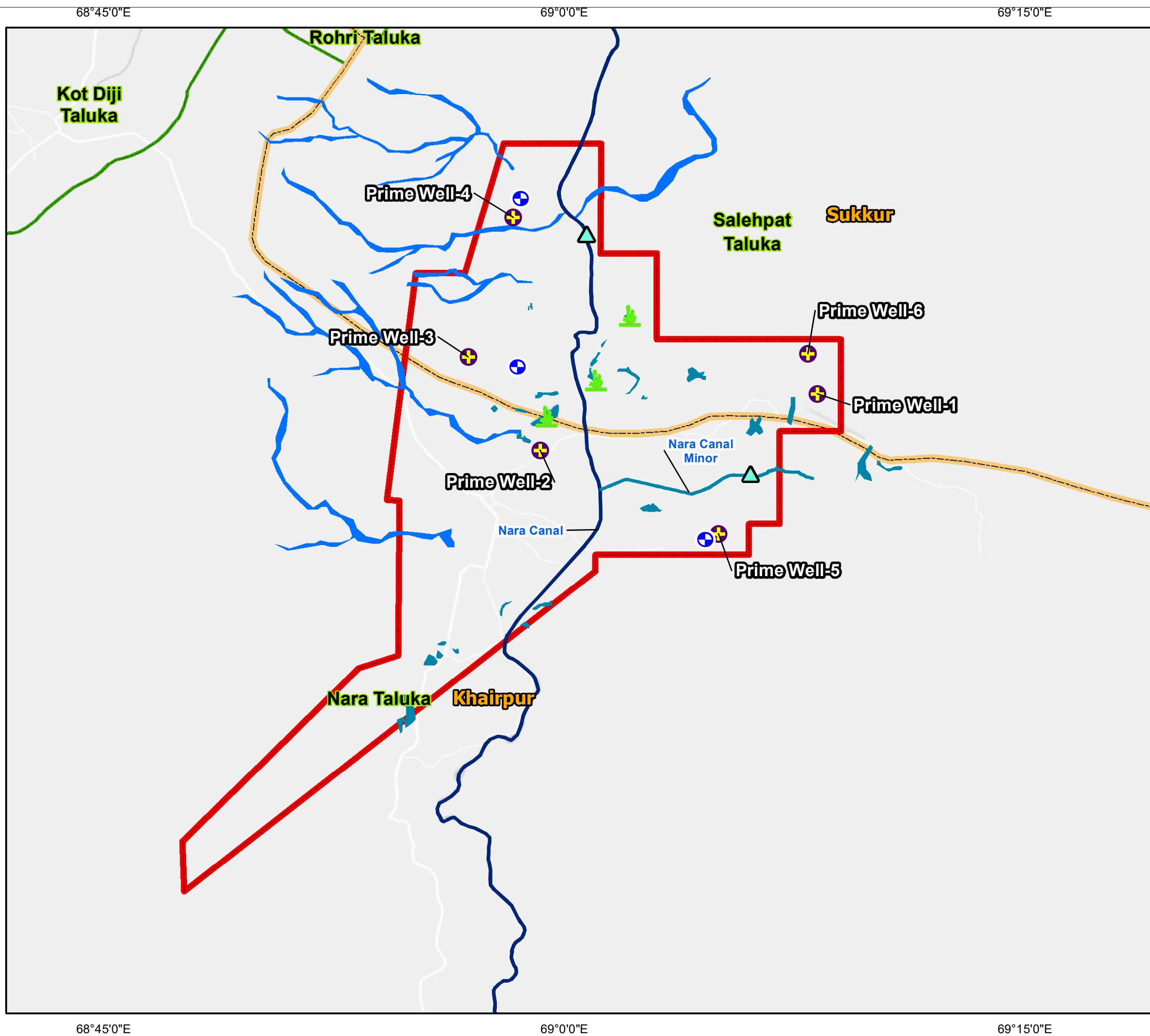
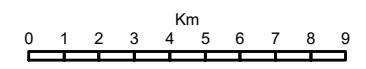


Fig 6-7 Water Resources Map
Environmental Impact Assessment
(EIA) Study for Drilling of Wells and
Associated Development Activities in
SW Miano-III Block, Sindh



Legend

- Proposed Well Locations
- Nara Canal
- Nara Canal Minor
- Canal
- Water Sample
- Wetland
- Streams
- Dhand
- Block Boundary
- District Boundary
- Taluka Boundary



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Photographic Record: Glimpse of Physical Features of the Project Area



Photograph 6-1: View of Prime Well-1 location-



Photograph 6-2: View of Prime well-5 location



Photograph 6-3: View of Prime well-6 location



Photograph 6-4: View of typical housing style of project area



Photograph 6-5: Agriculture crops in the project area



Photograph 6-6: Environmentalist collecting water sample



Photograph 6-7: Use of wood as fuel is also among the key air pollution sources



Photograph 6-8: Noise level measurement



Photograph 6-9: View of Sign Board of Government Dispensary in Goth Rab Rakhio Bhambro



Photograph 6-10: View of typical houses in Goth Ali Gul



Photograph 6-11: View of *Otak* in Goth Dubh



Photograph 6 12: Wheat silage in project area

6.2 Biological Environment

The SW Miano-III block features a diverse range of ecological habitats, primarily consisting of agricultural fields and human settlements, interspersed with desert expanses, wastelands, and waterlogged areas. The desert portion of the lease area forms part of the Nara Desert Wildlife Sanctuary (NDWS), a protected area under the Sindh Wildlife Ordinance, 1972. The Nara Desert is a subpart of the vast Great Thar Desert. The sandy soils in this desert region exhibit rapid water infiltration rates, poor fertility, and low humus content due to rapid oxidation and high salinity. These harsh conditions make the desert ecosystem highly fragile and unsuitable for primary production, leading to limited biodiversity and ecological regeneration opportunities.

6.2.1 Nara Desert Wildlife Sanctuary (NDWS)

SW Miano III covers approximately 13% of the Nara Desert Wildlife Sanctuary (NDWS). Located in the eastern part of Sindh, the NDWS spans parts of the Sukkur, Khairpur, and Ghotki districts, with a total area of approximately 6,300 square kilometers. Established in 1980 under the Sindh Wildlife Ordinance, 1972, the NDWS is part of the Thar Desert, which covers 368,000 square kilometers along the India-Pakistan border.

The habitats within the NDWS are heavily influenced by the proximity of the Thar and Rajasthan deserts, supporting a variety of mammals, birds, and reptiles. Up to 390 vertebrate species have been reported from the Thar Desert. Key wildlife species in the NDWS project area include the Chinkara and the Houbara/Macqueen bustard.

Changes in land use, infrastructure development, overgrazing by livestock, and land uptake for various activities have negatively impacted plant succession, altering species composition and abundance. The transformation of the desert into irrigated and rain-fed agricultural fields has further affected its biodiversity. Typical desert-oriented mammals, birds, and reptiles are declining and being replaced by human-dependent mesic species. The Chinkara is rapidly vanishing, while the Houbara/Macqueen bustard faces rapid decline due to excessive hunting and poaching. Additionally, the killing of carnivore mammals for their pelts has disrupted the prey-predator relationship, with top predators like the Hyena now facing the threat of extinction due to persecution as conflict species.

6.2.2 Data Sources

Data for the EIA was gathered from both primary and secondary sources. A comprehensive baseline field survey was conducted in April 2024, with sampling locations meticulously chosen to encompass all habitat types. This approach aimed to maximize the observation of species diversity within the project area. The following table summarizes the biological attributes identified during the EIA site visit:

Attributes	No. of Species
Flora	81
Birds	94
Mammals	18
Reptiles	18

Some representative flora and fauna of the project area are shown at the end of this section.

6.2.3

Habitats

As previously mentioned, the project area comprises three main habitat types: Nara desert, wetlands, Agricultural fields and human habitation. Descriptions of these prime ecological habitats, along with associated biological attributes (flora and fauna), are provided in the following sections:

f. Nara Desert

This habitat type dominates the SW Miano III block, covering approximately 95% of the lease area. The landscape features large masses of shifting sand, forming hillocks known as sand dunes or ridges. These dunes have distinct parts: the crest (topmost portion), swale (middle portion), and foot (base). The area between two successive dunes is called an inter-dunal valley. Dunes can be either stabilized or unstabilized. Unstabilized dunes are movable heaps of sand that lack vegetation and can shift with the wind, while stabilized dunes have a mixed population of plant species.

The vegetation in this habitat is typical of arid and semi-arid climates, consisting of xerophytic species adapted to high seasonal temperatures, low humidity, moisture fluctuations, and a variety of soil conditions. This vegetation responds well to favorable conditions such as rainfall events, especially during the monsoon and winter, with many ephemeral plants completing their life cycles in a few weeks.

Due to the long dry spells often observed in the area, herbaceous communities and ephemeral species do not emerge every year. These species respond quickly to rainfall, emerging with the first shower, growing instantly, producing seeds, and completing their life cycles in about 7 to 8 weeks. Otherwise, their seeds remain dormant throughout the dry periods.

The vegetation in the area is sparse, mainly consisting of stunted, thorny, or prickly shrubs and perennial herbs capable of drought resistance. Common species include *Aerva javanica*, *Calligonum polygonoides*, *Salvadora oleoides*, *Dipterygium glaucum*, *Capparis decidua*, and *Leptadenia pyrotechnica*, with trees such as *Prosopis cineraria* also present. Vegetation within the valleys is distinctively different from that on the sand dunes, with mixed communities of

trees like *Prosopis cineraria* and patches of shrubs such as *Aerva javanica* and *Calligonum polygonoides*.

The Chinkara or Indian gazelle, once common in the area, is now close to extinction due to excessive hunting and habitat loss. Its presence was recorded during the first EIA field visit of Miano III in 2006, but subsequent fieldwork in 2008, 2015, and the current EIA have not observed it directly or through evidence such as footprints or faeces. However, its presence cannot be ruled out in less disturbed areas near the Pakistan-India border. The Nara Desert also serves as a wintering habitat for the Houbara bustard, sandgrouse, and various birds of prey. The desert is home to the Indian/Bengal fox, Common red fox, and Asiatic jackal, as well as a variety of rodents including gerbils, jirds, rats/mice, and reptiles such as snakes and lizards, which are key food sources for carnivores and raptors.

In addition to wildlife, the desert supports the livelihood of pastoral communities that graze their livestock. Small, scattered settlements of these pastoralists can be observed where water is available. Livestock grazing and prolonged drought periods affect the distribution and type of flora and fauna within this habitat.

g. Wetlands

The second important habitat in the project area consists of wetlands, including perennial and seasonal wetlands. These wetlands, present in various locations within the project area, are influenced by rainfall and the irrigation network. These dhands/wetlands support a significant population of migratory birds and serve as a wintering habitat for various species of ducks, coots, and waders. In addition to migratory birds, these areas provide habitat for resident birds associated with wetlands, such as the Purple Sunbird, Indian Moorhen, White-breasted Waterhen, egrets, and herons. Resident species in these areas also include the Little Grebe, Cattle Egret, Red-wattled Lapwing, and a good number of babbblers.

h. Agriculture Land and Human Settlements

The remaining project area is composed of agricultural fields and small/medium sized human settlements. These include mostly permanent and little temporary hammock settlement of pastoral communities. This habitat type, mostly created due to presence of irrigation network, can clearly be differentiated from surrounding desert environment. The desert land has been levelled to allow flow of irrigation water for cultivation of crops and orchards. In some parts, depending upon suitability of soil, rain-fed agriculture is also practiced. Large and small human settlements with planted trees and hedges are also component of this habitat type.

Seasonal crops and weed species are found in the cultivated fields depending upon season for sowing/harvesting. These tree species have been introduced by the farmers for their use in daily life. These also provide roosting and nesting sites to a number of avian species. Some common lizards and small mammals like Five

striped palm squirrel also noticed on these trees. Other floral species of this habitat include *Calotropis procera*.

From wildlife point of view, this habitat is least important and covers limited space of the project area. The species associated with human settlement and agriculture can be seen in abundance. Presence of Black partridges can be noticed in fields close to dunes and barren areas. Same areas are visited by the Desert/Black napped hare after dusk and during night. Collared dove, Little brown dove, Jungle babbler Common babbler and Common myna are seen in abundance in addition to House crow and House sparrows. Indian roller, Red wattled lapwing, Red turtle dove and Rose ringed parakeet are also seen in fields and trees close to human habitations. Asiatic jackal, Jungle cat and Common red fox visit such areas during night for predation on domestic fowl.

6.2.4 Flora

This section provides information on the natural vegetation of the proposed project area. Data for the Environmental Impact Assessment (EIA) was gathered from both secondary and primary sources, with primary field data collected by an ecologist. The field survey methodologies adhered to scientifically established and accepted vegetation survey techniques. Various studies, such as Flora of Pakistan (Nasir & Ali, 1972-2002), Flora of Karachi (Jafri, 1966), the technical report “Floristic Study of Arid Zone (Desert Nara Region)” (Bhatti et al., 2001), and Post Rainfall Plant Biodiversity of Nara Desert (Bhatti, 2003), were consulted for the current determination of plant species.

Plant communities in the area face threats from livestock grazing in the desert. In general, the native vegetation is xerophytic and sparse, though there are patches of dense vegetation in flat areas between dunes. Rainfall is mostly confined to the summer monsoon period and is both scanty and meagre. The area experienced a severe drought from 1997 to 2001, resulting in slow plant growth and prolonged recovery. Due to climatic factors, most species complete their life cycle during the rainy season, with many shrubs flowering and setting seeds during this period. Plants shed their leaves in winter and remain leafless for most of the year. Many shrubs branch profusely into dome-shaped structures to reduce water loss and maintain a relatively lower temperature inside the domes. Since the survey was conducted at the start of the winter season, when climatic conditions were acutely dry, the number of observed floral species was quite low, lacking the ephemerals that are more commonly seen during the wet season, particularly the monsoon rains.

During the current EIA fieldwork, 81 flora species from 30 vegetation families were documented. **Table 6-6** presents a comprehensive list of the floral species observed during the recent EIA site visit.

Floral Diversity

During the fieldwork for the current EIA, 81 plant species from 30 vegetation families were identified in the project area. Regarding life span, 46 of these species are perennial, 32 are annual, and 3 are semi-perennial. Representative photographs of the flora observed in the project area are provided at the end of this chapter. Seven types of life forms were identified in the project area. The number and percentage of these floral life forms are detailed below:

Table 6-5: Life Form of Floral Species observed in the Project Area

Life Form	Number	Percentage
Herb	21	25.92
Grass	17	21.00
Tree	9	11.12
Shrub	25	30.89
Sedge	5	6.17
Climbers	3	3.70
Stem parasite	1	1.20

The dominant life forms in the area include Shrubs (30.89%) herbs (25.92%), grasses (21%), trees (11.12%), sedges (6.17%), Climbers (3.7). The table below presents the dominant families and the number of species within each family.

Family Name	No. of Species	Family Name	No. of Species
Aizoaceae	2	Malvaceae	2
Amaranthaceae	3	Meliaceae	1
Arecaceae	2	Mimosaceae	4
Asclepiadaceae	3	Molluginaceae	1
Asteraceae	3	Neuradaceae	1
Boraginaceae	2	Nyctaginaceae	1
Caesalpiniaceae	1	Poaceae	17
Capparidaceae	5	Polygonaceae	1
Chenopodiaceae	2	Rhamnaceae	1
Cuscutaceae	1	Salvadoraceae	1
Convolvulaceae	3	Solanaceae	2
Cucurbitaceae	2	Tamaricaceae	2
Cyperaceae	3	Tiliaceae	1
Euphorbiaceae	3	Typhaceae	2
Fabaceae	7	Zygophyllaceae	2
Total Plant Species = 81			

Rare or Endemic Species

No endemic or rare vegetation species were recorded during the EIA field visit. All species have a wide range of distribution in other ecological zones of country, especially at other locations of Sindh province, in Nara Desert and closer vicinities to the desert region in particular.

Expected Vegetation Clearing

No significant tree removal is expected, except for some small plants at specific well locations. Minor bushes may also need to be cleared to establish campsites, well sites, and along the proposed access track alignments for each well site preparation. It is essential to adhere to the mitigation measures outlined in the EIA to safeguard the natural environment and its associated biodiversity in the area.

6.2.5

Fauna

The SW Miano-III block encompasses a mosaic of three habitat types, resulting in a diverse array of mammals, birds, and reptiles. Several environmental assessments have been conducted in the project area to meet regulatory requirements. During the 2008 EIA field visit, 52 bird species, 14 mammal species, and 12 reptile species were documented. Similarly, the 2015 EIA field visit recorded 124 avian species, 16 mammal species, and 14 reptile species. In the most recent EIA field visit in April 2024, a total of 94 bird species, 18 mammal species, and 18 reptile species were observed in the project area.

i. Birds

A total of 94 avian species have been documented within the project area during the current EIA field visit, comprising predominantly resident species along with some migratory ones (refer to **Table 6-7**). Among these, 74 species are residents, while the remaining 21 are migratory. Further analysis reveals that out of the total 94 species, three species—the bank myna, common babbler, and crested lark—are abundant. Sixty-six species are considered common, 21 are categorized as less common, and four are classified as rare. Additionally, the recorded avian species include 16 species protected under the Sindh Wildlife Protection Act 2020, with ten species listed on the IUCN Red List. Eight migratory species are listed on CMS appendices, necessitating international cooperation for their conservation, while 13 species are covered by CITES due to their potential for international trade.

Several birds of prey, or raptors, have also been observed in the project and adjacent areas. The project area is home to resident species adapted to arid conditions, including various passerines. During the current EIA field visit, a diverse array of birds of prey was recorded, including the common/blue kingfisher, black kite, black-shouldered kite, Eurasian sparrowhawk, greater short-toed lark, merlin, and short-toed eagle. Common bird species within the project area include the small/wandering minivet, spotted owl, white/pied wagtail, cattle egret, collared dove, common babbler, crested lark, hoopoe, house crow, house sparrow, Indian crow pheasant, common myna, Indian roller, little egret, Indian pond heron, and variable wheatear. Less common and rare sightings include the chestnut-bellied sandgrouse, common tailorbird, greater short-toed lark, great cormorant, isabelline shrike, little ringed plover, long-tailed grass warbler, northern eagle owl, raven, red turtle dove, rose-ringed parakeet, ruff,

Sindh jungle sparrow, Sindh pied woodpecker, spotted redshank, and trumpeter finch.

j. Mammals

The mosaic of habitats within the project area supports a diverse range of mammalian fauna. The Chinkara gazelle, once a prominent ungulate of the Nara Desert and surrounding agricultural fields, has faced significant persecution by poachers following the proliferation of vehicles and weapons in the region. While it has nearly vanished from this area, the possibility of its existence in undisturbed pockets remains. However, no evidence of its presence was observed during the current field visit for the EIA.

During the EIA field visit conducted in April 2024, it was noted that the population of large mammals, particularly carnivores, has declined over time in the area. In contrast, small mammals, especially rodents, are flourishing, as evidenced by the extensive burrow systems and colonies observed. A comprehensive survey during this field visit recorded a total of 18 mammalian species within the project area. Of these, only two species are protected under the Sindh Wildlife Protection Act, 2020. Furthermore, six of the 18 species are listed on CITES appendices due to their vulnerability to international trade.

k. Reptiles

The project area of SW Miano III block is significant due to the presence of a variety of reptiles. During fieldwork for the current EIA conducted in April 2024, a total of 18 reptiles were observed or reported from the area. Among these 18 recorded species, six are protected under the Sindh Wildlife Protection Act 2020, while four species are listed on CITES appendices due to their potential for international trade.

Arable and waste lands provide favorable habitats for numerous reptile species, particularly the Desert monitor, Indian fringe-toed sand lizard, and Indian sand swimmer. The Indian fringe-toed sand lizard, Indian sand swimmer, and Indian garden lizard are commonly sighted in areas adjacent to desert habitats.

Various species of snakes are also prevalent, including the Checkered keelback, Saw-scaled viper, Pakistan ribbon snake, Indian sand boa, Indian cobra, Glossy-bellied racer, Royal diadem snake, and Common rat snake. Among these, the Saw-scaled viper and Indian cobra are venomous, while the others are non-venomous.

The Indian monitor lizard was observed in areas near wetlands, while the Indian spiny-tailed lizard inhabits flat terrains and is hunted for its purported medicinal properties. This species, listed in CITES appendices and protected under the Sindh Wildlife Protection Act 2020, is experiencing a rapid decline due to excessive hunting. A comprehensive list of reptiles documented during field visits for EIAs in the region is provided in **Table 6-9**.

Table 6-6: List of Floral Species found in the Project Area

No.	Botanical Name	Local Name	Family	Life Form						
				Herb	Shrub	Grass	Tree	Sedge	Climber	Creeper
1.	<i>Aeluropus lagopoides</i> (Linn.) Trin. ex. Thw	Kalar Gaah	Poaceae			X				
2.	<i>Aristida adscensionis</i> Linn.	Lumb Gaah	Poaceae			X				
3.	<i>Aristida funiculata</i> Trin. & Pupr.	Lumb Gaah	Poaceae			X				
4.	<i>Achyranthes aspera</i> Linn.	Ubat Kandri	Amaranthaceae	X						
5.	<i>Aerva javanica</i> (Burm.f.) Juss. ex.	Booh	Amaranthaceae		X					
6.	<i>Arthrocnemum indicum</i> (Willd.) Moq.	Lano	Chenopodiaceae		X					
7.	<i>Alhaji maurorum</i> Medic.	Kandero	Fabaceae		X					
8.	<i>Albizia lebbek</i> (L.) Benth	Serenh	Fabaceae				X			
9.	<i>Abutilon indicum</i> (Linn.) Sweet	Pat Teer	Malvaceae		X					
10.	<i>Abutilon fruticosum</i> Guill. & Perr.	Pat Teer	Malvaceae		X					
11.	<i>Azadirachta indica</i> Adv. Juss.	Neem	Meliaceae				X			
12.	<i>Acacia jacquemontii</i> Benth.	Banwar	Mimosaceae		X					

No.	Botanical Name	Local Name	Family	Life Form						
				Herb	Shrub	Grass	Tree	Sedge	Climber	Creeper
13.	<i>Acacia nilotica</i> (Linn.) Delile	Sindhi Babur	Mimosaceae				X			
14.	<i>Boerhavia procumbens</i> Banks ex Rxb.	Dakhri	Nyctaginaceae	X						
15.	<i>Cyperus arinarius</i> Retz.	Moniah Gaah	Cyperaceae					X		
16.	<i>Cyperus laevigatus</i> Linn.		Cyperaceae					X		
17.	<i>Cyperus rotundus</i> Linn.	Kabah	Cyperaceae					X		
18.	<i>Cenchrus biflorus</i> Roxb.	Mohabbat Buti	Poaceae			X				
19.	<i>Cenchrus ciliaris</i> Linn.	Bhurt	Poaceae			X				
20.	<i>Cymbopogon jawarancusa</i> (Jones) Schult.	Kattan	Poaceae			X				
21.	<i>Cynodon dactylon</i> (Linn.) Pers.	Chhabar	Poaceae			X				
22.	<i>Calotropis procera</i> (Willd.) R. Br.	Ak	Asclepiadaceae		X					
23.	<i>Cordia myxa</i> Linn.	Lesuro	Boraginaceae				X			
24.	<i>Cassia italica</i> (Mill.) F.W.Andr.	Ghora Wal	Caesalpiniaceae	X						
25.	<i>Cadaba farinosa</i> Forssk.	Khabri Wal	Capparidaceae		X					

No.	Botanical Name	Local Name	Family	Life Form						
				Herb	Shrub	Grass	Tree	Sedge	Climber	Creeper
26.	<i>Capparis decidua</i> (Forssk.) Edgew.	Kirar	Capparidaceae		X					
27.	<i>Cleome brachycarpa</i> Vahl ex DC.		Capparidaceae	X						
28.	<i>Cleome scaposa</i> D.C.	Khathoori	Capparidaceae	X						
29.	<i>Cressa cretica</i> Linn.	Oin	Convolvulaceae	X						
30.	<i>Convolvulus arvensis</i> Linn.	Naro	Convolvulaceae						X	
31.	<i>Convolvulus prostratus</i> Forssk.	Kirhanj	Convolvulaceae	X						
32.	<i>Citrullus colocynthis</i> (Linn.) Schrad.	Trooh	Cucurbitaceae		X					
33.	<i>Cuscuta chinensis</i> Lam.	Bepari	Cuscutaceae							
34.	<i>Calligonum polygonoides</i> Linn.	Phog	Polygonaceae		X					
35.	<i>Crotolaria burhia</i> Ham. ex Benth.	Chag	Fabaceae		X					
36.	<i>Corchorus depressus</i> (Linn.) Stocks.	Mundheri	Tiliaceae	X						

No.	Botanical Name	Local Name	Family	Life Form						
				Herb	Shrub	Grass	Tree	Sedge	Climber	Creeper
37.	<i>Dactyloctenium aegyptium</i> (Linn.) <i>P. Beauv.</i>	Gandheer Gaah	Poaceae			X				
38.	<i>Desmostachya bippinata</i> (Linn.) <i>Stapf.</i>	Drabh	Poaceae			X				
39.	<i>Dichanthium annulatum</i> (Forsskal) Stapf.	Dinohi	Poaceae			X				
40.	<i>Digera muricata</i> (Linn.) Mart.	Lulur	Amaranthaceae	X						
41.	<i>Dipterygium glaucum</i> Decne.	Phair	Capparidaceae		X					
42.	<i>Dalbergia sissoo</i> Roxb.	Taari	Fabaceae				X			
43.	<i>Eragrostis minor</i> Host.	Makhni Gaah	Poaceae			X				
44.	<i>Euphorbia hirta</i> Linn.	Kheer Wal	Euphorbiaceae	X						
45.	<i>Euphorbia prostrata</i> Ait.	Kheer wal	Euphorbiaceae	X						
46.	<i>Euphorbia thymifolia</i> Linn.	Kheera Wal	Euphorbiaceae	X						
47.	<i>Fagonia indica</i> var. <i>schweinfurthii</i> Hadidi	Dramaaho	Zygophyllaceae		X					

No.	Botanical Name	Local Name	Family	Life Form						
				Herb	Shrub	Grass	Tree	Sedge	Climber	Creeper
48.	<i>Heliotropium crispum</i> Desf.	Kharsan	Boraginaceae	X						
49.	<i>Indigofera argentea</i> Burm.f.	Lathio	Fabaceae	X						
50.	<i>Limeum indicum</i> Stocks ex T. Anderson.	Dhoor Chhapri	Aizoaceae	X						
51.	<i>Leptadenia pyrotechnica</i> (Forsk.) Decne.	Khip	Asclepiadaceae		X					
52.	<i>Launaea procumbens</i> (Roxb) Ramayya & Rajagopal.	Bhattar	Asteraceae	X						
53.	<i>Mukia maderaspatana</i> (Linn.) M. J. Roem.,	-----	Cucurbitaceae	X						
54.	<i>Mollugo cerviana</i> (Linn.) Ser.	Hazar Dani	Molluginaceae	X						
55.	<i>Neurada procumbens</i> Linn.	Chhapri/Chhipri	Neuradaceae	X						
56.	<i>Ochthochloa compressa</i> (Forssk..) Hilu.	Gandheer Gaah	Poaceae			X				
57.	<i>Oxystelma esculentum</i> (L.f.) R. Br.	Phuli	Asclepiadaceae						X	

No.	Botanical Name	Local Name	Family	Life Form						
				Herb	Shrub	Grass	Tree	Sedge	Climber	Creeper
58.	<i>Phragmites karka</i> (Retz.) Trin. ex Steud.	Nar/Naro	Poaceae			X				
59.	<i>Phoenix dactylifera</i> Linn.	Khaji	Arecaceae				X			
60.	<i>Phoenix sylvestris</i> Linn.	Khaji	Arecaceae				X			
61.	<i>Pluchea lanceolata</i> (DC.) Oliv. & Hiern.	Phaar Buti	Asteraceae		X					
62.	<i>Prosopis cineraria</i> (Linn.) Druce	Kandi	Mimosaceae				X			
63.	<i>Prosopis juliflora</i> (Swartz) DC.	Devi	Mimosaceae		X					
64.	<i>Rhynchosia minima</i> (Linn.) DC.	Wan Wehri	Fabaceae						X	
65.	<i>Saccharum bengalense</i> Retz.	Booro	Poaceae			X				
66.	<i>Saccharum spontaneum</i> Linn.	Booro/Munia n	Poaceae			X				
67.	<i>Setaria pumila</i> (Poir.) Roem. & Schult.	Sawri	Poaceae			X				
68.	<i>Stipagrostis plumosa</i> (Linn.) Munro ex T. Anders.	Lumb Gaah	Poaceae			X				

No.	Botanical Name	Local Name	Family	Life Form						
				Herb	Shrub	Grass	Tree	Sedge	Climber	Creeper
69.	<i>Saueda fruticosa</i> (Linn.) Forsk.	Lani	Chenopodiaceae		X					
70.	<i>Salvadora oleoides</i> Decne.	Jar/Peroon	Salvadoraceae		X					
71.	<i>Solanum surattense</i> Burm.f.	Kanderi Wal	Solanaceae		X					
72.	<i>Tamarix aphylla</i> (Linn.) Karst.	Lawo	Tamaricaceae				X			
73.	<i>Tamarix indica</i> Willd.	Lai	Tamaricaceae		X					
74.	<i>Typha elephantina</i> (Roxb.)	Paan	Typaceae					X		
75.	<i>Typha domingensis</i> Pers.	Paan	Typaceae					X		
76.	<i>Tephrosia uniflora</i> (Blatter & Hallberg) Gillett & Ali	Andhri/Siring h	Fabaceae		X					
77.	<i>Tribulus longipetalus</i> Viv.	Bakhro/Bhurt	Zygophyllaceae	X						
78.	<i>Withania somnifera</i> (Linn.) Dunal	Akri	Solanaceae		X					
79.	<i>Xanthium indicum</i> Koenig ex Roxb.	Bhurt	Asteraceae		X					
80.	<i>Zelya petandra</i> (Linn.) Jeffrey	Wasanh/Waho	Aizoaceae	X						
81.	<i>Zizyphus mauritiana</i> Lam.	Ber	Rhamnaceae		X					

Table 6-7: List of Birds Observed in Project Area

No.	Common Name	Scientific Name	EIA April, 2024	Status		Occurrence				Listing			
				Migratory	Resident	Common	Abundant	Less Common	Rare	WPO/Act	IUCN Red List	CMS Appendix	CITES Appendix
1.	Ashy-Headed Finch Lark	<i>Eremopterix grisea</i>	X		X	X							
2.	Bank Myna	<i>Acridotheres ginginianus</i>	X		X		X						
3.	Barn or Common Swallow	<i>Hirundo rustica</i>	X	X				X					
4.	Bay-backed Shrike	<i>Lanius vittatus</i>	X		X	X							
5.	Black crowned Finch Lark	<i>Eremopterix nigreiceps</i>	X		X	X							
6.	Black Drongo / King Crow	<i>Dicrurus macrocercus</i>	X		X	X							
7.	Black headed Bunting	<i>Emberiza melanocephala</i>	X	X		X							
8.	Black Kite	<i>Milvus migrans</i>	X		X	X				X			II
9.	Black Partridge	<i>Francolinus francolinus</i>	X		X			X					
10.	Black Redstart	<i>Phoenicurus ochruros</i>	X	X		X							
11.	Black-Shouldered Kite	<i>Elanus caeruleus/ E.leucurus</i>	X		X	X				X			II
12.	Black-winged Stilt	<i>Himantopus himantopus</i>	X		X	X						II	
13.	Blue Rock Pigeon	<i>Columba livia</i>	X		X	X							III

No.	Common Name	Scientific Name	EIA April, 2024	Status		Occurrence				Listing			
				Migratory	Resident	Common	Abundant	Less Common	Rare	WPO/Act	IUCN Red List	CMS Appendix	CITES Appendix
14.	Blue Throat	<i>Luscinia svecica</i>	X		X			X					
15.	Cattle Egret	<i>Bubulcus ibis</i>	X		X	X				X			III
16.	Chestnut bellied sandgrouse	<i>Pterocles exustus</i>	X		X			X			LC		
17.	Chestnut shouldered Rock Sparrow	<i>Petronia xanthocollis</i>	X		X	X							
18.	Chiffchaff	<i>Phylloscopos collybita</i>	X	X		X							
19.	Collared Dove	<i>Streptopelia decaocto</i>	X		X	X							
20.	Common / Blue Kingfisher	<i>Alcedo atthis</i>	X		X	X							
21.	Common Babbler	<i>Turdoides caudatus</i>	X		X		X						
22.	Common Kestrel / Eurasian Kestrel	<i>Falco tinnunculus</i>	X	X		X				X		II	II
23.	Common Sandpiper	<i>Actitis hypoleucos</i>	X		X	X							
24.	Common Snipe	<i>Gallinago gallinago</i>	X		X	X						II	
25.	Common Tailorbird	<i>Orthotomus Sutorius</i>	X		X			X			X		
26.	Common Wood Shrike	<i>Tephrodornis pondicerianus</i>	X		X	X							
27.	Cream coloured Courser	<i>Cursorius cursor</i>	X	X					X				
28.	Crested Lark	<i>Galerida cristata</i>	X		X		X						

No.	Common Name	Scientific Name	EIA April, 2024	Status		Occurrence				Listing			
				Migratory	Resident	Common	Abundant	Less Common	Rare	WPO/Act	IUCN Red List	CMS Appendix	CITES Appendix
29.	Desert lark	<i>Ammomanes deserti</i>	X		X	X							
30.	Desert Warbler	<i>Sylvia nana</i>	X		X	X							
31.	Desert Wheatear	<i>Oenanthe deserti</i>	X	X		X							
32.	Eurasian Nightjar	<i>Caprimulgus europaeus</i>	X		X	X							
33.	Egyptian/Scavenger Vulture	<i>Neophron percnopterus</i>	X		X	X				X			II
34.	Eurasian Sparrow Hawk	<i>Accipiter nisus</i>	X		X			X		X		II	II
35.	Glossy Ibis	<i>Plegadis falcinellus</i>	X		X	X				X		II	
36.	Golden backed Woodpecker	<i>Dinopium benghalense</i>	X		X	X							
37.	Great Cormorant	<i>Phalacrocorax carbo</i>	X	X				X		X			
38.	Great Grey Shrike	<i>anius excubitor</i>	X		X	X							
39.	Great Reed Warbler	<i>Acrocephalus arundinaceus</i>	X	X					X				
40.	Greater Short Toed Lark	<i>Calandrella brachydactyla</i>	X	X				X					
41.	Grey Partridge	<i>Fringilla pondicerianus</i>	X		X	X							
42.	Hoopoe	<i>Upupa epops</i>	X		X	X							
43.	House Crow	<i>Corvus splendens</i>	X		X	X							

No.	Common Name	Scientific Name	EIA April, 2024	Status		Occurrence				Listing			
				Migratory	Resident	Common	Abundant	Less Common	Rare	WPO/Act	IUCN Red List	CMS Appendix	CITES Appendix
44.	House Sparrow	<i>Passer domesticus</i>	X		X	X							
45.	House Swift	<i>Apus affinis</i>	X		X	X							
46.	Indian Moorhen	<i>Gallinula chloropus</i>	X		X	X							
47.	Indian Myna/Common Myna	<i>Acridotheres tristis</i>	X		X	X							
48.	Indian Pond Heron	<i>Ardeola grayii</i>	X		X	X				X			
49.	Indian Robin	<i>Saxicoloides fulicata</i>	X		X	X							
50.	Indian Roller	<i>Coracias benghalensis</i>	X		X	X							
51.	Indian Sand Martin	<i>Riparia paludicola</i>	X		X	X							
52.	Indian Tree-Pie	<i>Dendrocitta vagabunda</i>	X		X	X					LC		
53.	Indian silverbill	<i>Euodice malabarica</i>	X		X	X					LC		
54.	Isabelline Shrike	<i>Lanius isabellinus</i>	X	X				X					
55.	Jungle Babbler	<i>Turdoides striatus</i>	X		X	X							
56.	Little Brown Dove	<i>Streptopelia senegalensis</i>	X		X	X							III
57.	Little Cormorant	<i>Phalacrocorax niger</i>	X	X	X	X				X			
58.	Little Egret	<i>Egretta garzetta</i>	X		X	X				X			

No.	Common Name	Scientific Name	EIA April, 2024	Status		Occurrence				Listing			
				Migratory	Resident	Common	Abundant	Less Common	Rare	WPO/Act	IUCN Red List	CMS Appendix	CITES Appendix
59.	Little Grebe	<i>Tachybaptus ruficollis</i>	X		X	X							
60.	Little Green Bee-eater	<i>Merops orientalis</i>	X		X	X							
61.	Little ringed plover	<i>Charadrius dubius</i>	X	X				X			LC		
62.	Little Stint	<i>Calidris minuta</i>	X	X		X						II	
63.	Long-tailed Grass Warbler	<i>Prinia burnesii</i>	X		X			X			VU		
64.	Marsh Harrier	<i>Circus aeruginosus</i>	X	X		X				X			II
65.	Merlin	<i>Falco columbarius</i>	X		X				X	X		II	II
66.	Northern Eagle Owl	<i>Bubo bubo</i>	X		X			X					II
67.	Pied Bushchat	<i>Saxicola caprata</i>	X		X	X							
68.	Pied Kingfisher	<i>Ceryle rudis</i>	X		X	X							
69.	Eastern Pied Wheatear	<i>Oenanthe picata</i>	X	X		X							
70.	Purple Sunbird	<i>Nectarinia asiatica</i>	X		X	X							
71.	Raven	<i>Corvus corax</i>	X		X			X			LC		
72.	Red turtle Dove	<i>Streptopelia transquebarica</i>	X		X			X					
73.	Red-vented Bulbul	<i>Pycnonotus cafer</i>	X		X	X							

No.	Common Name	Scientific Name	EIA April, 2024	Status		Occurrence				Listing			
				Migratory	Resident	Common	Abundant	Less Common	Rare	WPO/Act	IUCN Red List	CMS Appendix	CITES Appendix
74.	Red-wattled Lapwing	<i>Hoplopterus indicus</i>	X		X	X							
75.	Rose-ringed Parakeet	<i>Psittacula krameri</i>	X		X			X					III
76.	Rosy Starling	<i>Sturnus roseus</i>	X	X		X				X			
77.	Ruff	<i>Calidris pugnax</i>	X	X				X			LC		
78.	Rufous Warbler/Scrub Robin	<i>Cercotrichas galactotes</i>	X	X					X				
79.	Shikra/Sparrow Hawk	<i>Accipiter badius cenchroides</i>	X		X	X				X			
80.	Short toed Eagle	<i>Circaetus gallicus</i>	X		X	X				X			II
81.	Sindh Jungle Sparrow	<i>Passer pyrrhonotus</i>	X		X			X					
82.	Sindh Nightjar	<i>Caprimulgus mahrattensis</i>	X		X	X							
83.	Sindh Pied Woodpecker	<i>Dendrocopos assimilis</i>	X		X			X					
84.	Small/Wandering Minivet	<i>Pericrocotus cinnamomeus</i>	X		X	X							
85.	Spotted Owl	<i>Athene noctua</i>	X		X	X						II	
86.	Spotted redshank	<i>Tringa erythropus</i>	X	X				X			LC		
87.	Streaked Longtail Warbler	<i>Prinia gracilis</i>	X		X	X							
88.	Trumpeter finch	<i>Bucanetes githagineus</i>	X		X			X			LC		

No.	Common Name	Scientific Name	EIA April, 2024	Status		Occurrence				Listing			
				Migratory	Resident	Common	Abundant	Less Common	Rare	WPO/Act	IUCN Red List	CMS Appendix	CITES Appendix
89.	White / Pied Wagtail	<i>Motacilla alba</i>	X	X		X							
90.	White-breasted Kingfisher	<i>Halcyon smyrnensis</i>	X		X	X							
91.	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	X		X	X							
92.	White-browed Fantail Flycatcher	<i>Rhipidura aureola</i>	X		X	X							
93.	White-cheeked Bulbul	<i>Pycnonotus leucogenys</i>	X		X			X					
94.	Wire-tailed Swallow	<i>Hirundo smithii</i>	X		X	X							

Abbreviations: NT – Near threatened; VU – Vulnerable LC: Least Concern

Table 6-8: List of Mammals Observed in and Adjacent to the Project Area

No	Common Name	Scientific Name	EIA April, 2024	Occurance			Listing		
				Common	Less Common	Rare	WPO/Act	IUCN Red list	CITES Appendix
1.	Asiatic Jackal	<i>Canis aureus</i>	X		X				
2.	Balochistan Gerbil	<i>Gerbillus nanus</i>	X		X				
3.	Common Red Fox	<i>Vulpes vulpes</i>	X	X					III
4.	Five stripped-palm Squirrel	<i>Funambulus pennantii</i>	X	X					
5.	House Mouse	<i>Mus musculus</i>	X	X					
6.	House Rat	<i>Rattus rattus</i>	X	X					
7.	Indian Crested Porcupine	<i>Hystrix indica</i>	X	X					
8.	Indian Desert Jird	<i>Meriones hurrianae</i>	X	X					
9.	Indian Desert Wild Cat	<i>Felis silverstris ornata</i>	X		X				II
10.	Indian Gerbil	<i>Tatera indica</i>	X	X					
11.	Indian Grey Mongoose	<i>Herpestes edwardsi</i>	X	X					III
12.	Indian Hare/Black-naped Hare	<i>Lepus nigricollis</i>	X	X					
13.	Indian or Bengal Fox	<i>Vulpes bengalensis</i>	X	X					III
14.	Jungle Cat	<i>Felis chaus</i>	X		X		X		II
15.	Little Indian field Mouse	<i>Mus booduga</i>	X	X					
16.	Long-eared desert Hedgehog	<i>Hemiechinus collaris</i>	X	X					
17.	Small Indian Mongoose	<i>Herpestes javanicus</i>	X	X			X		III
18.	Indian wild boar	<i>Sus scrofa cristatus</i>	X	X					

Note: EN – Endangered

Table 6-9: List of Reptiles Observed in the Project Area

No	Common Name	Scientific Name	EIA April, 2024	Listing		
				WPO	IUCN	CITES
1.	Brilliant Agama	<i>Trapelus agilis isolepis</i>	X			
2.	Black-headed Royal Snake Diadem Snake	<i>Spalerosophis atriceps</i>	X			
3.	Checkered Keelback snake	<i>Xenochrophis piscator</i>	X		LC	
4.	Fat tailed Gecko	<i>Eublepharis macularius</i>	X			
5.	Garden Lizard	<i>Calotes versicolor</i>	X			
6.	Glossy bellied Racer	<i>Coluber ventromaculatus</i>	X	X		
7.	Indian Cobra	<i>Naja naja naja</i>	X		LC	II
8.	Indian desert monitor	<i>Varanus griseus</i>	X			I
9.	Indian Fringe-toed Sand lizard	<i>Acanthodactylus cantoris cantoris</i>	X			
10.	Indian or Bengal Monitor	<i>Varanus bengalensis</i>	X	X		I
11.	Indian Sand Boa	<i>Eryx johnii johnii</i>	X	X		
12.	Indian sand swimmer	<i>Ophiomorus raithmai</i>	X			
13.	Indian Spiny-tailed Lizard	<i>Uromastix hardwickii</i>	X	X		II
14.	Ribbon Snake	<i>Psammophis leithii</i>	X	X		
15.	Sand Snake	<i>Psammophis condanarus condanarus</i>	X	X		
16.	Red spotted diadem snake	<i>Spalerosophis arenarius</i>	X			
17.	Saw scaled viper	<i>Echis carinatus pyramidum</i>	X			
18.	Sindh Sand Gecko	<i>Crossobamon orientalis</i>	X			

Photographic Record: Biological Environment of the Project Area



Photograph 6-12: *Aerva javanica*



Photograph 6-13: *Zizyphus mauritiana*



Photograph 6-14: *Calligonum polygonoides*



Photograph 6-15: *Saueda fruticosa*



Photograph 6-16: *Calotropis procera*



Photograph 6-17: *Crotolaria burhia*



Photograph 6-18: *Phoenix dactylifera*



Photograph 6-19: *Leptadenia pyrotechnica*



Photograph 6-20: *Calotropis procera*



Photograph 6-21: *Salvadora oleoides*



Photograph 6-22: *Prosopis juliflora*



Photograph 6-23: *Capparis decidua*



Photograph 6-24: White wagtail



Photograph 6-25: Rosy starling



Photograph 6-26: Collared Dove



Photograph 6-27: Common Babbler



Photograph 6-28: Chestnut shouldered Rock Sparrow



Photograph 6-29: Black winged stilt



Photograph 6-30: Little brown dove



Photograph 6-31: Indian robin



Photograph 6-32: Indian roller



Photograph 6-33: Indian silverbill



Photograph 6-34: Jungle babbler



Photograph 6-35: Little cormorant



Photograph 6-36: Little ringed plover



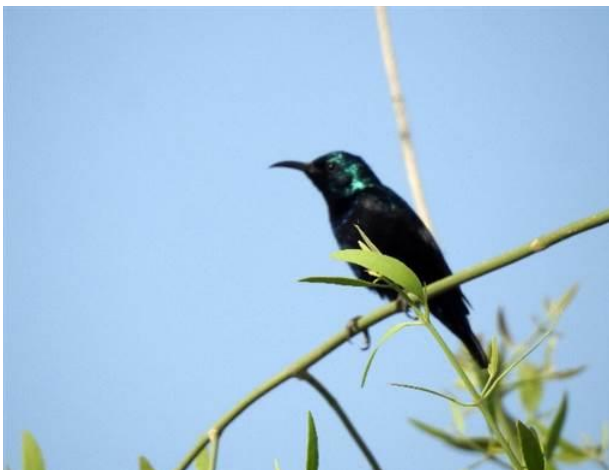
Photograph 6-37: Little grebe



Photograph 6-38: Common kite



Photograph 6-39: Pied bushchat



Photograph 6-40: Purple sunbird



Photograph 6-41: Red wattled lapwing



Photograph 6-42: Ruff



Photograph 6-43: Spotted redshank



Photograph 6-44: White cheeked bulbul



Photograph 6-45: Five striped-palm Squirrel



Photograph 6-46: Indian fringed toed lizard



Photograph 6-47: Indian monitor lizard

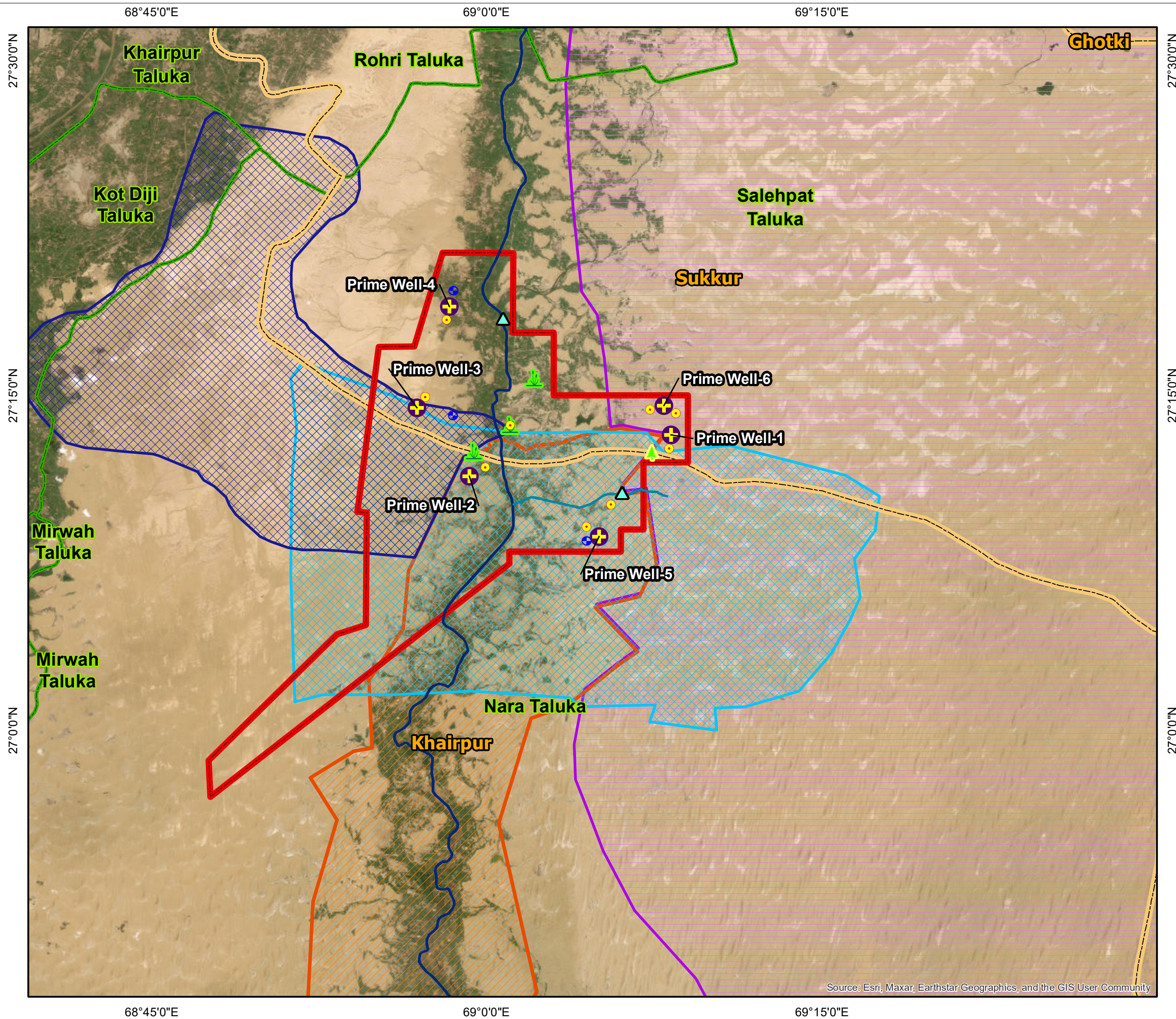
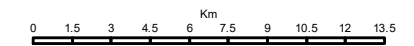
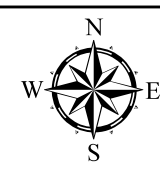


Fig 6-8 Background Environment Map
Environmental Impact Assessment (EIA) Study for Drilling of Wells and Associated Development Activities in SW Miano-III Block, Sindh



- Legend**
- Canal
 - Mechanized Farming
 - Noise
 - Water Sample
 - Wetland
 - Proposed Well Locations
 - City/Town
 - Nara Canal
 - Nara Canal Minor
 - Project Area
 - Block Boundary
 - Dsitrict Boundary
 - Taluka Boundary
 - Range Land
 - Nara Desert Wildlife Sanctuary
 - Nara Game Reserve
 - Takkar Wildlife Sanctuary



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6.3 Socioeconomic Environment

This section describes the socioeconomic and cultural environment of the project area. It presents information on the pertinent socioeconomic parameters of the area and includes inter alia its location, the generic characteristics of nearby communities, cultural conditionings, indigenous coping patterns as well as the health, economy, lifestyle and particularly use of resources by the local communities living within and in the close periphery of the protected areas.

6.3.1 Study Methodology

Various secondary sources of data including past several studies of the project area conducted by HPK, Government of Sindh, Pakistan Bureau of Statistics (PBS) and other agencies were consulted during the desk study.

The socioeconomic study undertaken for this EIA was designed and conducted to meet the following objectives:

- To assess the human environment of the area i.e. to determine the life's quality of the communities within the region of influence; and
- To have an insight into the day to day activities of people especially focusing on their income generating activities.

Primary data was collected by visiting the project area where informal interviews were carried out to collect data on important socioeconomic parameters. These interviews were carried out within (Goths) villages falling within project area or immediate vicinity of the SW Miano III Block. One on one interviews and discussions were held with locals including village elders and also in groups, to determine the community's needs and their concerns regarding the proposed project activities. Data from other published literature sources and respective District Census Reports (DCRs) have also been used to establish the social baseline conditions. Socioeconomic Characteristics of the project area is shown in **Figure 6-9**. A representative photographic record of the socioeconomic environment of the project area is shown at the end of this chapter.

6.3.2 Administrative Boundaries and Project Location

The project area which spans approximately 495 sq. km lies within two districts of Sindh, namely Sukkur and Khairpur. A major portion of the project area is located in Khairpur district in south of the project area while minor portion that lie in the north, that is, in Sukkur district. The project area is bounded on the North by Ghotki districts; on the south by Sanghar district; on the east by Jaisalmir (India); and on the west by Nawabshah and Larkana districts. The project area lies across two talukas Salehpat in (district Sukkur) and Nara in (District Khairpur).

6.3.3 Spiritual, Temporal and Political Authority

Sindhi society is structured around complex temporal and spiritual leadership dynamics. Tribal leadership in Sindh largely derives from temporal power, spiritual power, or from a combination of these. The spiritual power is either institutionalized through claiming direct descent from Mohammad (PBUH), the Holy Prophet of Islam, or from a Sufi saint. Spiritual authority in the project area largely rests with Pir Pagara, the Pirs of Utch Sharif, which is located near Multan.

The followers of Pir Pagara are the Hur warriors (also known as the Hur mujahid) who fought the British and rebelled against colonial occupation during the late 19th century. They are battle-tested desert warriors who fought against India during the wars of 1965 and 1971. The people of the project area also visit the district of Khairpur twice a year to pay homage and give alms to Pir Pagara. This is an important means of developing community integrity, as people from different clans become united under the principles of sainthood during their pilgrimage (ziyarat).

The range of a tribal leader's authority (temporal or spiritual) can encompass a single taluka or more. The traditional structure of authority in the study area is ordered into a hierarchical formation in which the decision-making process generally involves just the apical players. The tribal leaders are called upon to solve disputes regarding land, livestock, and women. All the tribes look to their sardars for guidance and conflict resolution and rarely go to thanas (police stations) when inter- or intra-tribal disputes arise.

Temporal as well as spiritual leaders in the study area are politically active. It was also observed that temporal leaders are not necessarily the spiritual leaders as well and hence the powers of temporal and spiritual leaders overlap.

6.3.4 Demographic Pattern and Profile

The project area can be divided into two regions. The agricultural lands along the Nara canal where majority of the population resides and practices agriculture. The other region comprising of desert and the undulating rocky plains along the foot of the Rohri hills where there is a thin population of pastrolists and few scattered settlements.

According to the 6th Population Census of Pakistan conducted by PBS in year 2017, the population stood at about 1.5 and 2.4 million persons in the Sukkur and Khairpur districts respectively (**Table 6-14**) The average household size comes out at 5.64 and 5.83 persons per household in Sukkur and Khairpur respectively. The average annual growth rate stands at 2.49 % and 2.34% respectively for Sukkur and Khairpur districts.

6.3.5 Settlement Pattern, Access and Housing

The settlement pattern (as per definition of Board of Revenue Sindh, place of human habitation having at least ten houses may be termed as settlement) like in most parts of Sindh is influenced by the availability of water, land ownership, and economic opportunities. The major fraction of the total population is concentrated in the irrigated part of the project area along the Nara Canal.

In general, the settlements are mainly in the form of small-scattered cluster of houses inhabited by single household or close kin-based hamlets. The villages are scattered within the project area, with one settlement a few kilometers away from the others as we move away from the Nara canal. Generally, aggregation of settlements is based on kinship relations, with each settlement being inhabited by descendants from the same family lineage. Most of the hamlets do not have proper access track / blacktop road and the locals have to face difficulty in traveling.

Housing in villages in the project area is mainly of three types:

- Pacca houses made of baked bricks/blocks and stones with cement bonding
- Kacha houses made of unbaked bricks / earth bound
- Huts are made of wood/bamboo

Every permanent village has its own mosque, which is usually in better condition than the houses, this represents their religious esteem. Every village has a guesthouse known as an *Otak*, where guests and visitors are entertained and travelers can stay overnight. Usually this belongs to the village head but can also be used by other people. The *Otak* is a simply constructed dwelling, often made of straw and reed.

6.3.6 Tribal Distribution and Languages

The principal ethnic group of District Sukkur and Khairpur is Sindhi, and a small population of Balochi people also lives in the districts. The different tribes in the project area are *Rajar*, *Marri*, *Shambani*, *Bhambhro*, *Chakarni*, *Laghari*, *Mallah*, *Bhatti*, *Soomro*, *Shaikh* and *Baloch*. The major languages spoken in the area are Sindhi include Urdu. Within the project area, the dominant tribe is *Bhambhro* and *Laghari*.

6.3.7 Gender Analysis

As in most rural parts of Pakistan the socio-economic well-being of women in the project area is poor. This section describes the roles and responsibilities of women in the project area. Their access to and control over resources, access to health, education, and means of livelihood are also addressed.

a. Dress and Footwear

Shalwar qameez is the common dress for women along with dupata in the project area, while women of some Balochi origin tribe wear long loose embroidered qameez called *ghagh* (loose full skirt with a big pocket in the front). Women of *Chakrani* tribe after marriage wear a long shirt with typical cultural embroidery called *kanjri* with skirt called *paro*. Married women also wear jewellery including: necklace (*luki*), rings in the fingers of hands as well as feet, earrings (*walian* , *nasbi*), bangles (*kangan*, *chora*), *parzeb*, nose pin (*phulli*) and nose ring (*nath*). Little unmarried girls mostly wear earrings and bangles only. There is no special cultural footwear for women. But they use the common wear called chapels made of rubber which are easily available in the market.

b. Purdah and Social Mobility

Women generally observe purdah from outsiders. The purdah restrictions are more stringent for young girls. Adult women can appear before male members of the same tribe. The restrictions on mobility are not very strict and vary with the marital status and age of women as well as it varies from tribe to tribe. Married and relatively older women are more free to attend marriage, death and birth ceremonies in other villages and even go to markets with male members of the family. In agriculture activity women help their male members in the fields at their own lands. All women take dupata even inside their homes and during household chores. Shopping or recreational visit are very uncommon for women in the project area. Balochi tribes in the project area are relatively stricter in observing *purdah*.

c. Decision Making

The villages located within the project area are predominantly patriarchal, where the decision-making is in the hands of men. They control even the household budget. A male member's decision cannot be challenged by a woman. Women are not allowed to speak loudly inside the house. The household purchases are also done by male members for whom they visit the nearest town or city every 15 days. Mostly males do not ask women for their choice in clothes or other items for personal use. Women's decisions are not sought in marriage. Women are expected to bear silence whatever hardships that come in their way as a result of the decision made by the male members.

d. Daily and Seasonal Work Load

Daily workload for a woman includes household chores and supporting male members in livestock rearing and agriculture management. A household mostly comprises more than one woman and hence the workload is distributed and shared among them. Mostly laborious work requiring strength is done by adult women and other chores are done by younger females. The distribution of work and workload is influenced by age and health of individuals. The girls' education

is highly affected due to the work load. The girls at very young age are supposed to look after their younger brothers and sisters, clean the house, utensils and clothes, cook and serve the meal and help in agriculture activities specially cotton picking.

As they marry at younger age, so they learn embroidery or sewing also considered important for young girls at early age. In agriculture, women participate in agricultural activities including sowing, land preparation, harvesting, drying and picking of cotton and wheat. In harvesting almost all females of the household work in the fields and only an old woman stays at home and looks after the children. All women working in the fields leave their houses at dawn and return at sunset. They also take their lunch with them. Those females whose male members do not possess any land, may work in the field as labourers along with their male counterpart. The earnings from such laborious work are used for household purchases and for social ceremonies such as marriage.

e. Inheritance

Islamic inheritance laws stipulate that a daughter receives half of a son's share on the death of a parent. This is completely ignored on the premise that girls are given their share of inheritance in the form of dowry. A typical dowry includes livestock and household items such as utensils and bedding. The number and quality of items in a dowry varies with the economic standing of the girl's family. Women are made to believe that inheritance in property is the right of their brothers.

f. Preferences in Marriage

Mostly marriages are endogamous (marriage within the family). The paternal cousins are given preference and the girl's choice is not sought. In some cases, parents decide their daughter's fate even before she is born. Engagement or *mangni* is held before marriage which symbolically represents the marriage decision. The females are engaged at an early age (between 8-10 years) when they cannot make decisions on their own. Then girl is disallowed from going to her in-law's family and also observes *purdah* from her fiancé. Girls are married at an early age mostly between 10-15 years because it is easier for the girls to adjust to their husband's lifestyle.

g. Patriarchal Society and Preference for Sons

The birth of a male child is celebrated. Male child is supposed to be the progenitor and expected heir of one's family. The birth of a girl is thought of as a burden source of additional worries. A local said "It is not the girl we are afraid of; it is her fate (*Taqdeer*) which makes us afraid". Women often desire to have sons for two reasons: firstly, the social pressure of son preference, and secondly to gain security and social support in old age.

h. Handicraft

Along with household chores, women pass their free time making different handicrafts including *Rali* comforters called *sour*, *sagi*, *agath* and embroidery on shirts, male *kurtas*, bedsheets, pillows, handkerchiefs and table covers. *Rali* making is a tradition for women in the area and this skill is passed from generation to generation. The details of different type of Handicrafts are as under:

Rali

Rali is traditional apparel used as a mat or quilt. The upper part of *rali* is a combination of different coloured square clothes sown together to form various floral and geometrical patterns. Each square piece is called a chalk. The lower part of the *rali* is a simple plain coloured cloth. The quality and outlook of the *rali* depends on the skills of the maker and quality of material. A simple *rali* takes about 1.5 - 2 months to prepare. The use of bright colours is the main feature of all types of *ralis*. *Rali* is an essential feature of a girl's dowry, so a girl starts learning the art of *rali* making from the age of 6-8 years.

Embroidery

The women use embroidery to decorate almost all household apparels including bed sheets, pillow covers, and handkerchief. Heavily embroidered clothes are used on ceremonies such as birth and marriages. The bed sheets in *Otak* are also embroidered to impress visitors. The common types of embroidery are *Hurmicho*, *Tuk*, *Kacho tanko* and *pako tanko*. Other products Women also make other items such as *sagi* or *parandas*, *agath* (local belts of shalwar), hand fans, and different household things. They decorate most of the household thing with colourful embroidered hand-made covers for TV, radio, begs, tables and chairs. The use of bright colours especially dark blue, red, green and yellow are prominent in all handicrafts.

i. Female Education

Female literacy is almost half compared to that of males. Female enrolment in schools is low and their dropout is high. Reasons for this dropout are:

- Most of the villages have Primary Boys Schools (PBS), where girls also studied with them. There are no separate girls' schools in most of the villages.
- Mostly Balochi tribes do not allow their girls to get education with boys and by male teacher.
- In the patriarchal society, sons are preferred for the education.
- The daily life of women is busy and the mothers prefer to use their daughters in supporting them in the daily household chores.
- Girls get married much earlier and they are taught household chores starting from 6-8 years.

6.3.8 Livelihood

The livelihood of people living in the project area is primarily dependent on various professions, including livestock farming, agriculture, labor work, handicrafts, and private jobs.

6.3.9 Civic Amenities and Infrastructure

Although the provisions of all civic amenities in the project area are below average, health remains the gravest area of concern. The status of public healthcare system presents a dismal picture and generally suffers from governance, funding, staffing and resource limitation issues.

Table 6-10: Basic Civic Amenities in EIA Surveyed Villages

No.	Name of Village	Facilities/Amenities			
		Education	Health	Electricity	Gas
1.	Matto Fageer Rajar	No	No	No	No
2.	Dubh Goth	Yes*	No	No	No
3.	Salik Marri	Yes	No	Yes	No
4.	Ghulam Bhambro Goth	No	No	Yes	No
5.	Goth Ali Gul	No	No	No	No
6.	Phariaro Goth	Yes	Yes	Yes	No
7.	Goth Khuda Beg Bhambro	Yes	Yes	Yes	No
8.	Goth Rab Rakhio Bhambro	Yes	Yes	Yes	No

Table 6-11: Development Priorities of EIA Surveyed Villages

No	Village	Top Development Priority Areas*		
		1	2	3
1.	Matto Fageer Rajar	Hospital	Educational Facilities	Access Road
2.	Dubh Goth	Natural Gas Supply	Access Track	Educational Facilities
3.	Salik Marri	Natural Gas Supply	Sweet Water Supply	Proper Educational Facilities
4.	Ghulam Bhambro Goth	Educational Facilities	Health Facilities	Micro Dams for Agriculture
5.	Goth Ali Gul	Sweet Water Supply	Employment Opportunities	Access Road Development
6.	Phariaro Goth	Access Road	Education Facilities	Natural Gas Supply
7.	Goth Khuda Beg Bhambro	Power Supply	Job Opportunities	Access Road Development
8.	Goth Rab Rakhio Bhambro	Access Roads	Hospitals	Skill Development

*Note: These development needs are placed as per priority of the villagers.

Table 6-12: Key Demographics of project area districts

District	Total Population	Urban (%)	Rural (%)	Gender Ratio	Average Household Size	Literacy Ratio (Male)	Literacy Ratio (Female)	Annual Growth Rate
Sukkur	1,488,372	720,806	767,566	109.05	5.64	65.62	42.75	2.49
Khairpur	2,405,190	777,006	1,628,184	106.48	5.83	62.08	35.49	2.34

Source: Pakistan Bureau of Statistics – 2017

Table 6-13: Details of Housing Characteristics of project area districts

District	Total Population	Rural Population (as % of Total Population)	Total Rural Housing Units	Characteristics as % of Total Rural Houses							
				Construction			Access to Utilities				
				Pacca	Semi Pacca	Kacha	Potable Water	Electricity	Natural Gas	Kitchen	Toilet
Sukkur	1,488,372	51.6	132,879	34.8	16.9	48.3	88.6	85.2	17.6	71.5	66.1
Khairpur	2,405,190	67.7	275,396	31.5	17.4	51.0	87.3	70.8	13.6	62.9	60.5

Table 6-14: Details of EIA Surveyed Villages

No.	Name of Village	No. of Houses*	Population*	Major Tribe(s)	Minor Tribe(s)	UC/Tehsil/District
1.	Matto Faqeer Rajar	10	200	Rajar	-	UC Lal Jorio, District Sukkur
2.	Dubh Goth	15	180	Marri	-	Deh Santrahu, District Sukkur
3.	Salik Marri	20	200	Marri	Shambani	UC Sikakandarabad, Deh Santarhu
4.	Ghulam Bhambro Goth	200	2000	Bhambhro	Meer Talpur	UC Janoji, Deh Janoji, Taluka Salehput, Zila Sukkur
5.	Goth Ali Gul	5	50	Chakarni	-	Deh Sohnara
6.	Phariaro Goth	1200	15000	Laghari	Mallah, Bhatti, Soomro, Shaikh	Deh Phariaro, Taluka Nara, District Khairpur
7.	Goth Khuda Beg Bhambro	20	300	Bhambhro	Baloch	Taluka Nara, District Khairpur
8.	Goth Rab Rakhio Bhambro	35	350	Bhambhro	-	UC Sikandarabad, Deh Phariaro, Taluka Nara

Note: *All numbers are approximate on best available information during the EIA field survey or provided by the locals during community consultation.

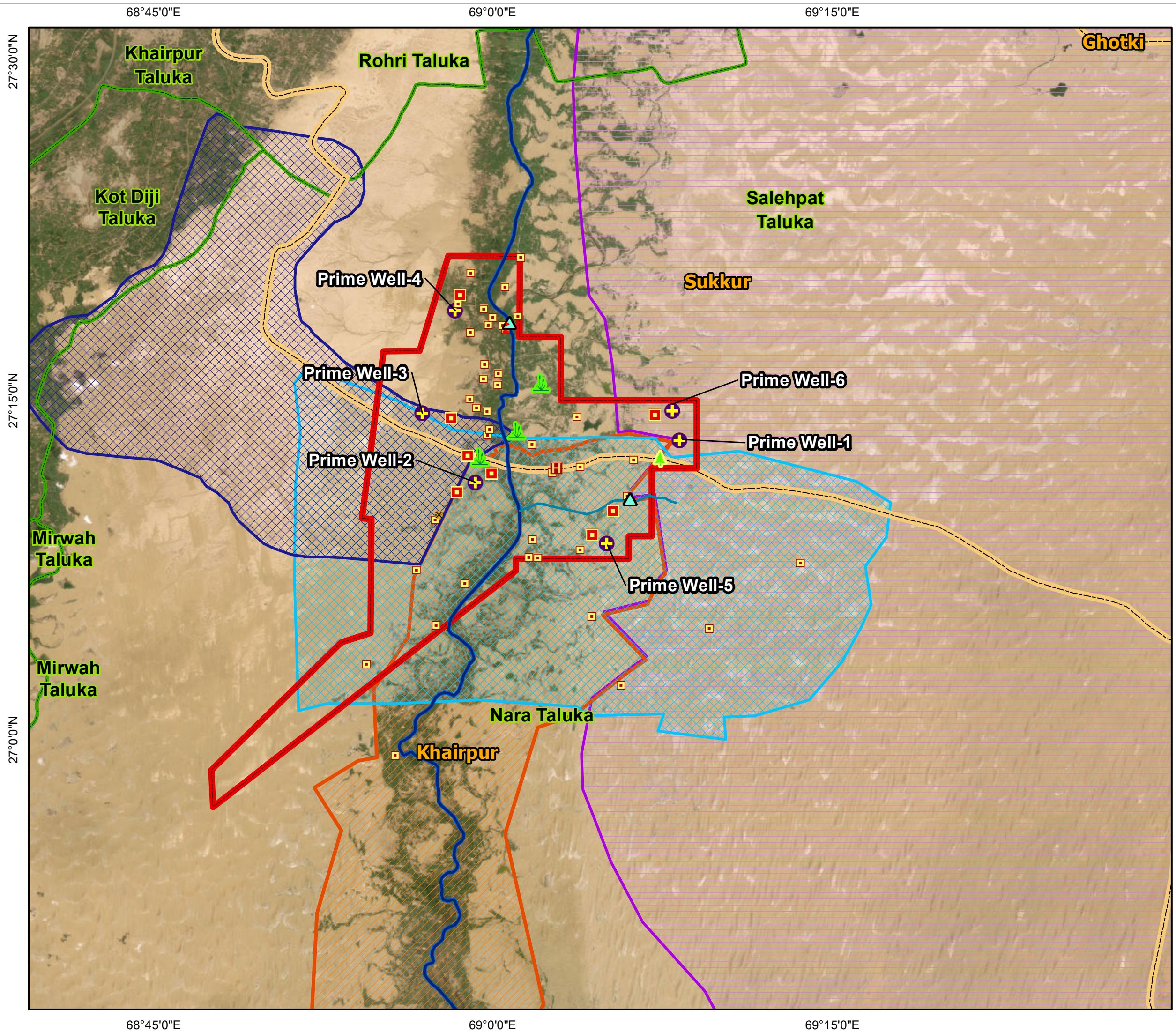
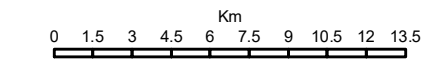
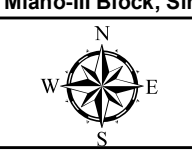


Fig 6-9 Socio Economic Map
Environmental Impact Assessment (EIA) Study for Drilling of Wells and Associated Development Activities in SW Miano-III Block, Sindh



Legend

- Canal
- Government Office
- Hospital
- Mechanized Farming
- School
- Surveyed Community
- WWF Office
- Wetland
- Google Communities
- Proposed Well Locations
- City/Town
- Nara Canal
- Nara Canal Minor
- Block Boundary
- District Boundary
- Taluka Boundary
- Range Land
- Nara Desert Wildlife Sanctuary
- Nara Game Reserve
- Takkar Wildlife Sanctuary



Prime Pakistan Limited

Photographs: Socioeconomic, Cultural Environment of the Project Area



Photograph 6-48: View of Government High School Lal Jorio Khan Shambani within project area



Photograph 6-49: A fuel station within project area



Photograph 6-50: A Government dispensary at Goth Rab Rakhio Bhambro



Photograph 6-51: View of local settlement in Goth Salik Marri



Photograph 6-52: A view of Nara Canal from a bridge within project area



Photograph 6-53: *Bazar* of Goth Ali Gul



Photograph 6-54: View of telecommunication tower in project area



Photograph 6-55: A mosque near Goth Khuda Baksh Bhambro



Photograph 6-56: A view of cultivated land surrounding the Nara Canal



Photograph 6-57: View of private school at Goth Bhambro



Photograph 6-58: A view of market near Goth Salik Marri



Photograph 6-59: A view of handpump in Goth Ali Gul

7 Stakeholder Consultation

Consultation with the general public and concerned stakeholders serves as a vital tool for communication, encompassing various objectives such as information dissemination, exchanging views, soliciting feedback and suggestions, planning future actions, initiating needs assessments, and identifying areas of concern.

During the EIA field survey for this study, meetings were conducted with the communities residing within the project area of SW Miano-III Block. The aim of these meetings and focused group discussions was to explore and document their needs, views, and concerns to be incorporated into the project design during the planning phase.

Similarly, meetings were organized with community members and representatives of various government and non-government organizations. All stakeholders were briefed on the proposed exploration and associated development activities planned by Prime Pakistan Company Limited in its SW Miano-III Block. Their concerns and suggestions were meticulously recorded, as presented in this chapter. Thus, both primary and secondary stakeholders were extensively consulted regarding the proponent's anticipated activities in the area.

7.1 Objectives of Public/Stakeholders Consultation

Consultation with stakeholders and public/communities residing in the project area i.e. where the project activities are planned, provides better dissemination of information about project and also gives the proponent a clearer understanding of the stakeholder's and general public's perspective. Effective consultation process can add substantial value to the EIA process. The information gained through consultation process can provide stakeholders/public concerns, interests and their ability to influence decision-making and also helps to identify key causes of environmental problems.

This can be used to evaluate direct and indirect environmental impacts and assess short term and long-term resources use implications. The input from local communities and affected stakeholders can help evaluating alternatives and strengthen the management planning by incorporating local inputs and know-how. These factors contribute towards improved project implementation sensitized to the socioeconomic environment of the area. The objectives of stakeholders/public consultation were to:

- Promote better understanding of the proposed operation through explaining its objectives and potential positive and negative impacts particularly on the local communities;
- Identify and address the concerns of all interested and affected stakeholders;

- Provide a mechanism to resolve issues identified by communities, before project plans are finalized and development begins thereby, avoiding public outcry and resentment; and
- Instill trust between various stakeholders and the proponent to promote cooperation.

7.2 Community Consultations

Community consultations were carried out in the project area through formal and informal meetings, focus group discussions and in depth interviews. Environmentalist having a vast experience of carrying out socioeconomic surveys & consultations, initiated the sessions by giving a brief, simple and non-technical description of the project providing an overview of all likely positive and negative impacts. This was followed by an open discussion in which all participants were encouraged to voice their concerns and opinions. Feedback obtained from the stakeholders was documented and all issues and suggestions raised were recorded in detail. Through this process the consultant reached out to a wide segment of the population of the area, whereby actively involving all stakeholders in the decision-making process.

All information was imparted to the communities and other stakeholders in such a manner that their expectations were not unnecessarily or unrealistically raised in order to avoid any future conflict involving local public, leaders or administrators.

Formal and informal community consultations and focused group discussions were carried out in almost all visited *Goths* (villages) during the field survey for the EIA.

7.3 Community's Concerns & Reservations

All people with whom meetings were held were open to the idea of development in the project area. No adverse concerns were raised; neither were there any objections to the project concept. Most people welcomed the idea of project activities sensing a relative boom in the localized economy particularly employments and provision of better civic amenities in the area. They envisaged the project activities a short-term as well as long term benefit for the communities residing in the area. However, the communities raised some legitimate concerns. The main concerns common to most communities are listed below:

- Local villagers should be given priority during employment process for various project-related activities, especially local unemployed educated people should be given preference for technical jobs;
- Health facilities in the area are inadequate and need major reforms. Proponent in liaison with the related government departments should ensure

that, provision of standardized and accessible health facilities to the marginalized communities of the area;

- Provision of educational facilities should be ensured to the children of the residing communities to equip and combat the emerging challenges of the 21st century;
- Proponent should also work with the local & provincial departments to uplift the socioeconomic conditions of the area by providing necessary and basic civic amenities;
- The local communities should also be provided the benefit of natural gas as per Government's order.
- Any land which is acquired as part of this project should be properly compensated and the non-influential persons must also receive benefit.
- The company should ensure that there is accountability of the funds which are deposited with the government officials for the development within project area.

7.4 Other Stakeholders

In addition to holding consultation meetings with communities, meetings with members of government institutions and NGOs were also deemed essential. All the stakeholders were given maximum project information verbally and by sharing project area maps. Their concerns and suggestions were then noted which have been reproduced below. A complete list of these stakeholders consulted is provided in **Table 7-1**. The remaining meetings which were conducted consisted primarily of information collection and dissemination.

7.4.1 Conservator of Forest - Social Forestry Circle - Sukkur

A formal consultation meeting was carried out with Mr. Iftikhar Ahmed Arain (Conservator of Forest), Social Forestry Circle - Sukkur, to share project scope and to discuss the potential environmental issues related to the proposed project activities planned by Prime Pakistan in SW Miano-III Block. As the proposed project area falls in protected area therefore, considering a basic stakeholder it deemed necessary to take this department on-board during the assessment process. Details of proposed exploration and associated development activities with respect to prospective area was briefed to Mr. Ahmed with the help of maps. Mr. Ahmed is an erudite, outspoken and well-informed person about the environmental scenarios in Sindh province. Furthermore, he expressed some certain concerns regarding the proposed project activities, which are indicated below:

- As part of this project, the proponent should carry out plantation of local species as compensation to offset their project's carbon footprint.

- This plantation should be carried out in an area where the water is relatively easily available.
- They should also enhance the local plantation like Lahya, Salvadora etc. (all species that are native).
- The proponent should also invest in making a nursery.

Mr. Ahmed further emphasized on abidance of all applicable laws and regulations during the proposed project execution. In addition, best industrial guidelines shall be practiced ensuring no or least harm to the existing environmental conditions of the area.

7.4.2 Deputy Conservator, Wildlife – Sukkur

A formal consultation was conducted with Mr. Adnan Hamid Khan, Deputy Conservator of Wildlife, Sukkur, to discuss the environmental issues related to the proposed project. Project-specific reservations and suggestions were provided to the team for the conservation, protection, and management of the area's wildlife. The following conclusions were made:

- The proposed drilling activities should be carried out at a safe distance from the wildlife protected area;
- EIA report should be shared with the respective wildlife departments and response of wildlife department should be sought;
- Prime Pakistan should give due attention to wildlife protection and habitat conservation;
- Noise generation should be mitigated as much as possible, especially during the night time hours when wildlife species are active;
- Movement of vehicles should be minimized, and off-road travel should be avoided; and
- Effects monitoring of the proposed activity should be conducted during the execution of the project to evaluate the impacts.

7.4.3 WWF Office, Sukkur

Members of EIA team also visited to meet Mr. Touheed Ghani (Manager, WWF Sukkur Office) briefed about the proposed project scope and prospective area with the help of maps. As a significant portion of project area in SW Miano-III Block fall under geographical jurisdiction of desert and wildlife sanctuary, it deemed necessary to take WWF on-board during the assessment process.

Furthermore, some certain concerns raised by the department's representatives are indicated below:

- WWF understands and has firm stance that no anthropogenic activity should be carried out in protected desert / any wildlife sanctuary, as per law no work should be initiated.
- However, WWF is also never against development projects in general, and in case the activity is allowed by the Government to go ahead, the proponent should strictly abide by all applicable laws and Best Industry Practices and implement all mitigation measures so that all impacts are made negligible.

7.4.4 Livestock Department, Sukkur, Government of Sindh

Members of EIA team also visited to meet Dr. Nazir Mir Bahar (Veterinary Officer) and briefed about the proposed project scope and prospective area with the help of maps. The purpose to carry out this meeting was to obtain the detailed information on the livestock of the area, proposed exploration and development activities and their potential impacts on the livestock which is a major source of income and social security for communities residing in leased area. Dr. Mir briefed about the common diseases for domestic animals which mainly includes goats, sheep, cows and donkeys. During discussion Dr. Mir also highlighted the importance of global warming and its effects on domestic & wild animals. Dr. Mir also informed that, in case of any disease outbreak (domestic or wild) in their jurisdiction, department takes the initiative to protect the domestic livestock and even wildlife. Department's Rep appreciated the stakeholder's consultation process and their major concerns and suggestions were as follows:

- The Company should provide awareness sessions to the locals. The locals should be provided access to common animal vaccines, education and clean water.
- The locals should be provided free vaccinations / spray for the various common diseases of camels, goats, cows, buffaloes and goats so as to benefit the locals in this way.
- Range lands shall also be protected during the execution of the project activities.
- Available water reservoirs should not be damaged or over-exploited by the proposed project activities;
- Every effort should be made for protection of natural habitats of the area;
- Local fuel wood shall not be used by the parties working in the project area; and
- Providing job opportunity to the locals will have positive impact on locals.

7.4.5 Town Municipal Office, Choondko, Harnai

The project team briefed the Municipal Officer about the proposed project and also discussed the potential positive and negative impacts of the proposed development.

Mr. Soorat Ali said that he fully supports any such developments in the area. Other than that, he had following to say:

- All locals of the project area should be preferred for job opportunities
- Access roads should be developed as part of this project

7.4.6 Government High School, Lal Juryo Khan Shambani, Sukkur

The project team briefed the Mr. Miruddin Shambani and his team at the school about the proposed project and also discussed the potential positive and negative impacts of the proposed development.

Mr. Miruddin Shambani said that he fully supports any such developments in the area. Other than that, he had following to say:

- Tree plantation should be carried out as part of this project. This plantation should be at least several thousand trees. The plantation may be carried out within a corridor of 2 km of the well area.
- The DC should be pursued by Prime Pakistan to check if the funds are being utilized properly. There should be accountability. The funds should be spent in the area most adjacent to the project within the SW Miano-III Block.
- The development funds should be spent for the construction of roads, health and educational development projects e.g., providing scholarships to the deserving students of the project area, the development of a public library etc.
- Prime should also install RO plant for public either through the DC or directly.

7.4.7 Government Dispensary, Rabb Rakhio Bhambhro, PPHI Sindh, District Khairpur

The consultation meeting with Government Dispensary representative i.e. Mr. Ali Khan – Health Technician, was conducted. The project team briefed the health worker about the proposed project and also discussed the potential positive and negative impacts of the proposed development.

Mr. Ali Khan said that he fully supports any such developments in the area. Other than that, he had following to say:

- There is a known issue of Arsenic and Fluoride in the ground water.

- The common diseases here include Hepatitis B, C, Typhoid, TB (due to consumption of raw milk).
- He expressed his opinion that as part of this project, the access roads should be developed utilizing the development funds.

7.4.8 Other meetings

Meetings were also held particularly with villages' heads to disseminate information regarding the proposed exploration and associated development activities. None of the stakeholders consulted during the consultation process showed any uneasiness or apprehensions about the proposed project. Important recommendation from villages' heads and local elders are as under:

- Locals should be preferred for employment;
- Roads, schools and health centers should be developed;
- The local cultural norms should be respected; and
- The proponent should initiate comprehensive community development work in the project area.

7.5 Key Findings and Issues

- Proposed project activities
- Most of the communities and to some extent the local influential people are not concerned over the environmental issues. They are mostly interested in getting maximum benefits in terms of employment, local market boom and community development programs;
- People have hopes that the Company would employ locals during its operations;
- The biggest aspiration of the locals is getting one thing i.e. 'employment';
- People have hopes that the Company would provide basic civic amenities, develop roads and improve the infrastructure of area; and
- Compensations for land acquired/leased and standing crops should be disbursed in a transparent manner on fast pace.

Table 7-1: List of Stakeholders Consulted during EIA

No.	Name	Organization/Department	Designation
1.	Mr. Miruddin Shambani	Principal GHS Lal Jokhio Khan Shambani	Principal GHS Lal Jokhio Khan Shambani
2.	Mr. Ali Khan	Government Dispensary, Rabb Rakhio Bhambhro, PPHI Sindh, District Khairpur	Health Technician
3.	Mr. Touheed Ghani	WWF Sukkur Office	Manager
4.	Dr. Nazir Mir Bahar	Livestock Department Sindh, Shikarpur	Veternary Doctor
5	Mr. Soorat Ali	Town Municipal Office Choondko	Municipal Officer
6	Mr. Iftikhar Ahmed Arain	Conservator of Forest - Social Forestry Circle - Sukkur	Conservator Social Forestry, Circle Sukkur
7	Mr. Javed Mehar	Sindh Wildlife Department, Karachi	Conservator Wildlife, Karachi
8	Mr. Adnan Hamid Khan	Wildlife Department Sukkur	Deputy Conservator Wildlife Sukkur

Photographs: Community Consultation



Photograph 7-1: Stakeholder consultation at Goth Rab Rakhio Bhambro



Photograph 7-2: Stakeholder consultation at Goth Khuda Beg Bhambro



Photograph 7-3: Stakeholder consultation at Goth Phararo



Photograph 7-4: Community consultation at Goth Phararo



Photograph 7-5: Community consultation at Goth Ali Gul



Photograph 7-6: Community consultation at Goth Bhambro



Photograph 7-7: Community consultation at Goth Bhambro



Photograph 7-8: Community consultation at Goth Dubh



Photograph 7-9: Community consultation at Goth Dubh



Photograph 7-10: Community consultation at Goth Matto Faqeer Raja

Photographs: Stakeholder Consultation



Photograph 7-11: Consultation with Conservator Forest- Forest Department Sukkur



Photograph 7-12: Consultation with Manager WWF, Sukkur



Photograph 7-13: Consultation with Livestock Department, Sukkur



Photograph 7-14: Consultation with GHS Lal Jory Khan Shambani, Sukkur



Photograph 7-15: Consultation with PPHI, Basic Health Unit

8 Potential Environmental Impacts and Mitigations

This section discusses the potential positive and negative impacts that may arise from the project activities and the mitigation measures that will be adopted to reduce or minimise these impacts. The impacts and mitigation related to physical, biological and socioeconomic & cultural environment have been discussed under three separate headings. Environmental Management Plan (EMP) is attached in **Appendix A**, Environmental Monitoring Checklists are attached in **Appendix B**, and Environmental Aspects Register in **Appendix C** of this EIA study.

8.1 Physical Environment

8.1.1 Changes in Landscape and Soil Erosion

a. Potential Sources of Impacts

The potential sources of soil erosion due to the proposed project activities include construction of access road for well site, construction of well site, quarrying of gravel or sand, use of project access road and off-road travel etc. An area of about 160,000 ft² will be required for proposed each well site and campsite.

b. Impact Assessment

Construction Activities

The proposed project activities for drilling involves, setup by construction contractor for the development/improvement of a road/access track and surface facilities for drilling of well site. The possibility of soil erosion has been assessed in detail in the following paragraphs.

The possibility of soil erosion from a human activity increases when soil particles are detached from the soil mass. This is true for agricultural lands where a certain landscape is changed and the area is left exposed to wind and water erosion and also for dirt tracks which are developed through continual use by vehicles and the soil surface is subject to continual erosion for as long as the track is used. However, these cases are different from scenarios in which the soil surface initially disturbed is sealed or compacted by engineering means. For example, metalled roads are not subject to soil erosion; similarly, neither would the gravel-topped roads proposed for each well site, which will be compacted to sustain loads of up to 45 tons.

On the basis of the above it can be assessed that on a macro level soil erosion from access road, well site construction activity will not be a significant issue as all these surfaces after being worked on will be compacted and topped with 150mm compacted gravel layer.

Drilling Operation

Construction/Maintenance of Access Road

A gravel top access track will be prepared to access the proposed well sites and existing black top road network in the project area will be used as much as possible. Construction of the access road in the flat area will not involve any major cutting and filling. Since the entire access road will be topped with compacted gravel, the chances of soil erosion will be reduced. The topping can be done with in-situ or imported gravel. Mitigation measures to minimize chances of soil erosion or land slippage during the entire length of the road have been recommended at the end of this section. This will primarily be due to wind erosion from earth-fill stockpiles and loose road surface during construction.

Construction of Well Site and Construction Camp

Establishment of Construction Base Camp for the Proposed Operation – For each proposed drilling operation, a base campsite will be developed to house the construction crew. The campsite will be located in levelled land and already cleared sites to avoid any disturbance to soil or vegetation.

No excessive cutting and filling is required because majority of proposed well sites are located on flat topography therefore minor nature of earthworks will be required for its development. Depending upon the location of well site, earthworks will be kept to the minimum design requirement. The top surface at these areas will be compacted to minimize any chances of soil erosion.

Quarrying of Gravel or Sand

Limited volumes of gravel or sand will be quarried from the project area. Quarrying if done inappropriately can lead to erosion. To minimize erosion due to quarrying, the quarry sites will be carefully selected after approval from Prime Pakistan HSE Representative such that they are located in levelled areas with existing clearing and the quarry sites are properly restored after use.

Road Travel during Project

The use of existing dirt roads during the project may result in erosion of soil from these road surfaces. On gravel-topped roads, erosion is less significant due to the compacted gravel topping. During the project, erosion from road surface will be minimized by sprinkling of water over the project access roads and compacting loose surfaces wherever required. However, as water is a precious resource in the area there will have to be some rationing of its use. Speed limits will be followed to avoid potential soil erosion.

Off-road Travel

In the entire course of the operation off-road travel will be avoided as much as possible. As far drilling and associated construction activities are concerned, off-road travel is minimal as activities are not scattered and only one access road suffices during the entire length of the drilling project.

c. Cumulative Impacts

Soil erosion, if it occurs, from each project activity can accumulate spatially as well as temporally. Impacts will be of minor nature for all proposed activities as the land area clearings will be kept to minimum and compacted wherever applicable in addition to maximum utilization of existing tracks in the project area. Hence, the cumulative impacts of the project activities will not be significant.

d. Mitigation Measures

A generic list of mitigation measures proposed for each project activity is provided below:

General

- Clearing of vegetation will be kept to a minimum;
- Existing access roads shall be used as much as possible;
- The cutting of trees will be avoided;
- Cutting of trees or tall shrubs will be avoided especially in the areas where wildlife presence is confirmed;
- Total land uptake by the well site, and access road will be kept to the minimum required;
- Vehicles speed will be regulated and monitored to avoid excessive dust emissions;
- Off-road travel should be avoided to the possible extent and observance of this should be monitored during entire course of operation;
- Periodic trainings will be provided to drivers on mitigation measures related to off-road travel and speed limits;
- During construction, movement of construction equipment will be restricted to work areas only to avoid unnecessary disturbance to soils in the project area; and
- Access tracks (other than the main access track for the project) to be used by water tankers, dumper trucks and other vehicles shall be regularly monitored by Prime Pakistan.

Drilling Operation

- Well site area will be kept to a minimum required;
- Well site will be constructed in already levelled and cleared land as far as possible to minimize disturbance to soils and landscape of the area;
- The access track shall be properly compacted at the time of construction and thereafter properly maintained by watering and compaction (where required) throughout the entire construction and drilling operation;
- Off-road travel shall be strictly prohibited and observance of this shall be monitored during the entire operation;
- Existing blacktop roads shall be utilized during the entire operation;

- Areas along the access track, well site shall be visually monitored and any area showing signs of soil erosion shall be watered and compacted;
- Cutting of vegetation shall be kept to the minimum required. Unnecessary clearing within the corridors along the access track or on the periphery of the well site shall be avoided;
- During construction, a single track shall be identified and approved along sections of the main track on which work is in progress. Vehicles shall be allowed to travel only on the approved track; and
- During construction dumping of gravel on or close to the access track being improved or constructed shall not be allowed.

e. Residual Impacts

The characteristics of the residual impacts for each project activity are tabulated below:

Characteristic	Activity		
	Construction	Drilling	Flow Line
Duration	<i>Medium</i>	<i>Short</i>	<i>Short</i>
Extent	<i>Local</i>	<i>Local</i>	<i>Local</i>
Likelihood	<i>Certain</i>	<i>Possible</i>	<i>Possible</i>
Consequence	<i>Minor</i>	<i>Minor</i>	<i>Minor</i>
Reversibility	<i>Reversible</i>	<i>Reversible</i>	<i>Reversible</i>
Significance	<i>Low</i>	<i>Low</i>	<i>Low</i>

8.1.2 Soil and Water Contamination

a. Potential Sources of Impacts

During construction/civil works potential sources of impacts will include domestic wastes (solid & wastewater), fuel or oil leakages or spills, onsite effluents from vehicle wash & cleaning, and cement spills. During drilling operations potential sources may include domestic wastes, clinical wastes, drilling mud and cuttings, produced formation fluids, and spillage or leakage of fuel, oil or chemicals.

Domestic Wastes

Domestic wastes generated during drilling and construction of proposed well sites will include sewage, grey water (from kitchen, laundry, and showers), kitchen wastes, combustible wastes and recyclable wastes. Sewage will be treated and disposed of by means of a septic tank and soak pit system. Grey water will also be collected in soak pits. Soak pits will be designed to accommodate wastewater generated during the total duration of the operation and shall also be engineered to prevent storm water runoff. In case if septic tank gets filled with sludge, septic tank shall be emptied through vacuum truck and material shall be transferred to a treatment facility or approved municipal drain. In case the soak pits get filled during the operation, grey water will be discharged into the nearest municipal drains by taking prior formal approval from the concerned authorities. Sprinkling of grey water will not be allowed. Burning of

wastes will be prohibited. All combustible and non-combustible wastes will be provided to Sindh EPA approved waste contractor for appropriate and safe disposal. All kinds of food waste will be buried properly.

Clinical Wastes

Clinical waste will be stored on-site temporarily and will then be sent to an offsite incinerator facility for incineration.

Recyclable and Reusable Wastes

Recyclable and reusable wastes will include glass, tin, metals etc. These wastes will be sent to an approved recyclable waste contractor. In order to ensure that the wastes are recycled or reused properly, without having any effect on the environment, Prime Pakistan representatives will conduct periodic visits of the waste contractor facility.

Oil Stains and Spills

Fuel or oil stains, leakage or spill during drilling and production activities can result in contamination of soil and water. From a management perspective these have been categorized as minor, moderate or major and detailed below along with the recommended mitigation measures.

- Minor Spills – Leaks from vehicles, equipment or storage containers at campsite/s or work areas outside the campsite or oil or fuel stains produced during handling and transfer operations such that the area and depth of soil contaminated is less than 1 square meter and 0.3 m respectively. The contaminated soil will be removed and sent to the approved facility for appropriate disposal e.g. incineration. Best industrial guidelines can be adopted in this regard i.e. burial of contaminated soil in such a manner that it does not contaminate the surrounding soil or groundwater or to be safely stored or to be disposed of in drills cutting waste pit.
- Moderate Spills – Oil spills during transfer or handling operations resulting in spillage of no more than 200 liters of fuel or oil. The contaminated soil will be removed, and disposed of in accordance with the best industrial practices guidelines. Specialized treatment such as incineration or bioremediation can also be employed.
- Major Spills – Spillage of oil/fuel more than 200 liters is considered as a major spill. Such a spill may occur during transportation to the campsite/s, or failure of the spill containment arrangement after leaking from a holding tank/s. The contaminated soil may require specialized treatment such as thermal (incineration), physical, chemical, or in situ/ex situ bioremediation etc.

Drilling Mud and Cuttings

As per preliminary information shared by Prime Pakistan only water based mud will be used to drill proposed wells. The drill cuttings and mud will be disposed into the pit lined with an impermeable geo-membrane. The pit will be of larger than the required capacity to accommodate overflows. At the time of restoration, the pits will

be backfilled with the cuttings and mud transported to new locations for reuse if possible or otherwise will be disposed as per waste management procedures. About 200 m³ of drilling mud is usually prepared to drill the well. However, the quantity and type of drilling mud required to drill proposed wells will depend upon the well geology, depth and diameter of the sections and other operating factors.

Produced Formation Fluids

Produced formation fluids will be collected inside the lined waste pit at each well site. In case the fluids are discharge into the flare pit, the soil at the sides of the flare pit will be excavated and disposed of into the lined waste pit at the well site. Produced water can also be re-injected in the deep subsurface formations, wherever possible.

b. Cumulative Assessment

Provided all mitigation measures recommended in this EIA are followed, contamination of soil or water resources is not expected to occur and hence impacts will not be cumulative. For the purpose of risk assessment, the likelihood of oil spillages during transportation has been assessed as possible. Because any contamination that may occur will be remediated following standard protocols, the effect of such spills will therefore not be cumulative.

A summary of waste generated during the proposed drilling and construction activities, including type and description of waste and recommended waste disposal methods are provided in the following table:

Activity			Description	Disposal Method
Construction	Drilling	Flow Line		
✓	✓	✓	<i>Food waste:</i> Kitchen waste e.g. fruit, meat, vegetable residues etc.	Deposition in bury pit/composting
✓	✓	✓	<i>Recycleable & Non-recyclable waste:</i> Paper, plastic, textiles, cardboard, rubber, wood, glass, tin cans, metal scrap, aluminium cans, ferrous/non-ferrous materials, plastic or aluminum pipe protection etc.	- Reuse - Recycling - Incineration, if required
✓	✓	✓	<i>Oily & Hazardous waste:</i> Oily rags, used oil, batteries, mercury lighting etc.	- Recycling - Incineration, if required
✓	✓	✓	<i>Clinical waste:</i> Syringes, glass bottles, used bandages,	Incinerate at appropriate facility

Activity			Description	Disposal Method
Construction	Drilling	Flow Line		
			expired drugs etc.	
✓	✓	✓	<i>Grey water:</i> Waste water from kitchen, laundry and showers	▪ To be first sent to septic tanks and finally disposed of in soak pits ▪ In case, the soak pits get filled during the operation, grey water will be transferred to nearest municipal drains with prior approval of concerned authorities
✓	✓	✓	<i>Sewage/Black water:</i> Waste water from toilets	▪ To be disposed of in septic tanks and then soak pits for evaporation.
	✓		<i>Drilling waste:</i> Drill cuttings, excess or spent drilling mud, rig wash water	▪ Water Based Mud (WBM) will primarily be used during drilling. The drill cuttings and WBM will be stored at the well site in lined pit. The drilling mud will be allowed to evaporate inside the mud pit and also dry out. After that, the mud pit and the cuttings pit will be backfilled

Activity			Description	Disposal Method
Construction	Drilling	Flow Line		
✓	✓	✓	<i>Minor Spill</i> Oil spills/soil contaminated by oil leakages or stains – Leaks from vehicles, equipment, or storage containers at campsites or work areas outside the campsite or oil or fuel stains produced during handling and transfer operations Quantity: Area and depth of soil contaminated; < 1m² and 0.3m respectively <i>Moderate Spill</i> Fuel, oil or chemical spills during transfer or handling operations. Quantity: Spill less than 200 litres <i>Major Spill</i> Spill during transportation of fuel, oil or chemicals or failure of the containment areas Quantity: Spill more than 200 litres	- Specialized treatment such as incineration or bioremediation - Best industrial guidelines will be followed - In case of chemical spill, the contaminated soil to be land filled
	✓		<i>Produced formation fluids/water</i>	- To be disposed of in impermeable (HDPE) lined evaporation ponds - To be re-injected into deep subsurface formations where possible
	✓		<i>Condensate</i>	To be transported and sold to the nearest refinery
✓	✓	✓	<i>Solid Waste:</i> Concrete, building materials, off cut pipe, plastic pipe protectors, plastic	- Recycling - Land filling

Activity			Description	Disposal Method
Construction	Drilling	Flow Line		
			sheeting, cable drums etc	

c. Cumulative Assessment

Provided all mitigation measures recommended in this EIA are followed, contamination of soil or water resources is not expected to occur and hence impacts will not be cumulative. For the purpose of risk assessment, the likelihood of oil spillages during transportation has been assessed as possible. Because any contamination that may occur will be remediated following standard protocols, the effect of such spills will therefore not be cumulative.

d. Mitigation Measures

Mitigation measures for each category of waste are listed below. Where a category of waste is common, the mitigation measures will apply equally to construction, drilling and laying of flow line activities.

Mitigation Measures for Domestic & Medical Wastes

- Sewage Treatment Plant (STP) shall be the most preferred option for handling of black/grey water under BATNEEC/BAT due to its environmental sustainability, but in case of unavailability of STP, septic system shall be provided;
- Alternatively, sewage will be disposed of into septic system comprising of septic tanks and soak pits;
- Wastewater from laundry, kitchen washings and showers will be disposed of into separate soak pits;
- Septic tank and soak pit shall be covered properly to avoid any obnoxious smell in surrounding areas;
- Soak pits will be built in absorbent soil and located 300 m away from surface water source or water well;
- Soak pits will be constructed such that surface runoff cannot enter the pits;
- Soak pits will be designed to accommodate wastewater generated during the total duration of the operation;
- Sprinkling of grey water will not be allowed. In case soak pits get filled wastewater will be transferred to the nearest municipal drains with prior formal approval from the concerned authorities;

- In case the septic tank gets filled with sludge, septic tank shall be emptied through vacuum truck and material shall be transferred to treatment facility or approved municipal drain;
- No solid waste will be disposed of in the field. All solid wastes will be disposed of in waste bins provided within the working and residential areas;
- Combustible, noncombustible and hazardous wastes will be temporarily stored on site and handed over to Sindh EPA's approved waste contractor for recycling purposes and safe disposal;
- At the time of restoration, septic tanks will be dismantled in place and backfilled with at least 1 m of soil cover above the buried dismantled septic tank;
- At the time of restoration, soak pits will be backfilled with at least 1 m of soil cover keeping in view landscape of surrounding natural surface; and
- Medical wastes will be temporarily stored onsite separately and incinerated at appropriate facility.

Mitigation Measures for Oily Wastes

- Used oil and wastes will be transported to local contractors for recycling;
- Shovels, plastic bags and absorbent material should be present near fuel and oil storage or handling areas to attend spills and leaks;
- A Spill Prevention and Contingency Plan will be prepared to deal with moderate and major spills;
- The soil contaminated from major spills may require specialized treatment such as incineration or bioremediation. In case of chemical spill, the contaminated soil may have to be treated or landfilled;
- The soil contaminated from minor and moderate spills will be removed and properly buried in such a manner that it does not contaminate the surrounding soils or groundwater. In the case of spill >200 liters the contaminated soil will be disposed of in line with the best industrial practices & guidelines;
- Fuels tanks will be daily checked for leaks and all such leaks will be plugged immediately;
- Fuel and oil storage areas will have secondary containment in the form of concrete or brick masonry bunds. The volume of the containment area should be equal to 125% of the total volume of fuel stored;
- All fuel tanks will be properly marked to highlight their contents;
- All fuel and oil storage areas will have a concrete pad underneath to prevent soil contamination in case of leaks or spills; and
- Vehicles will be daily checked for fuel or oil leaks. Vehicles with leaks will not be operated until repaired.

Mitigation Measures for Operations Wastes

- A water-based mud system will primarily be used for well drilling;
- Waste pit at each proposed well site will be lined with an HDPE liner;
- The drill cuttings and WBM will be disposed into a pit lined with an impermeable geo-membrane. The pit will be larger than the required capacity to accommodate overflows. At the time of restoration, the pit will be backfilled with the cuttings encapsulated within the liner and with a top soil cover;
- Produced formation fluids during testing will be flared along with the gas or collected inside the lined waste pit at the well site. In case the fluids discharge into the flare pit the soil at the sides of the flare pit will be excavated and disposed of into the lined waste pit at the well site; and
- If condensate is encountered during the proposed drilling operation, it must be safely transported and sold to the nearest refinery.

The minimum distance from waste pits has been tabulated below.

Type of Pits	Recommended Minimum Distance
Septic Tank and Soak Pits	300 m from local water wells, hand pumps or surface water bodies
Drill Cuttings and Mud Pits	500 m from local water resources
All other Waste Pits	300 m from settlements and local water resources

e. Residual Impacts

It is believed that after applying the recommended mitigation measures, no contamination of soil or water will occur.

Characteristic	Activity		
	Construction	Drilling	Flow Line
Duration	<i>Short</i>	<i>Medium</i>	<i>Short</i>
Extent	<i>Local</i>	<i>Local</i>	<i>Local</i>
Likelihood	<i>Certain</i>	<i>Certain</i>	<i>Possible</i>
Consequence	<i>Minor</i>	<i>Minor</i>	<i>Minor</i>
Reversibility	<i>Reversible</i>	<i>Reversible</i>	<i>Reversible</i>
Significance	<i>Low</i>	<i>Low</i>	<i>Low</i>

8.1.3 Climate and Ambient Air Quality

a. Potential Sources of Impact

During the drilling of proposed wells, potential sources of impact will include dust emission during road travel, airborne particulate matter, exhaust emissions from generators and vehicles, use of ozone depletion & global warming substances for refrigeration and air conditioning systems (e.g. CFC gases) and smoke emissions from

other sources e.g. burning of combustible wastes. Additional sources will include emissions during flaring/well testing and possible release of H₂S from proposed drilling operation in case of an emergency.

b. Impact Assessment

The sources of emissions during drilling and associated activities will not be significant enough to alter the ambient air quality of the area. However, the project facilities shall maintain appropriate distances from communities, so the effects on human health due to predicted deterioration in ambient air quality will not occur. No burning of waste at working sites will be allowed.

Exhaust Emissions from Generators and Vehicles

As discussed earlier, stack emissions from generators that will be used at the campsites and the well site will generally remain within SEQS. Any slight increase from the SEQS will not have any impact on the environment, as the emissions will quickly disperse with the prevailing wind currents. Control over black smoke from vehicles and construction machinery shall be kept by maintaining visual monitoring and tuning or maintenance of the vehicles or other equipment on regular basis.

Dust Emissions due to Construction/Trenching and Road Travel

Dust emissions due to construction and road travel shall be minimized by practising good construction practices (such as keeping stockpiles down wind and away from communities and camp) and sprinkling water over the access road.

Emissions from Flaring

Emissions in the form of oxides of carbon, nitrogen and sulphur will be produced during flaring. Emissions from flaring will have no effects on communities or rig site workers and local air quality provided the flare pit is kept downwind of the well site and at a safe distance from communities so the emissions will disperse and dilute with prevalent wind currents.

Possible H₂S Emissions in Case of Emergency

In the event of any release of hydrogen sulphide gas above safe acceptable limits, Prime Pakistan's emergency response procedures will be activated.

c. Cumulative Impacts

Construction of project facilities (well site, campsite and access track) and drilling operation are considered to be short to medium term activities. It is expected that all short-term sources of emissions will be non-cumulative in nature as the operations or the sources of emissions will be staggered and may not run in parallel; the level of emissions from the individual operations will not be significant and the emissions from each operation will disperse quickly with prevailing winds. There would be no

long-term impacts on ambient air quality due to construction and drilling activity. Any effects therefore are not considered to be cumulative.

d. Mitigation Measures

General

- After finalization of coordinates, campsites will be located away from communities. On a safer side 500 m should be maintained for the purpose;
- During construction, dust emissions due to road travel will be minimized by regulating vehicles speed and watering of the access track;
- Generators, compressors and vehicles used will be maintained in a good condition to ensure that emissions are kept to a minimum level;
- During operation emissions from all sources should be monitored to check compliance with SEQs;
- Appropriate measures will be taken to avoid ozone depletion e.g. prohibit use of CFC gases etc.;
- Dust emissions during construction activities should be minimized by good management practices such as locating stock piles out of the wind direction, keeping the height of the stock piles to a minimum, keeping earthwork areas damp etc.; and
- During construction leveling or widening along the access road will be done in sections, immediately followed by sprinkling of water and also preferably compaction (where required).
- Dry chemical powders i.e. air borne particles will be minimized by keeping cement sacks under cover;
- Burning of wastes will not be allowed; and
- Vehicles speed will be regulated and monitored to minimize dust emissions.

Drilling Operation

- Generators and vehicles used during construction and drilling operations will be maintained in a good condition to ensure that emissions are kept to a minimum level;
- After finalization of well locations, well sites and campsites will be located at a safe distance, away from communities;
- During drilling and construction dust emissions due to road travel will be minimized by regulating and monitoring vehicles speed and sprinkling of the access track;
- The access track selected to access the well location will maintain a reasonable distance from communities;

- Flare pit shall be kept downwind of the well site and away from the nearest community. The duration of flaring during well testing will be kept to the minimum required; and
- Dust emissions during construction activities will be minimized by good management practices such as locating stock piles out of the wind direction, keeping the height of the stock piles to a minimum, keeping earthwork areas damp etc.

Flow Line Construction

- Uncontrolled sand blasting will be avoided. Sand blasting will be performed after ensuring that it may not generate dust into the air;
- Access tracks used during laying of gas pipeline passing through communities will be avoided; and
- If unavoidable, a speed limit of less than 30 km/hr will be observed on the section of the road passing through the community.

Minimum Distances

The following minimum distances should be maintained from communities:

- Well Site and construction camps for all activities – 500 m (preferred)
- Quarry locations – 1,000 m
- Flare pit at well site – at a safe distance
- Access tracks to well sites and any other project facility – 100 m unless driven by community demand. If a distance less than 100 m is maintained, appropriate water sprinkling over the access track shall be done.

e. Residual Impacts

It is believed that after applying the recommended mitigation measures, no deterioration of air quality will occur.

Characteristic	Activity		
	Construction	Drilling	Flow Line
Duration	<i>Short</i>	<i>Short</i>	<i>Short</i>
Extent	<i>Local</i>	<i>Local</i>	<i>Local</i>
Likelihood	<i>Unlikely</i>	<i>Unlikely</i>	<i>Unlikely</i>
Consequence	<i>Minor</i>	<i>Minor</i>	<i>Minor</i>
Reversibility	<i>Reversible</i>	<i>Reversible</i>	<i>Reversible</i>
Significance	<i>Low</i>	<i>Low</i>	<i>Low</i>

8.1.4 Noise Pollution

a. Potential sources

Sources of noise during proposed project activities will be generators, vehicles, drilling rig, construction equipment and machinery.

b. Impact Assessment

Increased noise levels during civil works & drilling operations can be a source of nuisance for locals and a source of disturbance to wildlife. Monitoring of actual noise levels from drilling rigs and campsites for various operations has shown that the noise during construction and drilling attenuates to ambient levels after 300 m from the campsite/s and well site. Noise levels monitored from different vehicles under different conditions by HPK in other drilling operations show that the noise levels from all vehicles comply with the NEQS/SEQS level of 80dB at 7.5 m from the source and reach the ambient noise level in the area at distances ranging from 40 to 70 m from the source.

As the project facilities will be established after further detailed assessment and appropriate from nearby communities will be maintained so, adverse effects of noise on communities are not anticipated to occur. Similarly, effects of vehicles noise on communities will also not occur if the access tracks maintain a reasonable safe distance from communities.

Table presented below explains the permissible noise exposure limits which shall be met at working sites during the entire course of operation.

	For Lex & LAeq	For Peak Pr (Lpk)
OSHA Action Level	85 dB-A for TWA of 8 hours exposure	135 dB-C
	82 dB-A for TWA of 12 hours exposure	
OSHA Upper Exposure Limit	90 dB-A for TWA of 8 hours exposure	140 dB-C
	87 dB-A for TWA of 12 hours exposure	

Any further effects of noise during the operation shall be mitigated by the measures listed below:

c. Mitigation Measures

- It shall be ensured that generators, vehicles and other potentially noisy equipment used are in good condition to ensure that noise from them is kept to a minimum level;
- Blasting for construction activities (if deemed necessary) should be carried out with due diligence ensuring relief to the sensitive environmental receptors of the area;
- Noise levels at communities nearest to the well site, campsite/s and access tracks shall be monitored by Health, Safety and Environment Officer (HSEO) of Prime Pakistan. In case these are found to exceed acceptable limits, appropriate mitigation measures shall be taken;
- Well site and campsite/s shall be located at an appropriate distance from nearest communities;
- The use of horns by vehicles used for construction and drilling activities shall be minimized. The use of pressure horns shall be strictly prohibited;

- Movement of all project vehicles and personnel shall be restricted to within work areas only; and
- Generators will be kept within enclosures to minimize dispersion of noise.

d. Residual Impacts

It is believed that after applying the recommended mitigation measures, the effects of noise will be of low significance.

Characteristic	Activity		
	Construction	Drilling	Flow Line
Duration	<i>Short</i>	<i>Medium</i>	<i>Medium</i>
Extent	<i>Local</i>	<i>Local</i>	<i>Local</i>
Likelihood	<i>Unlikely</i>	<i>Certain</i>	<i>Unlikely</i>
Consequence	<i>Minor</i>	<i>Moderate</i>	<i>Minor</i>
Reversibility	<i>Reversible</i>	<i>Reversible</i>	<i>Reversible</i>
Significance	<i>Low</i>	<i>Low</i>	<i>Low</i>

8.1.5

Use of Water

a. Potential Sources of Impact

Use of water from local ground water resources for the project will result in decreased availability of water for local users. Potential sources of depletion of water resources are listed below:

- Use of ground/surface water during construction of well site;
- Use of local ground/surface water during drilling of well site; and
- Use of ground/surface water during hydro-testing and cleaning of flow line.

b. Impact Assessment

Required quantity of water for proposed activities will be obtained from commercially available water wells present in the vicinity of proposed well sites. People in the project area rely on hand pumps, and water bores for domestic purposes, therefore water for project activities will be only be met from commercial water sources after proper compensation. The aquifer yield will be calculated for ensuring that the available capacity at the local tube well (safe yield minus local demand) is at least 50% greater than the project demand. Discharge from the tube well will be regularly monitored to monitor any changes in the yield of the well. In order to conserve sweet groundwater, it is also recommended that Prime Pakistan should maximize wherever possible the use of brackish groundwater in its operations (if required).

c. Mitigation Measures

- The quantity of water used during construction (including flow line) and drilling activities will be kept to the minimum required by taking prudent water

conservation measures on site. A complete record of water consumption will be maintained by the Prime Pakistan Representative;

- If water has to be abstracted from the surface water bodies due to unfavourable reasons e.g. long haul distances, community conflicts it will be only done with the prior approval from the concerned authorities;
- Water from public sources will only be abstracted after getting formal permission from the concerned department (Sukkur and Khairpur Municipal Corporations, Irrigations department or local well owner) and fulfilling the requirements of the EIA and EMP;
- Water from a local well will only be used after ensuring that the available capacity at the well (safe yield minus local demand) is at least 50% greater than the project demand. Discharge from the water well will be regularly monitored to monitor any changes in the yield of the wells. If a single well fails to meet this requirement, water will be obtained from multiple wells such that each well meets the above-mentioned requirement;
- Use of brackish water will be maximized wherever possible during proposed drilling and associated developmental activities;
- If a new water well is to be installed, the well will be located at least 300 m from existing local wells and will be designed to abstract water preferably from deep aquifer not being used by local communities;
- Contamination of surface and groundwater resources and their surroundings will be avoided; and
- Prime Pakistan and project contractors will pay appropriate and justified compensation for water utilized to the owners of water wells.

d. Residual Impacts

Even after application of mitigation measures, impacts are characterised as follows:

Characteristic	Activity		
	Construction	Drilling	Flow Line
Duration	<i>Short</i>	<i>Short</i>	<i>Short</i>
Extent	<i>Local</i>	<i>Local</i>	<i>Local</i>
Likelihood	<i>Unlikely</i>	<i>Unlikely</i>	<i>Unlikely</i>
Consequence	<i>Minor</i>	<i>Minor</i>	<i>Minor</i>
Reversibility	<i>Reversible</i>	<i>Reversible</i>	<i>Reversible</i>
Significance	<i>Low</i>	<i>Low</i>	<i>Low</i>

8.1.6 Blockage of Natural Drainage

a. Impact Assessment

The project area especially well sites will be raised & landscaped to avoid blockage of water courses. Existing levelled or flat land will be used as base camp for proposed

drilling activities, where possible. As a precautionary measure, area around the well location will be landscaped to avoid blockage of natural drainage.

Access roads RoW may cross the watercourses. To avoid obstruction to surface runoff in plain areas, any soil embankments or piles formed along the access roads during construction activities shall be levelled. Pipe culverts will be provided across all watercourses (seasonal/permanent.) General mitigation measure to avoid blocking of natural drainage are provided below.

b. Mitigation Measures

- Irrigation channels and associated watercourses shall not be disrupted by project activities;
- Area around the well sites, campsites and associated facilities shall be landscaped to avoid blocking natural drainage; and
- Pipe culverts will be provided at all watercourses and minors crossings to avoid blocking of natural drainage (if required).
- Uncontrolled and unnecessary clearing, dozing, excavations or quarrying, storage of construction material etc. will be avoided.

8.1.7

Site Restoration

The restoration of well site and associated facilities (including access tracks and campsite) is of utmost importance. Mitigation measures have been suggested to improve the environmental standards of the area after termination of the operation. Restoration of the well site, access road and campsite will depend on whether the drilled well is a success or failure. The restoration measures that will be carried have been listed separately as follows for the two cases.

Complete Restoration – Dry Well

If there are no indications of a commercial quantity of oil or gas, either before or after testing, then the well will be declared dry and will be plugged and abandoned in line with local regulations and good industrial practices. The well site and the portion of access track which leads to the well site from the main community track will be restored.

a. Mitigation Measures

- All equipment and machinery at the well site will be demobilized;
- All wastes at the well site will be disposed of according to the requirements of the EIA/EMP;
- Liner from the water and waste pits at the well site may be taken out and re-used or disposed of in the existing pits with proper restoration;

- All concrete structures at the well site will be broken and either transported out of the project area by the demolition or site restoration contractors for sale or reuse or disposed of into the pits;
- All pits at the well site will be backfilled; and
- The areas covered by the portion of the access track that will be of no use for other wells will be restored, in that all gravel topping will be removed. This scenario will be applicable only if the locals require the portions of the track to be restored or otherwise it will be left on the site subject to local consent.

Partial Restoration – Producing Well

- The well sites and access roads will be retained to support well access work for further testing or during the production phase;
- The outer chain link fence will be retained as a safety measure to keep wildlife away from the pit areas;
- The constructed pit areas will be retained but all liquid and solid waste material will be removed from the site and disposed of in line with the requirements of this EIA/EMP.

Restoration – Flow Line

Restoration of flow line will also include removal of all wastes from the RoW of flow lines and access tracks. For reference purposes a photographic record of selected sections can be taken before and after the developmental activity.

8.2 Biological Environment

8.2.1 Clearing of Vegetation and Loss of Habitat

a. Potential Sources of Impact

This section of the report discusses the potential effects on vegetation due to the proposed project activities within the project area. The potential effects on vegetation will include:

- Loss of vegetation due to land clearing for well sites, campsites (construction & drilling) and access tracks (where required);
- Effects of dust emissions on road side vegetation; and
- Effects on vegetation due to obstruction of natural drainage.

Existing anthropogenic threats to vegetation include clearing of land for agricultural fields, livestock grazing, chopping of trees for fuel and construction material and encroachment issues into natural or planted forests by the locals.

b. Impact Assessment

Loss of Vegetation

During drilling phase, considering the limited land area requirement for the development of a well and rig campsite, no significant impacts due to this activity will occur provided the mitigation measures listed at the end of this section are adhered with. The alignment and length of the access track to each well site will be selected to maximize use of existing tracks and minimize earth works. The well sites, rig camps and construction camps shall preferably be located in existing clearings. Moreover, small portion of agricultural lands will be occupied if any well site is located within or access track passes through agricultural field. No significant number of tree cuttings are envisaged. Clearing will preferably be carried out in areas where the vegetation is in a degraded state due to livestock grazing or harvesting by local communities. Cutting of trees will be avoided as far as possible.

During operation, the farmers will be compensated for the loss of standing agricultural crop, if any at the time of leasing the land. Off-road travel during project activities should be avoided by providing training to the drivers and monitoring road travel during the project activities. During the EIA field survey, no endemic or rare species were observed. All species recorded during the field survey have a wide range of distribution. Mitigation measures recommended for selection of well sites and campsites and alignment of the access roads will further ensure that the impacts are of minimized nature.

Dust Emissions

During civil works, construction and road travel dust will be generated which may accumulate on the road side vegetation. This can, in certain cases, possibly hinder the plant growth and metabolism. However, because the vegetation species in the area adapted to exposure to dust, the impacts due to the project are considered to be negligible. The EIA recommends regulation of vehicles speed, sprinkling of access tracks and compaction and maintenance of permanent tracks to further reduce the likelihood and consequence of any adverse effect.

Blockage of Natural Drainage

The access tracks and other project facilities may obstruct natural drainage within the project area. This can affect the survival and or composition and characteristics of vegetation. In order to avoid this from occurring it is recommended that in case of access tracks the windrows formed along the access tracks should not obstruct natural drainage. Moreover, project facilities such as well sites, rig camps and basecamp shall be landscaped with care so that natural drainage is not blocked.

c. Cumulative Impacts

Clearing of land areas for the project facilities will have a cumulative effect on vegetation. However, provided mitigation measures recommended in this EIA are adhered, the impacts will have minor significance.

d. Mitigation Measures

General

The recommended project specific mitigation measures are listed below:

- The campsite area/s will be kept to the minimum required;
- Project authorities and contractors will strictly abide by the company's environmental protection protocols during execution of project activities;
- Camp/s will be located in existing clearings; as much as possible;
- Clearing of trees will be avoided as much as possible;
- Use of local vegetation/wood as fuel by crew personnel will be prohibited;
- Dust emissions on access tracks will be reduced by keeping speed limits below 30 km/hr;
- The well site, rig camp and construction camp will preferably be located in existing clearing and levelled land avoiding patches of dense vegetation as much as possible;
- Access tracks will be avoided from passing through patches of dense vegetation;
- Off-road travel, required at sections of the road where construction work is in progress, will be minimized and if required will be allowed only after approval from Prime Pakistan Representatives;
- The access tracks to campsite/s and well site will be properly compacted at the time of construction and thereafter properly maintained throughout the entire operation;
- Off-road travel will be strictly prohibited and observance of this will be monitored during the drilling and associated activities;
- Vehicles speed will be regulated and monitored to avoid excessive dust emissions;
- Clearing of vegetation will be minimized by keeping the road width to 5 m (except at bends where greater width will be required for safety reasons) and by keeping the length of new sections of the road to a minimum; and
- Quarry sites will be carefully selected such that they are located in levelled areas with existing clearing and the quarry sites are restored after use.

Drilling Operation

- Well site and campsite areas will be kept to a minimum required by adopting best engineering practices; and
- Campsite established for the purpose of construction will be located in existing clearing. Vegetation clearing from these sites will be kept to a minimum required.

e. Residual Impacts

If all mitigation measures recommended in the previous section are adhered with then residual impacts will be of minor significance i.e. loss of vegetation cleared from permanent facilities such as well sites, rig camps and access tracks.

Characteristic	Activity		
	Construction	Drilling	Flow Line
Duration	<i>Medium</i>	<i>Medium</i>	<i>Medium</i>
Extent	<i>Local</i>	<i>Local</i>	<i>Local</i>
Likelihood	<i>Certain</i>	<i>Certain</i>	<i>Certain</i>
Consequence	<i>Minor</i>	<i>Minor</i>	<i>Minor</i>
Reversibility	<i>Reversible</i>	<i>Reversible</i>	<i>Reversible</i>
Significance	<i>Low</i>	<i>Low</i>	<i>Low</i>

8.2.2 Disturbance to Wildlife

a. Potential Sources of Impact

Potential sources of impacts on wildlife during drilling and associated operations are disturbance due to movement of construction and drilling crew on vehicles, construction of access road, disturbance due to construction of well site, rig and construction campsites, disturbance from access road usage during the project, light and noise from the camp/s, light and noise during civil works, light and noise from well site (including flaring at the well site).

b. Impact assessment

The project can have two types of impacts on habitat and wildlife within the project area. The first is the loss of habitat due to clearing of land and vegetation and the other is sensory disturbance to wildlife species due to the physical presence of people, vehicles and equipment in the project area.

Since, the campsite for proposed developmental activity will occupy small area, the loss of habitat due to this facility will not be significant if its location is selected carefully maintaining a safe distance from sensitive biological receptors. Moreover, proposed area for project activity falls majorly outside the wildlife or forest protected areas, therefore impacts are not significant. Mitigation measures recommended for selection of campsite, alignment of the access road and for RoW of access road will further ensure that the impacts are minimized.

During drilling and associated activities there will be possible disturbance to mammals, birds and reptiles due to loss of habitat and clearing for access tracks/RoW, well site and campsite/s. Wildlife may also be disturbed due to sensory disturbance from drilling operation; movement of vehicles and crew personnel; location and operation of camps and site restoration. This can possibly result in changes in distribution and abundance of wildlife.

Existing sources of disturbance include the hunting during winter season and movement of traffic, excessive agriculture extension and livestock grazing in the natural areas. Since, the well site for drilling operation will occupy small areas in already cleared land therefore loss of habitat due to these facilities will not be significant.

In terms of other terrestrial wildlife species, previous studies have shown the effect of sensory disturbance during oil and gas exploration projects on small mammals, reptiles and birds to be insignificant. The above statement may not be true for birds if the well site and campsites located are close to wetlands or surface water sources. The effects of proposed operation on migratory birds will not be significant. Carnivores have a vast habitat territory and therefore disturbance during drilling and associated activities may only result in short term displacement from the immediate work areas not having any impact on the survival of the species.

c. Cumulative Impacts

Land uptake for the project facilities may have a cumulative effect of loss of habitat for wildlife. However, provided mitigation measures recommended in this EIA are adhered with and project facilities are located in wildlife non-sensitive areas the impacts will have minor significance.

d. Mitigation Measures

- Project authorities and contractors will strictly abide by the company's environmental protection protocols during execution of project activities;
- Prior to commencement of drilling or associated operation, awareness trainings will be provided to contractor's management and field crew on matters related to the requirements of the EMP in this regard;
- All mitigation measures to minimize noise levels, dust emissions, air emissions, and waste management required by the EIA will be adhered to;
- Food wastes will not be disposed of in the open. Food wastes collected in waste segregation units will be disposed of according to Prime Pakistan waste management procedure on a regular and strict basis as advised by the Prime Pakistan Representative;
- Construction work near areas which show small mammal and reptile populations will commence after a soft start up and will be randomly monitored;
- Hunting, fishing, trapping, feeding, harassment or deliberate killing of wildlife will not be allowed;
- Vehicles speed on access road will be controlled to avoid incidental mortalities of reptiles. Any such incident will be reported to the Prime Pakistan Rep. Vehicles speed will be randomly checked;
- Cutting of trees/tall bushes will be avoided as much as possible;
- Movement of all project personnel will be restricted to work areas only;
- Movement of project vehicles will be restricted only to the project access road or to routes approved by the Prime Pakistan Rep;
- Night work during construction works will be prohibited, night traveling will not be allowed unless absolutely necessary;

- All mitigations related to minimizing noise will be adhered to; and
- Campsite/s for drilling or other associated activities will be located 300 m from perennial water bodies.

Drilling Operation

- Land uptake by well site, campsite and access road will be minimized;
- Lights used at the well site and campsite will be kept to the minimum required; and
- Flaring during well testing will be done within enclosed ground burning flares rather than elevated flares, to minimize light, heat radiation and noise levels. The duration and intensity of flaring will be kept to the minimum required.

Laying of Flow Line

- RoW for flow line will avoid disturbing live bird nests and small mammal and reptile hole; and
- Cutting of trees/bushes will be avoided, where possible. The tree species should be indigenous to the region.

e. Residual Impacts

All project related locations will be restored as close as to its original condition. However, residual impact on wildlife will be the loss of habitat due to land uptake by permanent project facilities like fenced area of a well site and campsite that would cover a fraction of the project area.

Characteristic	Activity		
	Construction	Drilling	Flow Line
Duration	<i>Short</i>	<i>Short</i>	<i>Medium</i>
Extent	<i>Local</i>	<i>Local</i>	<i>Local</i>
Likelihood	<i>Possible</i>	<i>Possible</i>	<i>Certain</i>
Consequence	<i>Minor</i>	<i>Minor</i>	<i>Minor</i>
Reversibility	<i>Reversible</i>	<i>Reversible</i>	<i>Reversible</i>
Significance	<i>Low</i>	<i>Low</i>	<i>Low</i>

8.3

Socioeconomic, Cultural and Archaeological Environment

Development projects induce or stimulate associated impacts that manifest themselves as altered socioeconomic receptors. Socioeconomic impacts vary from project to project and are not always easily quantifiable. These are consequences of project activities on the human population that alter the ways in which people live, work, interact, relate to one another, organize to meet their needs and generally exist as members of society. These also include more long-term impacts such as cultural impacts involving changes to the norms, values and beliefs that guide and rationalize their cognition of themselves and their society. In the past socioeconomic impacts of large development projects were mitigated through monetary compensation or were

altogether ignored. However, the importance of these impacts have been recognized and it is very strongly felt that impacts on communities' cultural activities, local practices and day-to-day activities have far reaching impacts on their psychological, emotional and social well-being, whereby having an effect on their quality of life.

In this section of the report, the effects and impacts of the proposed exploration with associated development activities on various socioeconomic parameters have been assessed and methods to mitigate these impacts have been proposed.

a. Potential Sources of Impact

Sustenance Income

The livelihood of local communities largely depends on agricultural, livestock farming, government and private jobs in addition to other land related activities. Land required for proposed well sites will be purchased/leased from locals. Land acquisition will be carried out in consultation with revenue department. Compensation of the leased land and for standing crops is a standard mitigation practice in the oil and gas industry. The compensation rates, however, should be defined on the basis of prevailing market rates for land and crops and should be agreed with the local communities. In addition, the respective *taluka*/district administration should be involved whilst disbursing the compensation amounts so that the rightful owners of the land are compensated. Any delays in disbursement of compensation amounts should also be avoided so that the already marginalized communities of the area are not affected. Positive impacts of the project may include:

- Increased turnover of local businesses and shops due to an increased demand from project contractors and their employees; and
- An increased income of locals may occur due to employment opportunities in the project components.

Drinking Water

- Sharing of local water resources

Employment

- Distribution of employment opportunities during construction and operation phase subject to availability of local resource as per Prime Pakistan required competency criteria and in accordance to all applicable laws

Health

- Effect on health of local communities due to project wastes and dust emissions

Education

- Increased or reduced emphasis on education due to the project

Safety and Security

- Potential for road accidents, conflicts with locals and safety of local employees

Mobility and Transportation

- Ease/difficulty in mobility and transportation

Culture and Religion

- Damage to cultural, archaeological or religious sites (if encountered)

b. Impact Assessment

Sources of Income

Potential issues related to sustenance incomes have been assessed below:

Leasing of Agricultural Lands - Land might have to be leased for access track, well sites, campsites and RoW of flow lines. Land for the project activities shall be leased as per local regulations and according to mutual consent and deliberations of both parties. In addition, Prime Pakistan has established procedures for leasing of land and its compensation following which the landowner will be paid a lease amount for the land and a compensation amount for the standing crop affected at the time of the lease.

Sharing of Perennial Water Source - As discussed earlier, the project water usage will not affect the accessibility of locals to the water source in the long or short term. The water from local commercial wells will be obtained only after ensuring that the abstraction process will not result in any water shortages. In case where local water wells are not available Prime Pakistan will drill a water bore to meet water demand during execution of project activities.

Uptake of Livestock Grazing Area/Effect on Mobility of Livestock Herds/Potential for Loss of Livestock due to Road Accidents - The project facilities will cover livestock grazing areas. Compared to the total available grazing area, the uptake by the project will not be significant and will not have any significant affect. Project vehicles will follow safe speed limits, especially on seeing a livestock herd near the road to avoid any road accidents.

Effects on Local Businesses - Local business (such as hotels, shops and tea stalls) will experience a rise in sales as junior level project staff and local employees will purchase items of general use from shops and will patronize local tea stalls and eateries on a regular basis. However, it must be noted that the impact so created will be of short-term nature owing to the larger workforce required during proposed exploration and associated development project. This will have a positive impact on the local businesses.

Food - Food availability in the area is limited due to poor economic conditions in the project area. As a consequence, the influx of people from other areas to the project area may likely create a competition for food sources with the local residents. Food for consumption at the construction and drilling camps will be brought in from outside big markets of Nara and Saleh Pat so as not to place any burden on the already scarce local resources.

Employment - Opportunities for wage labour in the project area are very few. As a consequence, the expectations of local residents in relation to employment during the project will be high. Core activities of drilling operations, road/RoW and well site construction require skilled and trained labour force, which is marginally available in the area and will be given priority in the employment bound to company's competency criteria and local laws. However, the project will also to a great extent require the services of unskilled workforce. All unskilled and some semi-skilled workforce shall be hired equitably from local communities and different tribes of the project area.

Health - Communities that are located close to the project site will be exposed to dust emissions, wastes from the rig and construction camps, and any incidental spillage of fuel or oil. If the mitigation measures relating to the control of dust emissions, oil or fuel spills, and project wastes are followed no impacts will occur. Local complaints of dust emissions shall be noted and addressed immediately.

Safety and Security - The operations may affect the safety and security of the inhabitants of the areas in the following ways: issues of road safety, conflicts between residents and the construction contractors, safety and security issues pertaining to the carriage of fire arms on the site. Occurrence of any such impacts can be avoided by community sensitive project planning and implementation and through effective involvement of local administration.

Disturbance from Noise - Construction base camp, well site and rig camp must be located at a safe distance away from communities. As per the assessment done in the section for physical environment, impacts of the project noise will not occur on the local communities if the mitigation measures recommended for controlling the effect of noise are strictly adhered with.

Mobility and Transportation – Local women in the project area may be classified as vulnerable members of society. The project activities may affect mobility of local women. During proposed project and associated operations issues with regards to restricted mobility of local women should be identified in consultation with local communities and appropriate measures should be taken to avoid any inconvenience to them. Project personnel will be given gender sensitization briefings and will be instructed to respect local norms, the local culture, particularly in relation to the womenfolk of the area. In connection to the usage of the access track by the women of the area, they will not be restricted in any way, and will be given due right to crossing the road in pursuit of the daily chores such as collection of fuel wood and fetching water. The construction of any new access roads in the area will also have a positive effect in that it will improve access for rural residents and will also reduce travel time and vehicle-operating costs. This may also open other opportunities for the local population, in terms of transportation.

Community Grievances - During proposed exploration and associated development activities, community grievances should be identified through consultation with the

communities. These should be recorded in a Social Complaints Register and mitigated by Prime Pakistan. This will help maintaining a long-term relationship between Prime Pakistan and the local communities.

Cultural, Religious and Archaeological Sites – Religious and cultural sites in the form mosques, graveyards and mandirs exist in the project area. Prime Pakistan will maintain safe distance from cultural and religious monuments as per EIA/EMP suggestions. No site of archaeological significance was found in the project area. Moreover, as per requirement of Antiquities Act, proponent will have to inform archaeological department if any surface or subsurface archaeological remains are discovered during the project especially during construction works for project facilities.

c. Cumulative Impacts

Considering that for all land uptake local communities will be appropriately compensated and all other effects on sustenance income will be mitigated following the recommendations of the EIA, no cumulative impacts will occur.

d. Mitigation Measures

- Local sources of drinking water will not be exploited without taking steps listed in water use mitigation measures;
- The access tracks will be sprinkled regularly to minimize dust emissions (if required);
- Necessary rerouting of access roads so that a safe distance is maintained from a settlement;
- Drivers will be trained in responsible and safe driving practices, a speed limit shall be set and maintained; in addition, vehicle logbooks will be maintained and inspected for compliance;
- Labour from local communities will be recruited equitably from amongst the various tribes/castes, avenues for conflict resolution will be open and the employment procedures will be transparent;
- Use of local firewood for cooking by contractor staff to be prohibited;
- Strict compliance will be observed to Prime Pakistan's HSE guidelines;
- The vehicle speed for traveling along the access road will be limited;
- The well site will be located at a safe distance i.e. preferred 500 m from residential communities, thereby mitigating the effect of noise and emissions;
- Generators and vehicles will be regularly maintained to minimize emissions;
- Any land acquired and distribution of compensation will be carried out transparently, in consultation with the local leaders and in accordance with the Prime Pakistan compensation procedures;

- Damage to any artefacts during construction will be prohibited and construction activities near these areas will be monitored by Prime Pakistan;
- Safe distance will be maintained from sites of archaeological significance (if any);
- Proponent will inform archaeological department if any subsurface archaeological remains are discovered during the construction works for project facilities;
- In order to keep nearby local communities informed of the progress of the operation, communication channels will be maintained between local influential, community elders and Prime Pakistan;
- The road will be re-aligned to maintain safe distance from the edge of any graveyard, cultural and religious site; and
- All community grievances will be recorded and maintained in a Community Complaints Register. In addition to this, close liaison will be maintained between the community and the site representatives of Prime Pakistan throughout the proposed project activities.

e. Residual Impacts

Provided all mitigation measures are followed, residual impacts of the proposed project will be positive in the form of sustenance income and health safety and security.

Characteristic	Activity		
	Construction	Drilling	Flow Line
Duration	<i>Short</i>	<i>Short</i>	<i>Short</i>
Extent	<i>Local</i>	<i>Local</i>	<i>Local</i>
Likelihood	<i>Unlikely</i>	<i>Unlikely</i>	<i>Unlikely</i>
Consequence	<i>Minor</i>	<i>Minor</i>	<i>Minor</i>
Reversibility	<i>Irreversible</i>	<i>Irreversible</i>	<i>Irreversible</i>
Significance	<i>Low</i>	<i>Low</i>	<i>Low</i>

9 Conclusion

Pakistan faces a critical energy deficit, heavily reliant on imports to meet its energy needs, straining foreign reserves and the economy. It's imperative to seek additional energy sources domestically.

Oil and gas exploration hold transformative potential, reshaping the energy landscape and boosting the economy. With concerted efforts, existing obstacles can turn into opportunities. Urgent action is required to tap into oil and natural gas reserves, especially amid acute shortages. Additionally, the report highlights the potential for generating economic activity and providing sustainable livelihoods for thousands of Pakistanis through oil and gas exploration.

The proposed oil and gas development initiatives, including the drilling of appraisal/exploratory/development wells and associated activities, are integral to attaining this goal. Environmental assessment procedures have thoroughly evaluated the anticipated environmental impacts of the project, identifying necessary mitigation measures to minimize or prevent adverse effects. A comprehensive EMP has been devised to guide implementation and monitoring efforts. Furthermore, residual impacts have been assessed to determine their significance. These requirements have been addressed in this Environmental Impact Assessment (EIA) study, which has covered in detail the following:

- The proposed project activities;
- Environmental conditions of the project area;
- Legislative requirements related to the project;
- Potential environmental impacts of the proposed project activities on physical, natural and socioeconomic receptors; and
- Mitigation and monitoring measures that will help in avoiding or minimizing these impacts.

The operation is expected to significantly enhance the socioeconomic conditions of local residents, characterized by an increase in local businesses, employment opportunities generated during operations, improved mobility, and increased income resulting from land compensation disbursements.

The EIA confirms that the proposed drilling of six appraisal/exploratory/development wells, along with associated activities in SW Miano-III, will not result in adverse environmental impacts if adequate mitigation measures outlined in this report are implemented effectively. Furthermore, no significant or unacceptable alterations to the baseline environmental conditions of the project area are foreseen. The diligent execution of the EMP will ensure that environmental impacts are effectively managed and minimized, while ensuring compliance with all legal and statutory requirements by the project proponent.

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Appendix A

Environmental Management Plan

Appendix A – Environmental Management Plan

A.1 Introduction

This EIA has identified potential impacts that are likely to arise during the proposed drilling of six wells and associated construction, development & operational activities. The EIA has examined in detail both negative and positive impacts at each stage of the project. To minimize the effects of adverse impacts the EIA has recommended mitigation measures. The proposed mitigation measures have been based on the understanding of the sensitivity and behaviour of environmental receptors in the project area, the legislative controls that apply to the project and a review of good industry practices while operating in such kind of environments. For residual impacts (impacts remaining after applying the recommended mitigation measures) and for impacts in which there can be a level of uncertainty in prediction at the EIA stage, monitoring measures have been recommended to ascertain these impacts during the course of the project activities.

For the effective implementation and management of the mitigation measures an Environmental Management Plan (EMP) has been prepared. The EMP satisfies the requirement of the Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021 and Sindh Environmental Protection Act, 2014.

A.1.1 Objectives of the Environmental Management Plan

The EMP provides a delivery mechanism to address potential impacts of the project activities, to enhance project benefits and to introduce standards of good practice in all project activities. The EMP has been prepared with the objective of:

- Outlining mitigation measures required for avoiding or minimizing potential impacts assessed by the EIA;
- Developing a monitoring mechanism and identifying requisite monitoring parameters to confirm effectiveness of the mitigation measures recommended in the EIA;
- Defining roles and responsibilities of the project proponent for the implementation of EMP and identifying areas where these roles and responsibilities can be shared with other parties involved in the execution and monitoring of the project; and
- Defining the requirements necessary for documenting compliance with the EMP and communicating it to all concerned regulatory agencies.

A.1.2 Methodology

The basic approach to prepare this plan mainly comprise of:

- A review of relevant environmental legislation and guidelines;

- A review of past environmental studies carried out in SW Miano III block;
- A review of relevant environmental data in the SW Miano III block;
- On the basis of past experience gained during the monitoring of similar projects in relation to O&G exploration and production; and
- Consultation with Prime Pakistan staff.

A.1.3 Structure of the EMP

The EMP consists of the following sections:

- Legislation and Guidelines;
- Organizational Structure with Roles and Responsibilities;
- Change Management Plan; and
- Mitigation Management Matrix.

A.2 Legislation and Guidelines

The EIA for drilling and associated development activities of Six (6) wells in SW Miano-III block has discussed national and international legislation and guidelines and their relevance to the project activities. Prime Pakistan shall ensure that all project activities are conducted in conformance to Prime Pakistan's corporate HSE policy, national/provincial legislation and relevant international conventions and that guidance is sought from national/provincial and international guidelines. All relevant legislation, guidelines, convention and corporate requirements are discussed in **Chapter-3** of EIA. Prime Pakistan shall also ensure that the key project management staff is aware of these legislation and guidelines.

The Sindh Environmental Quality Standards (SEQS) specify standards for industrial and municipal effluents, gaseous emissions, vehicular emissions and noise levels is provided in **Table 3-1, Table 3-2 and Table 3-3** of EIA report. The standards for ambient air requirements, noise levels and drinking water quality are provided in **Table 3-4 to 3-6**. International Standards for Land Treatment and on-site burial of E&P wastes in unlined pits is provided in **Table 3-7. Table 3-8** provides the less stringent criteria set by **LSO 29B**.

A.3 Organisational Structure with Roles & Responsibilities

A.3.1 Organisational Structure

The proposed project includes the following three organizations:

- Prime Pakistan as the project proponent and owners of the EMP;
- Project Contractors for construction, drilling and pipeline laying activities as the executors of the EMP; and
- Sindh Environmental Protection Agency (Sindh EPA) as the regulator.

These organizations will have the following roles and responsibilities during the project.

A.3.2 Roles and Responsibilities

Roles and Responsibilities of Prime Pakistan

As project proponent, Prime Pakistan will be responsible for ensuring the implementation of the EMP. The HSE Manager will be responsible for the overall environmental performance during the proposed operations. He will delegate a Health, Safety and Environment Officer (HSEO) who will have functional responsibilities for Health Safety and Environmental (HSE) matters during the project. The HSEO will hold prime responsibility for ensuring that the environmental performance of the project is in accordance with governing legislation, Prime Pakistan's corporate objectives and the recommendations of this EIA. The HSEO will ensure that the provisions of the EMP are translated into the contractor's requirements and that these requirements are implemented to the full extent. Prime Pakistan's HSEO shall make regular site visit to the areas of operation and monitor compliance with the EMP using checklists provided in **Appendix B**.

Roles and Responsibilities of Project Contractors

For the proposed project, Prime Pakistan will appoint contractor(s) for construction, drilling and subsequent pipeline laying and operations. The contractors will be responsible for implementation of, or adherence to, all provisions of the EIA and the EMP and with any environmental and other codes of conduct required by Prime Pakistan.

Overall, responsibility for the contractor's environmental performance will rest with the person holding the highest management position within the organisation. Reporting to their management the contractor's site managers will be responsible for the effective implementation of the EIA and the EMP. The project contractor(s) will delegate a Health, Safety and Environmental representative (HSEO) who will have functional responsibilities on site for health, safety, and environmental matters during the construction and operation phase of the project. HSEO will have functional responsibilities to ensure implementation of or adherence to the requirements of the EMP.

Roles and Responsibilities of Sindh EPA

In pursuance of the requirements of Sindh Environmental Protection Act, 2014 after receiving the subject EIA from the proponent and issuing the confirmation of completeness, Sindh EPA is bound to conduct a preliminary scrutiny and reply within 15 working days of the submittal of the report a) confirming completeness; b) asking for additional information, if needed and c) returning the report requiring additional studies, if necessary. Sindh EPA is required to make every effort to complete the EIA review process within sixty days of the

issue of confirmation of completeness under Regulation 9 of Regulations, 2021. Subsequently, Sindh EPA will monitor compliance with the requirements of EMP of the project and any additional mitigation measures provided in the NOC for the proposed project.

A.3.3 Planning and Design of the Operation

a. Design of the Operation

Project details regarding drilling of wells and associated activities have been discussed in **Chapter 4** of the EIA report. Following approval of the EIA, if any aspect of the operation or requirements of the EIA need to be changed, Prime Pakistan will categorize that change in accordance with the Change Management Plan provided in this EMP and take appropriate measures thereon.

b. Approvals

Obtaining No Objection Certificate (NOC) from the Sindh EPA will not relieve the proponent from other legal obligations and hence, Prime Pakistan and project contractors will obtain all other relevant clearances and necessary approvals required by the Government of Pakistan and Government of Sindh prior to commencing the respective operations.

c. Contractual Provisions

EMP will be the fundamental part of the contract between Prime Pakistan and all project contractors. All project contractors will implement the mitigation measures, provisions and recommendations provided in the EMP during the execution of the proposed project.

A.3.4 Implementation of the Operation

a. Coordination with Stakeholders

Prime Pakistan will ensure that coordination with project stakeholders on environmental and social matters as required by the EMP and Sindh EPA is maintained throughout the operation.

b. Environmental Management Systems

Prime Pakistan and the project contractors will ensure that the mitigation measures mentioned in the mitigation management matrix for drilling and associated activities (**Table A-1 & A-2**) are adhered to and organizational HSE Management Systems are implemented during the proposed project. The contractors will abide by the relevant contractual provisions relating to the environment.

c. Minimum Distances

The EIA specifies minimum distances to be maintained from environmental features including communities, water sources etc. These minimum distances are also provided in the Mitigation Management Matrix. Prime Pakistan and the

project execution contractors will ensure that these minimum distances are adhered to during the implementation of the project. The minimum distances of the project activities and facilities from various environmental features in the project area are provided in **Table A-4**.

d. Monitoring

Prime Pakistan and the contractors will ensure that monitoring of the project activities is carried out throughout the project. The Prime Pakistan's HSEO will monitor project activities while working in the project area. He will keep a record of all non-conformances observed and report these along with actions to Prime Pakistan management in Karachi for further action. The HSEO will also report any impacts anticipated along with his recommendations for further action.

e. Change Management Plan

The EIA for the proposed project activities recognizes that changes in the operation or the EMP may be required during the operation and therefore provides a Change Management Plan to manage such changes (**Section A.5.1** of the EMP). Overall responsibility for the preparation of change management statements will lie with Prime Pakistan.

f. Emergency Procedures

Prime Pakistan and the project contractors shall have emergency management procedure to deal with any emergency situation that may arise during the project activities e.g. major oil spills, medical evacuation, flooding, fire incidents etc. and communicate these to the regulatory agencies (if required by these agencies).

g. Approvals

The project contractors will be responsible for obtaining all relevant approvals from Prime Pakistan's HSEO such as approvals for waste contractors, water source, construction camps and others as specified in the mitigation management matrix.

h. Training

The Prime Pakistan's HSEO will determine the training requirements for the contractors necessary for understanding and effective implementation of the EMP. The Prime Pakistan's HSEO and contractor's representatives will then disseminate the necessary training to all project personnel.

i. Communication and Documentation

For effective monitoring, management and documentation of the environmental performance during the project activities, environmental matters will be discussed during daily meetings held at site. Environmental concerns raised during the meetings will be mitigated. Any issues that require attention of Prime Pakistan's higher management will be communicated to them for action. The

contractors HSEO will also prepare a monthly HSE report. Copies of the report will be provided to the Prime Pakistan and the contractor's higher management.

j. Restoration

Prime Pakistan will be responsible for the final restoration of work areas according to the requirements of the EIA.

A.4 Environmental Monitoring

Prime Pakistan and its contractors will ensure that environmental monitoring of the project activities is carried out throughout the project. The objective of environmental monitoring will be as follows:

- To check compliance with the EMP by self-monitoring or inspecting project activities on a daily basis. This will be called compliance monitoring;
- To monitor and report effluents and emissions from the various sources during the operations; and
- To monitor actual impacts of the project on selected sensitive receptors so that impacts not anticipated in the EIA or impacts which exceed the levels anticipated in the EIA can be identified and appropriate mitigation measures can be adopted in time. This objective will be achieved through Effects Monitoring.

a. Compliance Monitoring

Compliance Monitoring will be carried out to ensure compliance with the requirements of the EIA/EMP. The Mitigation Management Matrix provided in the EMP will be used as a management and monitoring tool. Inspection may be carried out using environmental monitoring checklists. These checklists are provided in **Appendix B**. The contractor's HSEO will be responsible for monitoring the compliance of their organization with the relevant EMP requirements.

The contractor's HSEO will keep a record of all non-conformances observed and report these along with actions to Prime Pakistan management for further action. The officer will also report any impacts anticipated along with his recommendations for further action. Prime Pakistan's HSEO will monitor contractor's environmental performance on regular basis.

b. Effects Monitoring

Prime Pakistan's HSEO will be responsible to carry out the required effects monitoring during civil & engineering works and during drilling activities as per requirements of the EMP or obligations imposed by Sindh EPA.

A.4.1 Environmental Reporting

The project proponent shall prepare post project reports for each drilling operation and then pipeline operations (covered under this EIA) describing the

conduct of the actual operation, any changes from the operation for which approval was obtained, the degree to which the recommendations of the EIA were adhered to during the operation, any damages to the environment and the mitigation or compensation provided and monitoring information of scientific or environmental interest (e.g. sightings of wildlife species) that is not proprietary in nature. Any findings and recommendations relating to the operation that may improve future similar operations shall also be reported.

A.5 Communication & Documentation

A.5.1 Project Information

This EIA report covers drilling of six wells and associated construction activities to be carried out by Prime Pakistan. Proposed well locations are shown in **Figure 1-2**. Basecamp for each well site will be established adjacent to the well site whereas, access tracks and RoW for flow lines will fall within the project area boundary. Therefore, this EIA report is based on the fact that Prime Pakistan will obtain No Objection Certificate (NOC) for the EIA from Sindh EPA and will not be required to submit the Project Initiation Report (PIR) to Sindh EPA prior to the start of any project activity at site.

A.5.2 Environmental Monitoring Report

The project proponent shall prepare post project reports for each well with associated activities (covered under this EIA) describing the conduct of the actual operation, any changes from the operation for which approval was obtained, the degree to which the recommendations of the EIA were adhered to during the operation, any damages to the environment and the mitigation or compensation provided and monitoring information of scientific or environmental interest (e.g. sightings of wildlife species) that is not proprietary in nature. The report shall be submitted to the SEPA within one month of project completion. Any findings and recommendations relating to the operation that may improve future similar operations shall also be reported.

A.5.3 Kick-off Meeting

For proposed drilling with associated development works, prior to commencement of work and after set-up of the field camp, a meeting will be held on-site to discuss implementation of project specific EMP, show commitment to adhere with the EMP and check readiness of the contractors to start the project. The meeting will be attended by relevant management staff from Prime Pakistan and the contractors. Sindh EPA officials may also be invited to attend the meeting.

A.5.4 Daily Meetings and Reports

A daily meeting will be held during proposed drilling and associated activities to discuss the environmental conduct of the operation, non-compliances noted and their remedial measures. The meeting will be attended by the Prime Pakistan's site representatives and contractor's HSEO. The meetings will be recorded in the

form of a Daily Environmental Report (DER). The report will be communicated to the Prime Pakistan's HSE representatives and senior members of the contractors. The report will include:

- Summary of project activities on that day;
- Prime Pakistan and contractors' environmental representatives present onsite; and
- Non-compliances observed and mitigation measures taken or required.

A.5.5 Social Complaints Register

The Prime Pakistan's site representative will maintain a register of complaints received from local communities and measures taken to mitigate these concerns. All community complaints received will be sent to the Prime Pakistan's HSEO for further action.

A.5.6 Change Record Register

All changes to the EMP or the project will be handled through the Change Management Plan provided in the EMP. These changes will be registered in a Change Record Register.

A.5.7 Photographic Record

Prime Pakistan will ensure that a photographic record including the following is maintained:

- All areas used by the project activities; before use, during use and after restoration;
- Key non-compliances; and
- Key project activities.

A.6 Mitigation Management Matrix

Mitigation Management Matrix for drilling and associated development activities is provided in **Table A-1 & A-2**. The Mitigation Management Matrix will be used as a management and monitoring tool for implementation of the mitigation measures required by the EIA. The matrix lists down:

- The required mitigation measures recommended in the EIA;
- The person/organization directly responsible for adhering to or executing the required mitigation measures and monitoring adherence to the mitigation measures;
- The parameters which will be monitored to ensure compliance with the mitigation measures; and
- The timing at which the mitigation or monitoring has to be carried out.

Prime Pakistan will hold primary and overall responsibility for ensuring full implementation of the EMP.

A.6.1 Change Management Plan

The EIA for the proposed project activities recognizes that changes in the operation or the EMP may be required during the operation and therefore provides a Change Management Plan to manage such changes. The management of changes is discussed under two separate headings; Additions to the EMP and Changes to the Operation and the EMP.

A.6.2 Changes to the EMP

The EIA and the EMP have been developed based on the best possible information available at the time of the EIA study however, it is possible that during the conduct of the proposed operation additional mitigation measures based on the findings of environmental monitoring during the operation may have to be included in the EMP. In such cases following actions will be taken:

- A meeting will be held between Prime Pakistan and the concerned contractors. During the meeting the proposed addition to the EMP will be discussed and agreed upon by all parties;
- Based on the discussion during the meeting, a change report will be produced collectively, which will include the additional EMP clause and the reasons for the addition; and
- The report will be signed by all parties and will be filed at the site office. A copy of the report will be sent to Prime Pakistan and contractor head offices.
- All relevant project personnel will be informed of the addition.

A.6.3 Changes to the Operation

The change management system recognises three orders of changes:

a. First Order

A first order change is one that leads to a significant departure from the project described or the impacts assessed in the EIA and consequently require a reassessment of the environmental impacts associated with the change. Examples of first order change include:

- Drilling of more than six wells in the project area covered under this EIA;
- Drilling of well outside the block boundary;
- Increasing the crew size by over 100%.

Action required in this case will be that the environmental impacts of the proposed change will be reassessed by Prime Pakistan and sent to Sindh EPA for approval.

b. Second Order

A second order change is the one which does not result in project description or impacts that are significantly different from those in the EIA. Examples of second order changes include:

- Drilling of any proposed well in different block other than SW Miano-III block; and
- Increase in water requirement by more than 100%.

Action required for such change will be managed in such a way that Prime Pakistan's environmental representatives will reassess the impact of the activity on the environment and specify additional mitigation measures if required and report the changes to the Sindh EPA.

c. Third Order

A third order change is one that does not result in impacts above those already assessed in the EIA, rather these may be made on site to minimize the impact of an activity such as:

- Re-alignment of a particular road section or RoW for pipeline to avoid cutting of a tree; and
- One or all of the minimum distances specified in the EIA cannot be maintained only once or twice during the project activities.

The only action required for such changes will be to record the change in the Change Record Register.

A.7 Training Program

Environmental trainings will be a part of the continual environmental improvement program during construction and drilling operations. The training will be directed towards all personnel on following topics i.e. general environmental awareness, waste management, off road travel and biodiversity/species protection.

Table A-1: Mitigation Management Matrix for Drilling and Associated Construction Activities

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
1.	Changes in Landscape and Soil Erosion			
1.1	Well site area will be kept to a minimum required	Prime Pakistan, CC	Check compliance	After marking of the site layout on ground by the CC and prior to clearing of land at these areas
1.2	The construction of well site in leveled areas to minimize disturbance to soils and landscape shall be ensured	Prime Pakistan, CC	Location of well site in leveled area	Prior to site layout on ground
1.3	Existing access roads shall be used as much as possible. Development of new track lengths shall be avoided as much as possible	Prime Pakistan, CC	Monitor off-road travel and record non-compliances. Development & marking of access track during construction	During construction
1.4	The width of the improved track shall be kept at 5m, except at bends where safety considerations will dictate additional width	Prime Pakistan, CC	Randomly check the width of the improved access track	During construction
1.5	The access track shall be properly compacted at the time of construction and thereafter properly maintained by watering and compaction (where required) throughout the entire construction and drilling operation	Prime Pakistan, CC	Check compliance	Compaction during construction, dust emissions and loose sections of the track for the entire period of use of the track for this operation
1.6	Off-road travel shall be strictly prohibited and observance of this shall be monitored during the entire operation	Prime Pakistan, CC, DC	Advise all personnel, monitor any staff complaints and signs of off-road travel	During the entire operation

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
1.7	Vehicles speed shall be regulated and monitored to avoid excessive dust emissions	Prime Pakistan, CC, DC	Set speed limits, train drivers and monitor non-compliances	During the entire operation
1.8	Areas along the access track, well site and campsite shall be visually monitored and any area showing signs of soil erosion shall be watered and compacted	Prime Pakistan, CC	Check compliance	During drilling activities
1.9	Cutting of vegetation shall be kept to the minimum. Unnecessary clearing within the corridors along the access track or on the periphery of the well site shall be avoided	Prime Pakistan, CC, DC	Monitor land clearing activities	During construction activity
1.10	Movement of construction equipment shall be restricted to work areas only to avoid unnecessary disturbance to soils in the project area	Prime Pakistan, CC, DC	Monitor movement of vehicles and off-road travel	During construction activity
1.11	When tracks are to be used for obtaining water from water wells, the tracks shall be regularly sprinkled with water for dust suppression (where required)	Prime Pakistan, CC, DC	Sprinkling of water on access track to water wells	During the entire operation
1.12	During construction, a single track shall be identified and approved along sections of the main track on which work is in progress. Vehicles shall be allowed to travel only on the approved track	Prime Pakistan, CC	Check compliance	During construction activity
1.13	Dumping of gravel on or close to the access track being improved or constructed shall not be allowed	Prime Pakistan, CC	Gravel or sand dumping on access track	During construction activity
1.14	Access tracks (other than the main access track for the project) to be used by water tankers, dumper trucks and other vehicles shall be monitored by the HSEO	Prime Pakistan, CC	Check compliance	During construction activity

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
1.15	Periodic trainings shall be provided to drivers on mitigation measures related to off-road travel and speed limits	Prime Pakistan, CC, DC	Check training log, provide trainings	During the entire project
2.	Contamination of Soil and Water			
2.1	Approval to start of construction or drilling shall only be provided by HSEO after ensuring that all waste management facilities (waste segregation units, soak pits, septic tanks etc), equipment (waste bins, drip pans, tarpaulins, HDPE liner etc) and procedures (approvals for waste contractors etc) prescribed in the EIA are in a state acceptable to the HSEO	Prime Pakistan, CC, DC	Approval for waste contractor, waste management systems prior to start of work	Before construction and drilling activity
2.2	Combustible packaging wastes that have no re-use shall be stored temporarily onsite within designated waste segregation areas and sent to approved waste contractor for final disposal.	Prime Pakistan, CC, DC	Provision of sufficient waste bins, segregation of waste	During the entire operation
2.3	Dedicated waste segregation units/containers shall be built or placed at campsite and well site	Prime Pakistan, CC, DC	Construction and monitoring of waste segregation units	During entire project
2.4	Recyclable wastes including glass, tins and metal scrap shall be provided to approved waste contractor for recycling purposes	Prime Pakistan, CC, DC	HSEO to approve waste contractors. Monitor waste segregation and safe transportation to the recycling contractor's facility	During the entire operation

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
2.5	Waste oil shall be sent to Lube oil recycling companies for recycling	Prime Pakistan, CC, DC	HSEO to approve waste contractor and monitor safe transportation of the waste oil	During the entire operation
2.6	Clinical wastes shall be temporarily stored onsite separately in proper isolation and shall be transported offsite to the approved waste contractor for incineration	Prime Pakistan, CC, DC	HSEO to approve disposal arrangement. Monitor waste segregation and safe storage onsite. Further, Prime Pakistan waste disposal procedure will be implemented	During the entire operation
2.7	Wastes shall not be disposed of in the open	Prime Pakistan, CC, DC	Monitor during routine visits	During the entire operation
2.8	For collection of wastes at the well site and campsite adequate number of waste bins shall be provided with color coding	Prime Pakistan, CC, DC	Monitor provision of sufficient waste bins	During the entire operation
2.9	Grey water shall be collected in soak pits. In case soak pits get filled, wastewater shall be transferred from the site in tankers and disposed of into municipal drains nearest to the proposed working site with prior approval from the concerned authorities	Prime Pakistan, CC, DC	Check provision of soak pits and quality of wastewater	During the entire operation

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
2.10	Sewage generated from the toilets shall be collected and treated in septic tanks. The septic tanks shall be built of concrete and brick masonry to avoid leaching of wastewater from the tanks. The overflow from the tanks shall discharge into soak pits. In case the soak pits get filled the wastewater shall be transferred from the site in a tanker and disposed of into municipal drains in the nearest to the proposed working site with the prior approval from the concerned authorities	Prime Pakistan, CC, DC	Check provision of septic tank and soak pit. Monitor wastewater levels in the soak pits	During the entire operation
2.11	Soak pits shall be built in absorbent soil and located 300 m away from a perennial surface water source or a ground water well	Prime Pakistan, CC	Check soil condition and distance between the soak pits and the nearest water body	During design and construction
2.12	Soak pits shall be covered and constructed such that surface runoff cannot enter the pits	Prime Pakistan, CC, DC	Monitor provision of covers and berms	Provision of berms during construction and proper covers during the entire operation
2.13	Soil contaminated by minor spills/leakages (defined as leaks from vehicles, machinery, equipment or storage containers such that the area and depth of soil contaminated is less than 1 sq m and 3 inches respectively) shall sent to waste contractor for an appropriate disposal e.g. incineration or can be disposed in accordance to best industrial guidelines	Prime Pakistan, CC, DC	Monitor any oil leaks. Monitor disposal as per the requirements of the EIA	During the entire operation

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
2.14	Moderate spills defined as spills of volume less than or equal to 200 liters shall be contained and controlled using shovels, sands and native soil. These equipment and materials shall be made available at campsite and well site during the operation. The contaminated soil shall be excavated and stored in a bunded area lined with an impermeable base. Depending on the volume, the contaminated soil shall be sent to waste contractor for an appropriate disposal e.g. incineration, bioremediation or best industrial guidelines	Prime Pakistan, CC, DC	Ensure provision of equipment and material to control and handle such spills on site. Monitor disposal as per the requirements of the EIA	During the entire operation
2.15	Major spills (defined in the EIA as spills of volume much greater than 200 liters) will require initiation of Prime Pakistan's Emergency Response Procedures. These spills shall be handled and controlled according to the measures listed in Prime Pakistan's Oil Spill Contingency Plan and will require special treatment such as, thermal, chemical or bioremediation	Prime Pakistan, CC, DC	Ensure that Prime Pakistan's Emergency Response Procedures and Oil Spill Contingency Plan are available onsite. Ensure appropriate response is initiated at the time of such incident. HSEO to check that the plan is understood by all key personnel	During the entire operation
2.16	All fuel and oil storage areas shall have a concrete pad underneath to prevent soil contamination in case of leaks or spills	Prime Pakistan, CC, DC	Ensure provision of concrete pad	During construction activity
2.17	All fuel tanks shall be properly marked to highlight their contents	Prime Pakistan, CC, DC	Ensure that proper signs are placed with the tanks	During the entire operation

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
2.18	Fuel and oil storage areas shall have secondary containment in the form of concrete or brick masonry bunds. The volume of the containment area shall be equal to at least 125% of the total volume of fuel or oil stored	Prime Pakistan, CC, DC	Check containment volume of the bunded area	At the time of construction
2.19	During fuel and oil transfer operations such as re-fuelling drips and spills shall be avoided and drip pans/trays shall be used	Prime Pakistan, CC, DC	Ensure provision of drips pans/trays, provide training on safe re-fuelling practices, monitor oil or fuel stains	During the entire operation
2.20	Fuels tanks shall be daily checked for leaks and all such leaks shall be plugged immediately	Prime Pakistan, CC, DC	Inspect fuel tanks for leaks	During the entire operation
2.21	Shovels, plastic bags, and absorbent material shall be present near fuel and oil storage or handling areas to attend spills and leaks	Prime Pakistan, CC, DC	Monitor presence of materials and equipment	During the entire operation
2.22	Vehicles shall only be washed within designated areas within campsite. Mechanical maintenance works shall be done only in workshops	Prime Pakistan, CC, DC	Ensure provision of washing areas and maintenance workshops and monitor any non-compliances with the EIA requirement during routine monitoring	During the entire operation
2.23	Vehicles shall be daily checked for fuel or oil leaks. Vehicles with leaks shall not be operated until repaired	Prime Pakistan, CC, DC	Randomly inspect vehicles and designated parking areas	during the entire operation
2.24	Waste pits at the well site will be lined	Prime Pakistan, CC, DC	Monitor provision of liner	During construction activity

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
2.25	Chemicals used during the drilling operation will be stored on brick masonry pads with periphery drains discharging into the reserve pit	Prime Pakistan, CC	Ensure provision of brick masonry pads with drains	During construction activity
2.26	Produced formation fluids during testing will be flared along with the gas or collected inside the lined reserve pit. In case the fluids discharge into the flare pit the soil at the sides of the flare pit will be excavated and disposed of into the lined reserve pit at the well site. Formation fluids, drill cuttings and hazardous liquids can also be injected into injection and disposal wells. The tubing and casing of these wells shall be verified as per international standards.	Prime Pakistan, DC	Check compliance	Prior to and during disposal of waste fluids
2.27	A water based mud system will primarily be used for drilling operation	Prime Pakistan, DC	Check compliance	Planning stage
2.28	The drill cuttings and mud will be disposed into a pit reserve lined with an impermeable geo-membrane. The pit will be larger than the required capacity to accommodate overflows. At the time of restoration the pit will be backfilled with the cuttings encapsulated within the liner and with a top soil cover. The standards also require that the top of the burial cell must be at least five feet below ground level and the bottom of the burial cells must be five feet above seasonal high water table	Prime Pakistan, DC	Check compliance	During the entire operation and during restoration

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
2.29	Formation fluids, drill cuttings and hazardous liquids for final disposal can be injected into injection and disposal wells. The tubing and casing of these wells shall be verified as per international standards.	Prime Pakistan	Monitor compliance	During planing stage and after drilling activity
3.	Climate and Ambient Air Quality			
3.1	Generators and vehicles used during the operation shall be properly tuned and maintained to minimize air emissions and must be complied with SEQS	Prime Pakistan, CC, DC	Check maintenance logs	During the entire operation
3.2	Well site will be located at a safe distance, away from communities	Prime Pakistan, CC	Check distances of well site and campsite from communities	Prior to construction of well site and campsite
3.3	Dust emissions due to road travel shall be minimized by regulating vehicles speed and watering of the access track (where required)	Prime Pakistan, CC, DC	Set and monitor speed limits. Monitor sprinkling of access track	During the entire operation
3.4	Dust emissions during construction activities shall be minimized by good management practices such as locating stock piles out of the wind direction, keeping the height of the stock piles to a minimum, keeping earthwork areas damp etc	Prime Pakistan, CC	Monitor dust emissions during earthworks. Train CC on good management practices	During the construction operation
3.5	Flare pit will be kept downwind of the well site and at safe distance from the nearest community. The duration of flaring during well testing shall be kept to the minimum required	Prime Pakistan, CC, DC	Check location and distance of the flare pit from nearest community and monitor flaring	Prior to construction of the flare pit and during flaring

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
3.6	During construction levelling or widening along the access road will be done in sections, immediately followed by sprinkling of water and also preferably compaction (where required)	Prime Pakistan, CC	Access road construction	During construction activity
4.	Noise Pollution			
4.1	It shall be ensured that generators, vehicles and other potentially noisy equipment used are in good condition	Prime Pakistan, CC, DC	Monitor noise levels	Prior to use of machinery and vehicles
4.2	Noise levels at communities nearest to the well site, campsite and access tracks shall be monitored by HSEO. In case these are found to exceed safe acceptable limits appropriate mitigation shall be taken	Prime Pakistan	Monitor noise levels as part of the Effects Monitoring Program	Frequency of monitoring specified in the Effects Monitoring Program
4.3	Well site will be located at safe distance, away from nearest communities	Prime Pakistan, CC	Check distances from the community	Prior to construction of the well site and campsite
4.4	In areas with higher noise levels or longer shifts ear plugs and earmuffs will be provided to workers	Prime Pakistan, CC, DC	Identify areas and ensure provision of PPE	During the entire operation
4.5	The use of horns by project vehicles shall be minimized. The use of pressure horns shall not be allowed	Prime Pakistan, CC, DC	Train drivers, check vehicles and record non-compliances	During the entire operation
4.6	Movement of all project vehicles and personnel shall be restricted to within work areas only	Prime Pakistan, CC, DC	Advise all drivers, and investigate non-compliances from staff	During the entire operation
5.	Use of Water			

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
5.1	Water from surface water resources i.e. wetlands/springs etc will not be used for drilling operation	Prime Pakistan, CC, DC	Check compliance	During the entire operation
5.2	The quantity of water used during construction and drilling operation will be kept to the minimum required by taking prudent water conservation measures on site. A complete record of water consumption will be maintained	Prime Pakistan, CC, DC	Monitor water consumption, advise water conservation measures	During the entire operation
5.3	In case local water well has to be used, it will be approved by the HSEO. Water from these wells will only be used after ensuring that the available capacity at the well (safe yield minus local demand) is at least 50% greater than the project demand. Discharge from the water well will be regularly monitored to monitor any changes in the yield of the well.	Prime Pakistan, CC, DC	Approve waterwell, record abstraction of water	During the entire project
5.4	If a new water well is to be installed, the well will be located at least 300m from existing local wells and will be designed to abstract water preferably from deep aquifer not being used by local community/communities	Prime Pakistan, CC, DC	Approve waterwell, record abstraction of water	During the entire project
5.5	Marginally sweet water wells will be used for construction and drilling activities.	Prime Pakistan, CC, DC	Approve waterwell, record extraction of water	During the entire project
5.6	Appropriate/mutual agreed compensation for water utilized will be paid by the contractors to the owner of the water wells	Prime Pakistan, CC, DC	Ensure that proper compensation is being paid	During the entire project

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
6.	Blockage of Natural Drainage			
6.1	Area around the well site and campsites shall be landscaped to avoid blocking of natural drainage	Prime Pakistan, CC	Monitor landscaping and any obstruction caused to natural drainage	During the construction activity
7.	Site Restoration			
	Complete Restoration – Dry Well			
7.1	All equipment and machinery at the well site will be demobilized	Prime Pakistan, DC	Check compliance	During site restoration
7.2	All wastes at the well site will be disposed of according to the requirements of the EIA	Prime Pakistan, DC	Check compliance	During site restoration
7.3	Liner from the water and waste pits at the well site may be taken out and re-used or disposed of in the existing pits adopting restoration protocols	Prime Pakistan, CC	Check compliance	During site restoration
7.4	All concrete structures at the well site will be broken and either transported out of the project area or can be demolished and used for site restoration, sold, reuse or disposed of into the pits	Prime Pakistan, CC	Check compliance	During site restoration
7.5	All pits at the well site will be backfilled	Prime Pakistan, CC	Check compliance	During site restoration
7.6	The areas covered by the portion of the access track that will be of no use will be restored, in that all gravel topping will be removed. This scenario will be applicable only if the locals require the portions of the track to be restored or otherwise it will be left on the site on the consent of the locals	Prime Pakistan, CC	Check compliance	During site restoration
	Partial Restoration – Producing Well			

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
7.7	The well site and access roads will be retained to support well access work for further testing or during the development phase	Prime Pakistan	Check compliance	During site restoration
7.8	The outer chain link fence will be retained as a safety measure to keep wildlife away from the pit areas	Prime Pakistan	Check chain link fence is retained	During site restoration
7.9	The constructed pits area will be retained but all liquid and solid waste material will be removed from the site and disposed of in line with the requirements of this EIA	Prime Pakistan	Ensure that all liquid and solid waste is removed	During site restoration
8.	Clearing of Vegetation and Loss of Habitat			
8.1	Clearing of vegetation will be minimized by keeping the road width to 5m (except at bends where greater width will be required for safety reasons) and by keeping the length of new sections of the road to a minimum	Prime Pakistan, CC	Check compliance	During the construction activity
8.2	Off-road travel, required at sections of the road where construction work is in progress, will be minimized and if required will be allowed only after approval from HSEO	Prime Pakistan, CC, DC	Train drivers and investigate non-compliances	During the entire operation
8.3	During construction good management practices will be adopted to avoid disturbance to areas adjacent to work areas including the access track, well site and campsite	Prime Pakistan, CC,	Train construction supervisors, monitor construction activities	During construction operation
8.4	Well site and campsite areas will be kept to a minimum required	Prime Pakistan, CC,	Check compliance	After marking of the site layout on ground by the CC and prior to clearing of land at these areas

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
8.5	Campsite established for the purpose of construction will be located in existing clearing. Vegetation clearing from the site will be kept to a minimum as much as possible	Prime Pakistan, CC,	Supervise camp setup	During setup of the construction camps
8.6	Cuttings of trees will be strictly avoided as much as possible	Prime Pakistan, CC,	Supervise land clearing activities	During land clearing for the access track, well site and drilling campsite
8.7	Use of local vegetation as fuel will not be allowed	Prime Pakistan, CC,	Check compliance	During the entire operation
9.	Disturbance to Wildlife			
9.1	Prior to commencement of construction and drilling, awareness trainings will be provided to contractor's management and field crew on matters related to the wildlife protection	Prime Pakistan	Provide environmental awareness training	Before commencement of construction and drilling activity
9.2	Land uptake by well site, rig camp and access road will be minimized	Prime Pakistan, CC	Check compliance	After marking of the site layout on ground by the CC and prior to clearing of land at these areas
9.3	The total duration of construction and drilling will be minimized by good management practices	Prime Pakistan	Check compliance	During the entire operation for the time specified
9.4	All mitigation measures to minimize noise levels, dust emissions, air emissions and waste management required by the EIA will be adhered to	Prime Pakistan, CC, DC	Check compliance	During the entire operation
9.5	Food wastes will not be disposed of in the open or burnt at site. Food waste will be buried in a bury pit	Prime Pakistan, CC, DC	Monitor collection and disposal of food waste	During the entire operation
9.6	Construction work near areas which show small mammal and reptile populations will commence after a soft start up and will be randomly monitored	Prime Pakistan, CC,	Check compliance	During construction activity

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
9.7	Vehicles speed on access road will be controlled to avoid incidental mortalities of reptiles. Any such incident will be reported to the HSEO. Vehicles speed will be randomly checked	Prime Pakistan, CC, DC	Monitor speed limits	During the entire operation
9.8	Cutting of trees will be avoided as much as possible	Prime Pakistan, CC	Check compliance	During construction activity
9.9	Movement of all project personnel will be restricted to work areas only	Prime Pakistan, CC, DC	Check compliance	During entire operation
9.10	Movement of project vehicles will be restricted only to the project access road or to routes approved by the HSEO	Prime Pakistan, CC, DC	Check compliance	During the entire operation
9.11	All mitigation related to minimizing noise will be adhered with to avoid unnecessary disturbance to the wildlife of the area	Prime Pakistan, CC, DC	Check compliance	During the entire operation
9.12	Lights used at the well site and campsite will be kept to the minimum required	Prime Pakistan, CC, DC	Ensure that the EIA requirement are met	During the entire operation
9.13	Flaring during well testing will be done within enclosed ground burning flares rather than elevated flares, to minimize light, heat radiation and noise levels. The duration and intensity of flaring will be kept to the minimum required	Prime Pakistan, DC	Check compliance	During flaring activity
9.14	Hunting, trapping, killing, harassment or feeding of wildlife will not be allowed	Prime Pakistan, CC, DC	Check compliance	During the entire operation
10.	Socioeconomic, Archaeological and Cultural Environment			

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
10.1	Local sources of drinking water will not be exploited unless measures listed in water use mitigation measures are followed	Prime Pakistan, CC, DC	Monitor adherence with the requirement	During the entire operation
10.2	The access road will be watered regularly to minimize dust emissions (if required)	Prime Pakistan, CC, DC	Monitor water sprinkling	During the entire operation
10.3	Construction of by pass to all major settlements, and where necessary rerouting the access road so that a safe distances is maintained from a settlement	Prime Pakistan, CC	Check alignment of access routes	During construction activity
10.4	Drivers will be trained in responsible and safe driving practices, a speed limit shall be set and maintained in addition to vehicle logbooks will be maintained and inspected for compliance	Prime Pakistan, CC, DC	Provide training and monitor compliance	During the entire operation
10.5	Labour from local communities will be recruited equitably amongst the various tribes subject to company's competency criteria	Prime Pakistan, CC, DC	Monitor adherence with the requirement and maintain record of labour	During the entire operation
10.6	Use of local firewood for cooking by contractor staff to be prohibited	Prime Pakistan, CC, DC	Monitor adherence with the requirement	During the entire operation
10.7	The well site should be located at a distance of 500m (preferred) from residential communities. Thereby mitigating the effect of noise and emissions	Prime Pakistan, CC	Check compliance	Before construction activity
10.8	Generators and vehicles will be regularly maintained to minimize emissions	Prime Pakistan, CC, DC	Monitor air emissions	During the entire operation
10.9	If any land has to be acquired, distribution of compensation will be carried out on fast pace and with transparent manner	Prime Pakistan	Check compliance	During the entire operation
10.10	Project staff will respect cultural norms	Prime Pakistan, CC, DC	Check compliance	During the entire operation

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
10.11	Damage to any artifacts/local old sites during construction will be prohibited and construction activities near these areas will be monitored by HSEO	Prime Pakistan, CC	Check compliance	Before and during the construction activity
10.12	The road will be re-aligned to maintain safe distance from the edge of any graveyard and shrine (if any)	Prime Pakistan, CC	Check distance	Before and during construction
10.13	All community grievances will be addressed and mitigated accordingly	Prime Pakistan, CC, DC	Check compliance	During the entire operation
10.14	Prime Pakistan shall consider the reservations of Primary Stakeholder during the execution of the project as part of CSR	Prime Pakistan	Check compliance	During the entire operation

CC: Civil Contractor, DC: Drilling Contractor, **Prime Pakistan:** Prime Pakistan's Management, **HSEO:** Prime Pakistan's Health, Safety & Environment Officer

Table A-2: Mitigation Management Matrix for Laying of Pipeline/Tie-in Works

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
1.	Changes in Landscape and Soil Erosion			
1.1	Total land uptake during laying of pipeline will be kept to the minimum required, preferable within the existing clearing and levelled area	Prime Pakistan	Check compliance	After marking of the site layout on ground by the PC and prior to clearing of land at these areas
1.2	Existing levelled land in the project area may be used as a camp for the proposed project activities	Prime Pakistan	Check compliance	After marking of the site layout on ground by the PC
1.3	Good engineering practices will be adopted during construction activities to ensure that unnecessary clearing of vegetation and disturbance to soils outside work areas are avoided	Prime Pakistan, PC	Supervision of project activities	During entire project
1.4	Topsoil of the RoW will be separately stored. This topsoil will be backfilled after proper compaction ensuring minimum loss of topsoil	Prime Pakistan, PC	Check compliance	During excavation and backfilling
1.5	During activity, movement of heavy machinery/equipment will be restricted to work areas only to avoid unnecessary disturbance to soils in the project area	Prime Pakistan, PC	Check compliance	During entire project
1.6	Clearing of vegetation (especially dense vegetation) will be minimized by careful selection of pipeline alignment	Prime Pakistan, PC	Identify pipeline alignment	During site selection
1.7	Off-road travel will be strictly prohibited and observance of this will be monitored during the operation	Prime Pakistan, PC	Monitor off-road travel	During entire project

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
1.8	Vehicles speed will be regulated and monitored to avoid excessive dust emissions	Prime Pakistan, PC	Monitor vehicles speed	During entire project
1.9	Periodic trainings will be provided to drivers on mitigation measures related to off-road travel and speed limits	Prime Pakistan, PC	Check training record	During entire project
1.10	Prime Pakistan will monitor the access tracks (other than the main access track for the project) to be used by water tankers, dumper trucks and other vehicles	Prime Pakistan	Check compliance	During construction phase
1.11	Photographs will be taken at intervals throughout the project activities to monitor any changes on soil and its conditions	Prime Pakistan, PC	Check photographic record	During project execution phase
2.	Soil and Water Contamination			
2.1	Approval to start of construction of pipeline shall only be provided by HSEO after ensuring that all waste management facilities (waste segregation units, soak pits, septic tanks etc.), equipment (waste bins, drip pans, tarpaulins etc.) and procedures (approvals for waste contractors etc.), prescribed in the EIA are in a state acceptable to the HSEO	Prime Pakistan, PC	Approval for waste contractors, check provision of waste management facilities	Before start of project activity
2.2	Septic tank and soak pits shall be provided in base camp to collect and treat wastewater	Prime Pakistan, PC	Check provision of septic tank and soak pit	During the construction activity
2.3	Septic tank and soak pits will be covered properly to avoid any bad smell or environmental nuisance in surrounding areas	Prime Pakistan, PC	Check compliance	During the entire operation

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
2.4	The septic tanks shall be built of concrete and brick masonry to avoid leaching of wastewater from the tanks	Prime Pakistan, PC	Check compliance	During the construction activity
2.5	Wastewater from laundry, kitchen washings, and showers will be disposed of into separate soak pits	Prime Pakistan, PC	Check provision of soak pits	During the construction activity
2.6	Soak pits will be built in absorbent soil and located 300 m away from a perennial surface water source or water well	Prime Pakistan, PC	Check soil condition and distance between the soak pits and the nearest water body	During the construction activity
2.7	Soak pits shall be covered and constructed such that surface runoff cannot enter the pits. Soak pits will be designed to accommodate wastewater generated during the total duration of the operation	Prime Pakistan, PC	Check design of the soak pit and monitor construction. Monitor provision of covers and berms	During the construction activity
2.8	Sprinkling of wastewater shall not be allowed	Prime Pakistan, PC	Ensure compliance	During entire operational phase
2.9	Sprinkling of sewage will not be allowed. In case the soak pits get filled the excess wastewater will be disposed of into the nearest municipal drains with the prior approval of concerned authorities	Prime Pakistan, PC	Check compliance during routine visits	During construction and operation phase
2.10	No solid waste will be disposed of in the field. Within the construction camp for laying of pipeline all solid wastes will be disposed of in waste bins provided	Prime Pakistan, PC	Monitor provision of sufficient waste bins	During construction and commissioning phase

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
2.11	All combustible material will be handed over to approved waste contractor for appropriate disposal. No burning of waste will be done during the construction and operation phase of the project	Prime Pakistan, PC	Check compliance	During construction and commissioning phase
2.12	Non-combustible waste including plastic or glass bottles and cans will be temporarily stored on site and sold/handed over to a waste/recycling contractor who will utilise these wastes for recycling purposes	Prime Pakistan, PC	HSEO to approve waste contractors. Monitor waste segregation and safe transportation to the recycling contractor's facility	During construction and commissioning phase
2.13	At the time of restoration, septic tanks will be dismantled in place and backfilled with at least 1 m of soil cover above the surrounding natural surface level	Prime Pakistan, PC	Monitor restoration activity	At the time of restoration
2.14	At the time of restoration, soak pits will be backfilled with at least 1 m of soil cover above the surrounding natural surface level	Prime Pakistan, PC	Monitor restoration activity	At the time of restoration
2.15	Clinical wastes will be temporarily stored onsite separately and incinerated at nearest hospital or a similar facility	Prime Pakistan, PC	HSEO to approve disposal arrangement. Monitor waste segregation and safe storage onsite	During construction and commissioning phase

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
2.16	The soil contaminated from minor spill/leakages (defined as leaks from vehicles, machinery, equipment or storage containers such that the area and depth of soil contaminated is less than 1 sq ft and 3 inches respectively) will be removed and properly buried in such a manner that it does not contaminate the surrounding soils or groundwater	Prime Pakistan, PC	Monitor compliance	During construction and commissioning phase
2.17	Moderate spills (defined as spills of volume less than or equal to 200 liters) shall be contained and controlled using shovels, sands and native soil. These equipment and materials shall be made available at construction campsite, laying of pipeline and during the operation. The contaminated soil shall be excavated and stored in a bunded area lined with an impermeable base. Depending on the volume, the contaminated soil shall be either disposed of by handing over to approved waste contractor or by specialized treatment such as bioremediation	Prime Pakistan, PC	Ensure provision of equipment and material to control and handle such spills on site. Monitor disposal as per the requirements of the EIA	During construction and commissioning phase

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
2.18	Major spills (defined in the EIA as spills of volume much greater than 200 liters) will require initiation of Prime Pakistan's Emergency Response Procedures. These spills shall be handled and controlled according to the measures listed in Prime Pakistan's Oil Spill Contingency Plan and will require special treatment such as bioremediation	Prime Pakistan, PC	Ensure that Prime Pakistan Emergency Response Procedures and Oil Spill Contingency Plan are available onsite. Ensure appropriate response is initiated at the time of such incident. HSEO to check that the plan is understood by all key personnel	During construction and commissioning phase
2.19	All fuel and oil storage areas shall have a concrete pad underneath to prevent soil contamination in case of leaks or spills	Prime Pakistan, PC	Ensure provision of concrete pad	During construction phase
2.20	All fuel tanks should be properly marked to highlight their contents	Prime Pakistan, PC	Ensure that proper signs are placed with the tanks	During construction and commissioning phase
2.21	Fuel and oil storage areas shall have secondary containment in the form of concrete or brick masonry bunds. The volume of the containment area shall be equal to at least 125% of the total volume of fuel or oil stored	Prime Pakistan, PC	Check containment volume of the bunded area	At the time of construction
2.22	A spill prevention and contingency plan will be prepared to deal with moderate and major spills	Prime Pakistan, PC	Study and examine the plan and identify any flaws before its approval	Before the commencement of project

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
2.23	During fuel and oil transfer operations such as re-fuelling, drips and spills shall be avoided and drip pans should be used	Prime Pakistan, PC	Ensure provision of drips pans, provide training on safe re-fuelling practices, monitor oil or fuel stains	During construction and commissioning phase
2.24	Fuels tanks shall be daily checked for leaks and all such leaks should be plugged immediately	Prime Pakistan, PC	Inspect fuel tanks for leaks	During construction and commissioning phase
2.25	Used oil will be provided to approved waste contractor by the HSEO where it will be recycled	Prime Pakistan, PC	HSEO to approve waste contractor and monitor safe transportation of the waste oil	During construction and commissioning phase
2.26	Shovels, plastic bags, and absorbent material shall be present near fuel and oil storage or handling areas to attend spills and leaks	Prime Pakistan, PC	Monitor presence of materials and equipment	During construction and commissioning phase
2.27	Vehicles will only be washed within designated areas within campsite. Mechanical maintenance works shall be done only in workshops	Prime Pakistan, PC	Ensure provision of washing areas and maintenance workshops and monitor any non-compliances with the EIA requirement during routine monitoring	During construction and commissioning phase
2.28	Vehicles shall be daily checked for fuel or oil leaks. Vehicles with leaks should not be operated until repaired	Prime Pakistan, PC	Randomly inspect vehicles and designated parking areas	During construction and commissioning phase

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
2.29	Water used for cleaning and hydro-testing of pipeline will be collected in lined pits where it will evaporate with time or drained into the nearest drainage channel with the prior approval of concerned authorities. The residual sludge or solids and the liner will be disposed of following best industrial practices	Prime Pakistan, PC	Check compliance	During operation and site restoration
3.	Climate and Ambient Air Quality			
3.1	Generators, vehicles, machinery and other equipment used during the operation will be properly tuned and maintained to minimize air emissions	Prime Pakistan, PC	Check maintenance logs	During construction and commissioning phase
3.2	Dust emissions due to road travel shall be minimized by regulating vehicles speed and watering of the access track (where applicable)	Prime Pakistan, PC	Set and monitor speed limits. Monitor sprinkling of access track	During construction and commissioning phase
3.3	Dust emissions during construction/laying activities shall be minimized by good management practices such as locating stock piles out of the wind direction, keeping the height of the stock piles to a minimum, keeping earthwork areas damp etc.	Prime Pakistan, PC	Monitor dust emissions during earthworks. Train PC on good management practices	During the construction phase
3.4	Comply with minimum safe distances from environmental receptors recommended in the EIA study	Prime Pakistan, PC	Check location and distance of project facilities	Prior to construction of activity

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
3.5	All combustible material will be handed over to approved waste contractor for appropriate disposal. No burning of waste will be done during the construction and operation phase of the project.	Prime Pakistan, PC	Check compliance	During entire project
3.6	During construction, emissions from all point sources and ambient air quality should be monitored to check compliance with SEQS	Prime Pakistan, PC	Monitor emissions from all point sources and ambient air quality	During construction and commissioning phase
4.	Noise Pollution			
4.1	During project activities generators, vehicles, machinery and other equipment will be maintained in a good condition to ensure that noise from them is kept to a minimum level.	Prime Pakistan, PC	Monitor noise levels	During construction and commissioning phase
4.2	Noise levels at communities nearest to the campsite, access track and pipeline alignment route will be monitored. In case these are found to exceed SEQS limits appropriate mitigation shall be taken.	Prime Pakistan, PC	Monitor noise levels as part of the Effects Monitoring Program	During construction and commissioning phase
4.3	Generators will be kept within enclosures to minimize dispersion of noise	Prime Pakistan, PC	Check provision of enclosure	During construction and commissioning phase
4.4	The use of horns by project vehicles will be minimized. The use of pressure horns shall not be allowed	Prime Pakistan, PC	Train drivers, check vehicles and record non-compliances	During construction and commissioning phase
4.5	Movement of all project vehicles and personnel will be restricted to within work areas only	Prime Pakistan, PC	Advise all drivers and investigate non-compliances from staff	During construction and commissioning phase

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
4.6	Noise from sand blasting activity will be minimized by applying controlled blasting protocols	Prime Pakistan, PC	Check compliance	During construction phase
5.	Use of Water			
5.1	Water from surface water bodies e.g. wetlands, streams and springs will be abstracted for project use after approval from concerned authorities	Prime Pakistan, PC	Check compliance	During construction and commissioning phase
5.2	The quantity of water used during pipeline construction phase will be kept to the minimum. A complete record of water consumption will be maintained	Prime Pakistan, PC	Monitor water consumption, check records and advise water conservation measures	During construction and commissioning phase
5.3	The use of brackish water will be maximised wherever possible	Prime Pakistan, PC	Check compliance	During the entire project
5.4	Contamination of surface and groundwater resources will be avoided	Prime Pakistan, PC	Check compliance	During the entire project
5.5	The use of new water wells installed by Prime Pakistan for community benefits will be allowed	Prime Pakistan, PC	Check Compliance	During the construction phase

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
5.6	Water from a local water well will only be used after ensuring that the available capacity at the water well (safe yield minus local demand) is at least 50% greater than the project demand. Discharge from the tube well will be regularly monitored to monitor any changes in the yield of the wells. If a single well fails to meet this requirement, water will be obtained from multiple wells such that each well meets the above-mentioned requirement	Prime Pakistan, PC	Check local demand and water abstraction	During the construction phase
5.7	Appropriate/mutual agreed compensation for water utilized will be paid by the contractors to the owner of the water wells	Prime Pakistan, PC	Ensure justified compensations	During construction and commissioning phase
6.	Blockage of Natural Drainage			
6.1	Area around the campsite and RoW alignment shall be landscaped to avoid blocking of natural drainage	Prime Pakistan, PC	Monitor landscaping and any obstruction caused to natural drainage	During the construction activity
6.2	Natural pathways of drainage will not be disrupted during laying of pipeline	Prime Pakistan, PC	Check Compliance	During the construction activity
6.3	Culverts shall be provided on water channels if intervened in the RoW of pipeline	Prime Pakistan, PC	Check Compliance	During the construction activity
7.	Clearing of Vegetation and Loss of Habitat	Prime Pakistan, PC		
7.1	Land area requirements for pipeline laying will be kept to the minimum required	Prime Pakistan, PC	Check area of campsite	Before construction activity
7.2	Off-road travel will be minimized and avoided as much as possible	Prime Pakistan, PC	Monitor movement of vehicles	During construction and commissioning phase

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
7.3	During construction movement of construction equipment will be restricted to work areas only to avoid unnecessary disturbance to soils and vegetation in the project area	Prime Pakistan, PC	Check compliance	During construction activity
7.4	The access track will be properly compacted and thereafter properly maintained throughout the entire operational life	Prime Pakistan, PC	Monitor compaction of access track	During construction and commissioning phase
7.5	Vehicles speed will be regulated and monitored to avoid excessive dust emissions	Prime Pakistan, PC	Regulate and monitor vehicles speed	During construction and commissioning phase
7.6	Periodic trainings will be provided to drivers on mitigation measures related to off-road travel and speed limits	Prime Pakistan, PC	Provide training to drivers	During construction and commissioning phase
7.7	Good engineering practices will be adopted during construction activities to ensure that unnecessary clearing of vegetation outside work areas is avoided	Prime Pakistan, PC	Train construction supervisors, monitor construction activities	During construction phase
7.8	Cuttings of trees will be avoided as much as possible	Prime Pakistan, PC	Check compliance	During construction phase
7.9	Use of local vegetation as fuel will not be allowed	Prime Pakistan, PC	Check compliance	During construction phase
8.	Disturbance to Wildlife			
8.1	Prior to commencement of the project, awareness trainings will be provided to contractor's management and field crew on matters related to the requirements of the EMP in this regard	Prime Pakistan, PC	Provide environmental awareness training	Before commencement of construction

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
8.2	Land uptake for RoW of pipeline will be minimized	Prime Pakistan, PC	Check compliance	After marking of the site layout on ground by the PC and prior to clearing of land at these areas
8.3	The total duration of construction phase will be minimized by good management practices	Prime Pakistan, PC	Check compliance	During the entire operation for the time specified
8.4	All mitigation measures to minimize noise levels, dust emissions, air emissions, and waste management required by the EIA will be adhered to	Prime Pakistan, PC	Check compliance	During construction and commissioning phase
8.5	Food wastes will not be disposed of in the open. Food wastes collected in waste segregation units and will be disposed of according to waste disposal procedure on a regular and strict basis as advised by the HSEO	Prime Pakistan, PC	Monitor collection and disposal of food waste	During construction and commissioning phase
8.6	Construction work near areas which show small mammal and reptile populations will commence after a soft start up and will be randomly monitored	Prime Pakistan, PC	Check compliance	During construction activity
8.7	Vehicles speed on access road will be controlled to avoid incidental mortalities of reptiles. Any such incident will be reported to the HSEO. Vehicles speed will be randomly checked	Prime Pakistan, PC	Monitor speed limits	During construction and commissioning phase
8.8	Cutting of trees/bushes will be avoided as much as possible	Prime Pakistan, PC	Check compliance	During Construction activity
8.9	Movement of all project personnel will be restricted to work areas only	Prime Pakistan, PC	Check compliance	During construction and operation phase

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
8.10	Movement of project vehicles will be restricted only to the project access road or to routes approved by the HSEO	Prime Pakistan, PC	Check compliance	During the entire project
8.11	All mitigation related to minimizing noise will be adhered with	Prime Pakistan, PC	Check compliance	During construction and commissioning phase
8.12	Lights used at the campsite will be kept to the minimum required	Prime Pakistan, PC	Check compliance	During installation of lights
8.13	Hunting, trapping, killing, feeding or harassment of wildlife will not be allowed	Prime Pakistan, PC	Check compliance	During construction and operation phase
9.	Socioeconomic, Archaeological and Cultural Environment			
9.1	Local sources of drinking water will not be over exploited	Prime Pakistan, PC	Monitor adherence with the requirement	During construction and operation phase
9.2	The access road will be watered regularly to minimize dust emissions where required	Prime Pakistan, PC	Monitor water sprinkling	During construction and operation phase
9.3	Drivers will be trained in responsible and safe driving practices; safe speed limits for vehicles will be followed	Prime Pakistan, PC	Provide training and monitor compliance	During construction and operation phase
9.4	Strict compliance will be observed with Prime Pakistan HSE guidelines	Prime Pakistan, PC	Ensure compliance	During construction and operation phase
9.5	Labour from local communities will be recruited equitably amongst the various tribes, avenues for conflict resolution will be open, and the employment procedures will be transparent	Prime Pakistan, PC	Monitor adherence with the requirement and maintain record of labour	During construction and operation phase

No.	Impact and Mitigation Measures	Responsibility/Execution	Action/Monitoring Parameter/ Monitoring Method	Timing
9.6	For the operation phase a long-term employment and skill development policy will be made and implemented	Prime Pakistan, PC	Check compliance	During operation phase
9.7	Use of local wood for cooking by the contractor staff will be prohibited	Prime Pakistan, PC	Monitor adherence with the requirement	During construction and operation phase
9.8	If any land has to be acquired, distribution of compensation will be carried out in transparent manner	Prime Pakistan, PC	Check compliance	Before construction phase
9.9	All mitigation measures related to waste management; minimizing air emissions and noise recommended in the EIA shall be adhered with	Prime Pakistan, PC	Check compliance	During construction and operation phase
9.10	Project staff will respect cultural norms	Prime Pakistan, PC	Check compliance	During construction and operation phase
9.11	Confidence of local community will be gained through gender sensitive and balanced community development initiatives	Prime Pakistan, PC	Ensure that community development initiatives are taken	During construction and operation phase
9.12	All community grievances will be addressed and mitigated accordingly	Prime Pakistan, PC	Check compliance	During construction and operation phase
9.13	Prime Pakistan shall consider the reservations of Primary Stakeholder during the execution of the project as part of CSR	Prime Pakistan, PC	Check compliance	During construction and operation phase

PC: Pipeline/Project Contractor, **Prime Pakistan:** Prime Pakistan Management, **HSEO:** Prime Pakistan's Health Safety & Environment Office

Table A-3: Proposed Environmental Monitoring Plan for Drilling and Associated Development Activities

Environment Component	Monitoring Locations	Parameters	Frequency	Responsibility	Documentation
Exhaust and Emissions Monitoring	Vehicles, Generators & Fuel operated Machinery	CO, Smoke, Noise for vehicle, CO, NO _x , SO _x , PM for engines/generator	Once during the project	Contractor/Prime Pakistan	Laboratory test reports
Wastewater	Campsite	Effluent Flow, Temperature, pH, TDS, TSS, COD, BOD ₅ , Oil & Grease, Chloride & Phenolic Compounds	Quarterly (if wastewater discharged into any nullah)	Contractor/Prime Pakistan	Laboratory test reports
Noise Level	Boundaries of the well and camp sites	Noise level (dbA)	Once in a project during construction and drilling operations (when work is started)	Contractor/Prime Pakistan	Internally / externally
Solid Waste	Project Site	Solid waste collection, storage, transportation and disposal	During routine monitoring	Contractor/Prime Pakistan	Complete waste generation record, waste disposal record & disposal certificate
Drilling Mud	Drilling Site	Collection, storage, transportation and disposal	During routine monitoring	Contractor/ Prime Pakistan Site Incharge/ HSE Monitor	Complete record
Occupational Safety	Survey sites, campsite, project roads	HSE Records, Incidents and injuries	During routine monitoring	Contractor/Prime Pakistan	Record of observations

Table A-4: Recommended Distance from Environmental Receptors during Proposed Project Activities

Area/Facility	Distance (m)		
	Community	Community Water Well	Archaeological or Cultural Site
Well site	500	300	300
Rig camp	500	300	300
Construction camp	500	100	300
RoW of pipeline	100	100	50
Soak pits	N.A	300 from ground/surface water resources	N.A

Note: Minimum distances of various project activities from environmental receptors (not mentioned in this table) will be decided during project execution phase.

Appendix B

Environmental Monitoring Checklists

Checklist for Vehicles

No	Description	Status	Additional Comments
1.	Are the vehicles maintained and inspected regularly?	☐ Yes ☐ No	
2.	Are the oil, fuel and other leaks from the vehicles immediately attended to?	☐ Yes ☐ No	
3.	Are the vehicles with leaks being operated?	☐ Yes ☐ No	
4.	Has there been any spillage during vehicle re-fueling or maintenance?	☐ Yes ☐ No	
5.	If yes, have recommended mitigation measures been adhered to?	☐ Yes ☐ No	
6.	Are the vehicles being washed or serviced in the field?	☐ Yes ☐ No	
7.	Are the vehicles being washed in designated areas having concrete pad and waste water collection pits?	☐ Yes ☐ No	
8.	Is vehicle related waste, such as oils, filters, old tires or parts are left lying around?	☐ Yes ☐ No	
9.	Is vehicle related waste, such as oils, filters, old tires or parts being disposed of properly?	☐ Yes ☐ No	
10.	Are the vehicles emitting excessive smoke?	☐ Yes ☐ No	
11.	Do the potentially noisy vehicles have properly functioning silencers (mufflers)?	☐ Yes ☐ No	
12.	Do all vehicles have provision for containers/trash bags to store trash/refuse?	☐ Yes ☐ No	
13.	Are Prime Pakistan's HSE guidelines being followed?	☐ Yes ☐ No	
14.	Have all other mitigations measures specified in the EIA been adhered to?	☐ Yes ☐ No	

Name _____ Signature _____

Date _____

Additional Comments

Checklist for Camp Establishment

No.	Description	Status	Additional Comments
1.	Has the new campsite been selected in consultation with HSEO?	☐ Yes ☐ No	
2.	Have photographs been taken to record the pre-camping conditions?	☐ Yes ☐ No	
3.	Has the new campsite been selected in existing clearings and on leveled land?	☐ Yes ☐ No	
4.	Has the new campsite been selected at 500 meters away from any communities?	☐ Yes ☐ No	
5.	Has the new campsite been selected 300 meters from any surface water resource?	☐ Yes ☐ No	
6.	Has any vegetation been cleared?	☐ Yes ☐ No	
7.	If yes, is the vegetation loss significant?	☐ Yes ☐ No	
8.	If yes, have the mitigation measures specified in the EIA been adhered with?	☐ Yes ☐ No	
9.	Has the top soil been damaged significantly or root stock destroyed?	☐ Yes ☐ No	
10.	Have the trees or bushes been used as fuel wood?	☐ Yes ☐ No	
11.	Have any trees been cut?	☐ Yes ☐ No	
12.	Has the natural drainage been disturbed or blocked?	☐ Yes ☐ No	
13.	Does the new campsite have a septic system comprising of septic tank and soak pit?	☐ Yes ☐ No	
14.	Have the soak pits for laundry, kitchen and showers been built?	☐ Yes ☐ No	
15.	Have the soak pits been built in absorbent soil?	☐ Yes ☐ No	
16.	Have the soak pits (where required) been built down-slope from the camp?	☐ Yes ☐ No	
17.	Have the soak pits been designed to accommodate waste water generated during the total duration of the operation?	☐ Yes ☐ No	
18.	Are the soak pits within 300 meters of any surface water source or a ground water well?	☐ Yes ☐ No	
19.	Can Surface water enter the soak pits?	☐ Yes ☐ No	
21.	Have all other mitigations measures specified in the EIA been adhered to?	☐ Yes ☐ No	

22. Are Prime Pakistan's HSE guidelines being followed? ☐ Yes ☐ No

Name _____ Signature _____

Date _____

Additional Comments

Checklist for Camp Operations

No.	Description	Status	Additional Comments
1.	Has any vegetation been cleared or damaged?	☐ Yes ☐ No	
2.	Have bushes or trees been used as fuel wood?	☐ Yes ☐ No	
3.	Is water drawn from a local water source?	☐ Yes ☐ No	
4.	If yes to point 3, has the yield and demand been determined to ensure there is enough to meet the requirements of the locals?	☐ Yes ☐ No	
5.	If yes to point 3, is water well discharge(s) being checked and recorded on a regular basis?	☐ Yes ☐ No	
6.	Has the natural drainage been disturbed?	☐ Yes ☐ No	
7.	Are the fuels and oils handled in a safe manner, ensuring no leakage or spillage?	☐ Yes ☐ No	
8.	Are the soak pits being constructed 300 meters away from a surface water source or ground water well?	☐ Yes ☐ No	
9.	Has any surface water entered the soak pits?	☐ Yes ☐ No	
10.	In case the soak pits get filled during the operation, has the grey water been sprinkled?	☐ Yes ☐ No	
11.	Has arrangements for the transportation of grey water to the municipal drains been in place, incase water is not soaking?	☐ Yes ☐ No	
12.	Are there enough waste bins around the camp?	☐ Yes ☐ No	
13.	Are the waste bins emptied on a regular basis?	☐ Yes ☐ No	
14.	Is food waste disposed in the open?	☐ Yes ☐ No	
15.	Is the combustible waste been given to approved waste contractor?	☐ Yes ☐ No	
16.	Is the non-combustible waste being sent to the approved waste contractor(s)?	☐ Yes ☐ No	
17.	Is clinical waste being stored separately at the campsite?	☐ Yes ☐ No	
18.	Is clinical waste being disposed of properly i.e., incinerated?	☐ Yes ☐ No	
19.	Are water consumption figures being maintained?	☐ Yes ☐ No	
21.	Are Prime Pakistan's HSE guidelines being followed?	☐ Yes ☐ No	
22.	Have requirements of the EIA been adhered to?	☐ Yes ☐ No	

Name _____ Signature _____

Date _____

Additional Comments

Checklist for Road Travel

No.	Description	Status	Additional Comments
1.	Is the number of routes kept to a minimum?	☐ Yes ☐ No	
2.	Are the existing routes being used to access the project site?	☐ Yes ☐ No	
3.	Have new access routes been developed?	☐ Yes ☐ No	
4.	If yes, have requirements of the EIA been adhered to?	☐ Yes ☐ No	
5.	Are short cuts been used?	☐ Yes ☐ No	
6.	Has vegetation clearing been minimized?	☐ Yes ☐ No	
7.	Has off-road travel been observed?	☐ Yes ☐ No	
8.	Is vehicle speed limit being followed?	☐ Yes ☐ No	
9.	Are heavily traveled routes watered (where required) on a daily basis to minimize dust?	☐ Yes ☐ No	
10.	Are the drivers careful and watchful about wild and domestic animals?	☐ Yes ☐ No	
11.	Has any natural drainage been disturbed or altered?	☐ Yes ☐ No	
12.	Is any soil erosion observed?	☐ Yes ☐ No	
13.	If yes, have the mitigation measures been adhered to?	☐ Yes ☐ No	
14.	Is the use of horns avoided as far as possible?	☐ Yes ☐ No	
15.	Are pressure horns being used?	☐ Yes ☐ No	
16.	Do the vehicles carry adequate containers/trash bags for litter/garbage and are they emptied at the campsite or other designated location regularly?	☐ Yes ☐ No	
17.	Are there any damages caused by project activities to local roads or other infrastructure (where applicable)?	☐ Yes ☐ No	
18.	Are Prime Pakistan's HSE guidelines being followed?	☐ Yes ☐ No	

Name _____ Signature _____
Date _____

Additional Comments

Checklist for Fuels, Oils and Chemicals

No.	Description	Status	Additional Comments
1.	Do the fuel storage facilities have adequate secondary containment up to 125% capacity in case of leakage or spillage?	☐ Yes ☐ No	
2.	Is there any other combustible or flammable material in the fuel storage area?	☐ Yes ☐ No	
3.	Is regular inspection carried out to check leaks and spills?	☐ Yes ☐ No	
4.	Have the entire oil and fuel storage and transfer areas provided with concrete floor underneath to prevent soil contamination from leaks or spills?	☐ Yes ☐ No	
5.	Are the fuel tanks properly marked with their contents?	☐ Yes ☐ No	
6.	Are the fuel transfer arrangements protected against spills?	☐ Yes ☐ No	
7.	Are the drip trays being used?	☐ Yes ☐ No	
8.	Are tarpaulin sheets placed under equipment and fuel containers that have the potential to spill or drip fuels, oils or chemicals?	☐ Yes ☐ No	
9.	Is the fuel transfer operation being supervised?	☐ Yes ☐ No	
10.	Are the spills and leaks thoroughly cleaned?	☐ Yes ☐ No	
11.	Are the spilled oil or fuel and used clean-up material being disposed properly?	☐ Yes ☐ No	
12.	Are the spills and leaks reported and recorded?	☐ Yes ☐ No	
13.	Is contaminated soil being removed or covered following proper clean-up procedures?	☐ Yes ☐ No	
14.	Is the emergency response plane available on site?	☐ Yes ☐ No	
15.	Is the Prime Pakistan's emergency response plan being followed for spills and leaks (moderate or major spills and leaks)?	☐ Yes ☐ No	
16.	Has all the mitigation measures suggested in the EIA been adhered to?	☐ Yes ☐ No	
17.	Are Prime Pakistan's HSE guidelines being followed?	☐ Yes ☐ No	

Name _____

Signature _____

Date _____

Additional Comments

General Environmental Checklist

No.	Description	Status	Additional Comments
1.	Are activities taking place in agricultural or grazing areas?	☐ Yes ☐ No	
2.	Are contractor staff informing village leaders of location and timing of all major activities?	☐ Yes ☐ No	
3.	If yes, are these damages being compensated?	☐ Yes ☐ No	
4.	Are the cultural norms being respected by the project staff?	☐ Yes ☐ No	
5.	Has off sets been provided from sites of religious or cultural significance? (If found)	☐ Yes ☐ No	
6.	Is trash, wrappers, shopping bags, paper, cans, bottles or any other kind of litter being left out in the open?	☐ Yes ☐ No	
7.	Is the HSEO immediately notified of any wildlife sightings and are the sightings logged?	☐ Yes ☐ No	
8.	Is the “no hunting, no harassment, no trapping, no trapping, no killing” policy strictly enforced?	☐ Yes ☐ No	
9.	Are any archeological sites or places of cultural or religious significance disturbed?	☐ Yes ☐ No	
10.	Has all the mitigation measures suggested in the EIA been adhered to?	☐ Yes ☐ No	
11.	Are Prime Pakistan’s HSE guidelines being followed?	☐ Yes ☐ No	

Name _____ Signature _____

Date _____

Additional Comments

Checklist for Restoration and Rehabilitation

No.	Description	Status	Additional Comments
General			
1.	Have the erosion control measures been taken where needed?	☐ Yes ☐ No	
2.	Has the contaminated soil been removed and disposed of appropriately?	☐ Yes ☐ No	
3.	Have the sites been inspected to ensure the recommended restoration measures have been strictly adhered to?	☐ Yes ☐ No	
For Campsite(s), Access route			
1.	Have the camping sites been restored as close as possible to the original condition?	☐ Yes ☐ No	
2.	Have the campsites been cleaned, leaving no refuse or wastes behind?	☐ Yes ☐ No	
3.	Have the routes been restored as close as possible to the original condition?	☐ Yes ☐ No	
4.	Have all the soak pits and septic tanks been backfilled with an extra cap of 1 meter soil on top to cater compaction?	☐ Yes ☐ No	
5.	Are Prime Pakistan's HSE guidelines being followed?	☐ Yes ☐ No	

Name _____ Signature _____

Date _____

Additional Comments

Checklist for Laying of Flow Line

No.	Description	Status	Additional Comments
1.	Has the cutting along the slopes been minimized?	☐ Yes ☐ No	
2.	Has the width of RoW been limited to 50 ft to minimize clearing of vegetation and disturbance to soil?	☐ Yes ☐ No	
3.	Has the clearing of dense patches of vegetation been avoided?	☐ Yes ☐ No	
4.	Has clearing for RoW blocked the natural drainage?	☐ Yes ☐ No	
5.	Is tree cutting being minimized?	☐ Yes ☐ No	
6.	Were any trees felled?	☐ Yes ☐ No	
7.	Were any trees or bushes burnt or disposed of?	☐ Yes ☐ No	
8.	Are communities informed before commencing the activity close to the settlements?	☐ Yes ☐ No	
9.	Has soil erosion been observed as a result of the construction activities?	☐ Yes ☐ No	
10.	Has topsoil of the RoW been stored separately?	☐ Yes ☐ No	
11.	Has topsoil been backfilled ensuring minimum loss of topsoil?	☐ Yes ☐ No	
12.	Has water used for cleaning and hydro-testing of pipeline collected in lined pits?	☐ Yes ☐ No	
13.	Are safety measures for locals in place?	☐ Yes ☐ No	
14.	Has RoW for pipeline by-passed major settlements?	☐ Yes ☐ No	
15.	If yes, are mitigation measures needed?	☐ Yes ☐ No	
16.	If yes, have the mitigation measures specified in the EIA being adhered to?	☐ Yes ☐ No	
17.	Are Prime Pakistan's HSE guidelines being followed?	☐ Yes ☐ No	

Name _____ Signature _____

Date _____

Additional Comments

Appendix C

Environmental Aspects Register

Appendix C – Environmental Aspects Register

The appendix presents environmental aspects and impacts of the proposed drilling of six wells and subsequently pipeline laying/tie-in activities, presented as **Table C-2 & C-3**. The register identifies the potential impacts of construction and operational activities on various environmental resources. The register also categorizes the significance of the impacts on the basis of their severity of consequence and the probability of occurrence. The impact significance has been categorized on the basis of the following criteria (**Table C-1**).

Table C-1: Criteria for Environmental Impacts and Aspects for Proposed Project Activities

Severity Rating	Consequence				Increasing probability				
	People	Assets	Environment	Reputation	A Never heard of in E&P industry	B Heard of in E&P industry	C Incident has occurred in our country	D Happens several times per year in our company	E Happens several time per year in a location
0	No health effect/injury	No damage	No effect	No impact					
1	Slight health effect/injury	Slight damage	Slight effect	Slight impact					
2	Minor health effect/injury	Minor damage	Minor effect	Limited impact					
3	Major health effect/injury	Localised damage	Localised effect	Considerable impact					
4	Single fatality	Major damage	Major effect	National impact					
5	Multiple fatalities	Extensive damage	Massive effect	International impact					

	Manage for continuous improvement (MCI)
	Incorporate risk reduction measures (IRRM)
	Intolerable (I)

Table C-2: Environmental Aspect Register for Drilling and Associated Development Activities

No.	Environmental Aspect/Activity	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
1	Land acquisition	Public grievances	Normal	0	2	0	2	B	MCI	Equitable disbursement of compensation amounts as per mutual agreement of both parties in transparent manner and on fast pace Loss of standing crops, traditional land rights and community ownership will be given due consideration while determining compensation amounts Manage and maintain a Community Complaints Register
2	Equipment and crew mobilization and demobilization	Dust and vehicular emissions due to additional traffic	Normal	1	0	2	1	D	IRRM	Regulate and monitor vehicles speed Maintain vehicles in a good working condition Avoid off-road travel Conduct vehicles and equipment emission testing in accordance to SEQS
		Noise and vibration		1	0	1	1	B	MCI	Minimize use of horns by project vehicles The use of pressure horns will not be allowed Conduct noise monitoring on regular intervals in accordance to SEQS
		Safety hazards – locals		1	0	0	0	B	MCI	Train drivers in responsible and safe driving practices Observe minimum distances from local communities Night travelling will only be done after getting approval from Company Site Manager in case of emergency
3	Camp construction/ Improvement of access track/s	Soil erosion	Normal	0	1	1	0	D	MCI	Avoid preparation of new access tracks Maximize usage of existing tracks Width of existing tracks development or improvements will be kept to a minimum with proper compaction at the time of construction Restrict movement of personnel and construction equipment to work areas only Maintain photographic records of all activities to monitor any changes and soil conditions Train drivers on mitigation measures related to off-road travel Avoid off-road travel
		Soil and water		0	0	1	0	D	MCI	Vehicles and other equipment will be daily checked for fuel or oil leaks

No.	Environmental Aspect/Activity	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
		contamination								Fuel and oil transfer operations will be carried out using a dedicated fuel vehicle Drip pans/trays will be used to avoid drips and spills Concrete pad with periphery drains will be constructed for refuelling of vehicles at drilling sites Procedure for transfer of oil and fuels shall be developed and implemented Oil spill drill will be carried out on regular interval to cater with emergency situation
		Noise and vibrations		1	0	1	0	D	MCI	Minimize use of horns by project vehicles Use of pressure horns will not be allowed Properly maintain vehicles and construction equipment Restrict all project vehicles and personnel within work areas only Conduct noise monitoring on regular intervals
		Dust and vehicular emissions		1	0	1	0	D	MCI	Regulate and monitor vehicles speed Minimize dust emissions by employing good management practices Avoid off-road travel Train drivers on mitigation measures related to off-road travel and speed limits Sprinkling of water to be carried out to avoid dust emission wherever required
		Loss of vegetation		0	0	2	0	D	IRRM	Minimize vegetation clearance Prohibit use of local vegetation as fuel Minimize preparation of new access tracks Width of the access track to the well site will not exceed 8-10 m Width of existing tracks development or improvements will be minimized Avoid clearing of trees or even tall bushes during the well site construction Access tracks shall avoid passing through the areas with dense vegetation
		Loss of habitat		0	0	1	0	B	MCI	Avoid clearing of trees or tall bushes or access track passing through dense vegetation and use single approved track during construction Width of the access track to the well site will not exceed 8-10 m

No.	Environmental Aspect/Activity	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
										Minimize total land uptake by access roads, well sites and campsites Width of existing tracks development or improvements will be minimized
		Disturbance to wildlife		0	0	2	0	C	MCI	Prohibit hunting, fishing, trapping, killing, feeding or even harassment of wildlife Minimize preparation of new access tracks Width of existing tracks development or improvement will be minimized Select routes with minimum vegetation clearing Avoid working in dense patches of vegetation Maintain construction vehicles and equipment in good working order Minimize time period of operation near surface water bodies e.g. wetlands (especially which are breeding areas) by good management practices Access tracks shall avoid passing through the areas with dense vegetation Avoid night travelling unless required in case of an emergency
		Safety hazards and disturbance to communities		2	0	0	1	C	MCI	Train drivers on mitigation measures related to off-road travel and speed limits Comply with all EIA/EMP mitigations related to waste, noise and dust emissions Manage and maintain a Community Complaints Register Local sources of drinking water will be used only after complying with relevant requirements of the EIA/EMP Repair/compensate any damage caused by project activities to local infrastructure Observe strict compliance with Prime Pakistan's HSE guidelines Project staff to respect cultural norms Provide offsets from sites of religious, cultural or archaeological significance if encountered
4	Camp & well site construction/ Establishment/ Operation	Soil erosion/ Physical scarring/ Vegetation	Normal	0	0	1	0	D	MCI	Minimize vegetation clearing and avoid cutting of trees and tall bushes Locate well sites and campsites in existing clearing and on levelled land Natural topography shall not be altered Minimize total land uptake by the well sites and camps

No.	Environmental Aspect/Activity	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
		clearing								Maintain photographic records of all activities to monitor any changes in soil conditions Stockpiles will be located downwind during well sites, camps and access roads construction Campsites will be located outside the boundaries of areas with dense vegetation
		Soil and water contamination		0	0	1	0	C	MCI	Dispose sewage generated at the campsite in septic system comprising septic tanks and soak pits (in case of unavailability of STP) Dispose wastewater from laundry, kitchen washings and showers into separate soak pits Build soak pits in absorbent soil Keep septic system at minimum distances of 300 m from surface water sources or groundwater wells Design and construct soak pits to prevent surface runoff Design soak pits to accommodate wastewater generated during the total duration of the operation In case the soak pits get filled during the operation grey water shall be transferred offsite in tankers and disposed of into municipal drains nearest to the proposed working sites with the prior approval from the concerned authorities Solid wastes at the campsites will be stored temporarily on site for onward supply to an approved waste contractor Wash vehicles in designated areas within campsites Regularly check vehicles for fuel or oil leaks All fuel and oil storage areas will have a concrete pad underneath to prevent soil contamination in case of leaks or spills All fuel tanks will be properly marked to highlight their contents Fuel and oil storage areas will have secondary containment in the form of concrete or brick masonry bunds Ensure provisions for proper fuel, oil and chemicals storage and handling

No.	Environmental Aspect/Activity	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
										Ensure preparation of a spill prevention and contingency plan and implemented accordingly Ensure provisions of a HDPE liner for the waste pits at the well sites
		Dust and exhaust emissions		1	0	1	0	C	MCI	Maintain vehicles and equipment in good working condition Select well sites and campsites location away from communities Employ good management practice to minimize dust emissions
		Noise and vibrations		1	0	1	0	B	MCI	Ensure that generators, vehicles and other potentially noisy equipment are in good working condition Select well sites and campsites locations away from communities Minimize use of horns by project vehicles Use of pressure horns will not be allowed Restrict all project vehicles and personnel within work areas only
		Resources utilization and depletion		0	0	2	1	B	MCI	Use of water from surface water bodies will be prohibited e.g. wetlands, springs, streams etc. Employ prudent water conservation measures and keep complete records of water consumption during entire course of the project Obtain water required for construction and drilling operation from local wells existing in the area or newly installed water wells by Prime Pakistan Install (if required) new water wells 300 m from existing local wells and abstract water from deep aquifer Water from a local well will only be used after ensuring that the available capacity at the tube well (safe yield minus local demand) is at least 50% greater than the project demand Pay proper and justified compensation to the owner of local water well for abstracted water
		Disturbance to wildlife		0	0	2	0	B	MCI	Prohibit hunting, fishing, trapping, killing, feeding or even harassment of wildlife Select campsite locations 300 m from <i>dhands</i> , wetlands or other surface water bodies Avoid clearing of dense patches of vegetation

No.	Environmental Aspect/Activity	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
										Food wastes will not be left in the open and shall be buried Maintain vehicles and equipment in good working condition Avoid night travel unless required in case of an emergency
5	Waste management	Air, soil and water contamination	Normal	1	0	2	0	B	MCI	Well sites shall preferably be raised by at least 3 m with respect to surrounding natural ground level, where possible. Dispose sewage generated in septic system comprising septic tanks and soak pits (if STP is not available) Dispose wastewater from laundry, kitchen washings and showers into separate soak pits and build soak pits in absorbent soil Ensure that the soak pits remain covered all the time and measures are taken to prevent entry of rainwater or surface runoff into them Design soak pits to accommodate wastewater generated during the total duration of the operation In case the soak pits get filled during the operation, grey water shall be transferred offsite in tankers and disposed of into municipal drains nearest to the proposed working sites with prior approval from the concerned authorities No solid waste will be disposed of in the field Recycle non-combustible waste Bury all food waste properly Send combustible waste (except food waste) to approved waste contractor Burning of waste shall be prohibited Wash vehicles in designated areas within campsites Check vehicles for fuel or oil leaks All fuel and oil storage areas will have a concrete pad underneath to prevent soil contamination in case of leaks or spills All fuel tanks will be properly marked to highlight their contents Fuel and oil storage areas will have secondary containment in the form of concrete or brick masonry bunds Use dedicated vehicles for fuel and oil transfer operations

No.	Environmental Aspect/Activity	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
										Use drip pans/trays to avoid drips and spills Check fuel tanks for leaks on regular basis The soil contaminated from minor and moderate spills will be removed and sent to waste contractor for appropriate disposal e.g. incineration or can be disposed of in accordance to best industrial practices A spill prevention and contingency plan will be prepared to deal with moderate and major spills and implemented accordingly Ensure provisions for proper fuel and oil storage and handling Recycle used oil and vehicle related waste Incinerate all clinical wastes Maintain vehicles and other equipment in good working condition
6	Community issues	Public grievances	Normal	0	1	1	1	D	MCI	Manage and maintain a Community Complaints Register Comply with all EIA/EMP mitigations related to waste, noise and dust emissions Prime Pakistan and its contractors will employ local residents during the project activities meeting the company's competency criteria Local residents living closest to the project location will be given priority in the employment process subject to company's selection criteria Groundwater sources currently being used for irrigation/domestic purposes by the resident communities will be exploited only after complying with relevant requirements of the EIA/EMP
7	Fire and explosion at drilling rig derrick	Air pollution due to burning flames/Land and water contamination from drilling mud and hydraulic	Emergency	5	4	4	5	C	IRRM	Advance well control system A series of BOPs will be installed in order to control the back kick of raw natural gas or condensate

No.	Environmental Aspect/Activity	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
		fluids								
8	Produced water production during testing operation	Land and water contamination	Normal	0	0	2	0	B	MCI	Testing operation will be kept to the minimum required. During that period, produced water will be sent to lined pit which shall be large enough to handle amounts of produced water for evaporative disposal or can be re-injected into deep subsurface formations wherever possible Even in case of high levels or with chance of overflow, produced water will be sent to pit made for drill cuttings
9	Chemicals storage at drilling site	Land contamination /Soil and water contamination	Normal	0	1	1	0	B	MCI	Storage of dry chemicals on brick masonry pads with periphery drains Preferably store liquid chemicals in secondary containments Chemicals shall be properly marked with their contents
10	Diesel storage and use at drilling site	Soil, water and air pollution (NO _x , SO _x , acid rain, global warming)	Normal	0	1	1	0	C	MCI	Spill control plans No smoking at site Secondary containment around diesel tanks Inspection of secondary containments SOP of diesel filling procedure Liner or concrete pad under the power engines Routine inspections
11	Use of mud during drilling operation	Land contamination /Water aquifers contamination	Normal	0	0	1	0	C	MCI	Mud control system Disposal of unusable mud and cuttings into lined pits
12	Restoration	Public grievances/ Wildlife protection/ Waste	Normal	0	1	0	1	C	MCI	All pits at the well sites and campsites will be backfilled Ensure that after restoration activities the well site and campsite is clean and that no refuse has been left behind Remove all concrete structures In case of a dry well, access track sections not in use will be restored

No.	Environmental Aspect/Activity	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
		management/ Safety hazards								In case of a producing well, well site and access roads will be retained to support well access works for further testing and operations In case of producing well, retain constructed pits for producing wells but remove all liquid waste from the pits

N – Normal, A – Abnormal, E – Emergency

Table C-3: Environmental Aspect Register for Construction of Pipeline

No	Environmental Aspect	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
1	Land acquisition	Public grievances	N	0	2	0	2	B	MCI	Equitable disbursement of compensation amounts for land leased for pipeline construction Pay compensation amounts as soon as possible Loss of standing crops, traditional land rights and community ownership will be given due consideration while determining compensation amounts Compensation amounts will be settled based on prevailing market rates Manage and maintain a community complaints register Avoid settlements and agriculture fields as far as possible
2	Equipment and crew mobilization and demobilization	Dust and vehicular emissions due to additional traffic	N	1	0	2	1	D	IRRM	Regulate and monitor vehicles speed Maintain vehicles in a good condition Avoid off-road travel
		Noise and vibration		1	0	1	1	B	MCI	Minimize use of horns by project vehicles The use of pressure horns will not be allowed
		Safety hazards - locals		1	0	0	0	B	MCI	Train drivers in responsible and safe driving practices Observe minimum distances from local communities Night travelling will only be done after getting approval from Company Site Manager in case of emergency
		Damage to local infrastructure		0	2	0	2	B	MCI	Minimize and control unnecessary logistic activities Regulate speed limits on local roads subject to road condition Observe height of overhead electric and other utility transmission lines especially during transportation of heavy equipment Properly manage transportation of heavy equipment and movement of heavy traffic Repair or compensate all damages caused by Prime Pakistan and its contractors operations

No	Environmental Aspect	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
3	Camp construction / Improvement of access tracks	Soil erosion	N	0	1	1	0	D	MCI	Minimize vegetation clearing and cutting of trees Locate campsite and other land acquired for pipeline and operation activities in existing clearings (if possible) and on levelled land Minimize preparation of new access tracks Select routes of minimum disturbances for development of new tracks Width of existing tracks development or improvements will be kept to a minimum Restrict movement of personnel and construction equipment to work areas only Maintain photographic records of all activities to monitor any changes and soil conditions Train drivers on mitigation measures related to off-road travel Avoid off-road travel as much as possible
		Soil and water contamination		1	0	1	1	D	MCI	Vehicles will be daily checked for fuel or oil leaks Fuel and oil transfer operations will be done using a dedicated fuel vehicle Drip pans will be used to avoid drips and spills
		Noise and vibration		1	0	1	0	D	MCI	Ensure that generators, bulldozers, vehicles and other potentially noisy equipment are in good condition Select campsite locations away from communities Minimize use of horns by vehicles Use of pressure horns will not be allowed Conduct noise monitoring Restrict all vehicles and personnel within work areas only

No	Environmental Aspect	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
		Dust and vehicular emissions		1	0	2	1	D	IRRM	Regulate and monitor vehicles speed Minimize dust emissions by employing good management practices Avoid off-road travel Train drivers on mitigation measures related to off-road travel and speed limits Properly maintain vehicles and equipment Restrict all project vehicles and personnel within work areas only Conduct emission monitoring as per applicable regulations
		Loss of vegetation		0	0	1	0	D	MCI	Minimize vegetation clearance Prohibit use of local vegetation as fuel Minimize preparation of new access tracks Width of existing tracks development or improvements will be minimized Avoid/minimize clearing of trees Loss of standing crops, traditional land rights and community ownership will be given due consideration while determining compensation amounts Access tracks should avoid passing through the areas with dense vegetation
		Loss of habitat		0	0	1	0	D	MCI	Minimize total land uptake by access roads and RoW for pipeline Width of existing tracks development or improvements will be minimized Access tracks should avoid passing through the areas with dense vegetation Avoid/minimize clearing of trees as much as possible Use single approved track during construction

No	Environmental Aspect	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
		Safety hazards and disturbance to communities		1	0	0	1	C	MCI	Train drivers on mitigation measures related to off-road travel and speed limits Comply with all EIA mitigations related to waste, noise and dust emissions Manage and maintain a community complaint register Repair or compensate any damage caused by project activities to local infrastructure Observe strict compliance with Prime Pakistan's HSE guidelines Project staff to respect all cultural norms Provide offsets from sites of religious, cultural or archaeological significance
		Disturbance to wildlife		0	0	2	0	C	MCI	Prohibit hunting or harassment of wildlife Minimize preparation of new access tracks Width of existing tracks development or improvement will be minimized Select routes with minimum vegetation clearing Maintain construction vehicles and equipment If possible minimize time period of operation in areas where wildlife presence is confirmed, especially those which are breeding areas Access tracks should avoid passing through the areas with dense vegetation Night travelling will only be done after getting approval from Company Site Manager in case of emergency
4	Camp construction / Establishment / Operation	Soil erosion / Physical scarring	N	0	1	1	0	D	MCI	Minimize vegetation clearing Avoid cutting of trees as much as possible Locate campsite in existing clearing and on levelled land Minimize total land uptake for the project facilities Maintain photographic records of all activities to monitor any changes in soil conditions Proper restoration will be done after camp demobilization

No	Environmental Aspect	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
		Soil and water contamination		1	0	1	1	C	MCI	Dispose sewage generated at the campsite in septic systems comprising septic tanks and soak pits Dispose wastewater from laundry, kitchen washings, and showers into separate soak pits Build soak pits in absorbent soil Ensure provision of grease pits at kitchen drain outlets Keep septic systems at minimum distances of 300 m from surface water sources or ground water wells Design and construct soak pits to prevent surface run-off Design soak pits to accommodate wastewater generated during the total duration of the operation In case the soak pits get filled during the operation, grey water will be transferred to the nearest municipal drains Solid wastes at the campsite will be disposed of in waste bins Wash vehicles in designated areas within campsite Regularly check vehicles for fuel or oil leaks All fuel and oil storage areas will have a concrete pad underneath to prevent soil contamination in case of leaks or spills All fuel tanks will be properly marked to highlight their contents Fuel and oil storage areas will have secondary containment in the form of concrete or brick masonry bunds Ensure provisions for proper fuel and oil storage and handling
		Dust / Exhaust emissions		1	0	2	0	D	IRRM	Maintain vehicles and equipment in good condition Select campsite location away from communities Employ good management practice to minimize dust emissions Conduct emissions monitoring as per the applicable regulations

No	Environmental Aspect	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
		Noise and vibration		1	0	1	0	B	MCI	Ensure that generators, vehicles and other potentially noisy equipment are in good condition Select campsite locations at safe environmental distance from communities Minimize use of horns by project vehicles Use of pressure horns will not be allowed Conduct noise monitoring Restrict all project vehicles and personnel within work areas only
		Resource depletion		0	0	2	1	B	MCI	Prohibit use of water from surface water bodies Under unavoidable conditions (due to improper access for water bowsers; long haul distances; or unavailability of tube wells in the project area etc.) water abstraction from surface water body will be only allowed after getting a formal approval from relevant department (irrigation department) Employ prudent water conservation measures Keep complete records of water consumption for camps and operational usages Abstract water from deep aquifer Groundwater resources will not be over exploited. Water from a local well will only be used after ensuring that the available capacity at the tube well (safe yield minus local demand) is at least 50% greater than the project demand Pay proper compensation for water abstraction from local wells
		Disturbance to wildlife		0	0	2	0	B	MCI	Prohibit hunting or harassment of wildlife Food wastes will not be left in the open. Food waste will be buried in a bury pit Maintain compressors and vehicles in good condition Night travelling will only be done after getting approval from Company Site Manager

No	Environmental Aspect	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
5	Clearing, levelling and excavation for pipeline RoW	Soil erosion / Physical scarring	A	0	1	1	0	C	MCI	Minimize vegetation clearance Avoid/minimize cutting of trees as much as possible Maintain photographic records of all activities to monitor any changes in soil conditions Minimize disturbance to natural topography and soils Regulate and monitor vehicles speed Avoid off-road travel as much as possible Train drivers on mitigation measures related to off-road travel and speed limits
		Soil contamination		0	0	1	0	C	MCI	Prohibit solid waste disposal in the field Regularly check vehicle for fuel or oil leaks Use a dedicated fuel vehicle for fuel and oil transfer operation Use drip pans to avoid drips and spills Incineration or bio remediate to treat soils contaminated with oil spills
		Noise and vibration		1	0	1	0	D	MCI	Minimize use of horns by project vehicles Maintain generators and construction machinery in good condition The use of pressure horns will not be allowed Restrict movement of personnel and construction equipment within work areas only
		Dust / Exhaust emissions		1	0	2	0	D	IRRM	Maintain vehicles in good condition Minimize dust emissions by employing good management practices Conduct emissions monitoring as per the applicable regulations
		Loss of vegetation		0	0	2	0	D	IRRM	Minimize clearing of vegetation Prohibit use of local vegetation as fuel by crew personnel Avoid cutting of trees as much as possible Loss of standing crops, traditional land rights and community ownership will be given due consideration while determining compensation amounts Minimize width of pipeline Right of Way

No	Environmental Aspect	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
		Disturbance to wildlife		0	0	2	0	C	MCI	Prohibit hunting or harassment of wildlife Minimize vegetation clearing and land uptake Avoid clearing of dense patches of vegetation Food wastes will not be left in the open. Food waste will be buried in a bury pit Maintain vehicles in good condition to reduce noise Night travelling will only be done after getting approval from Company Site Manager.
		Safety hazards and disturbance to communities		2	1	0	1	C	MCI	Train drivers on mitigation measures related to off-road travel and speed limits Comply with all EIA mitigations related to waste, noise and dust emissions Manage and maintain community complaints register Local sources of drinking water will be used only after complying with relevant requirements of the EIA Repair or compensate any damage caused by project activities to local infrastructure Observe strict compliance with Prime Pakistan's HSE guidelines Project staff to respect cultural norms Provide offsets from sites of religious, cultural or archaeological significance Maintain effective communication channels with local communities to inform them about the progress of various project activities

No	Environmental Aspect	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
6	Pipeline laying (Stringing, Welding etc.) / Pipeline operation	Disturbance to wildlife	N	0	0	2	0	C	MCI	Prohibit hunting or harassment of wildlife Food wastes will not be left in the open. Food waste will be buried in a bury pit Maintain compressors and vehicles in good condition Night travelling will only be done after getting approval from Company Site Manager.
		Noise and vibration		1	0	1	0	D	MCI	Minimize the use of horns by project vehicles The use of pressure horns will not be allowed Conduct noise monitoring Restrict movement of all project vehicles and personnel within work areas
		Dust / Exhaust emissions		1	0	2	0	D	IRRM	Maintain vehicles in good condition Minimize dust emissions by good management practices Regulate vehicles speed Conduct emissions monitoring as per applicable regulations
		Soil contamination		0	0	1	0	C	MCI	No solid waste will be disposed of in the field Regularly check vehicle for fuel and oil leaks Use dedicated vehicle for fuel and oil transfer Wastewater produced during hydro-testing and cleaning of pipeline will be collected in lined pits and evaporated or disposed of into nearby drainage channels with prior approval of concerned authorities Incineration or Bioremediation to treat soils contaminated with oil spills

No	Environmental Aspect	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
		Resource depletion		0	0	2	1	B	MCI	Prohibit use of water from surface water bodies Under unavoidable conditions (due to improper access for water bowzers; long haul distances; or unavailability of tube wells in the project area etc.) water abstraction from surface water body will be only allowed after getting a formal approval from concerned government department (Irrigation department) Employ prudent water conservation measures Keep complete records of water consumption for camps and operational usages Abstract water from deep aquifer Groundwater resources will not be over exploited. Water from a local well will only be used after ensuring that the available capacity at the tube well (safe yield minus local demand) is at least 50% greater than the project demand Pay proper compensation for water abstraction from local wells

No	Environmental Aspect	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
7	Waste management	Air, soil and water contamination	N	3	0	2	2	C	IRRM	Dispose sewage generated at the campsite in septic systems comprising septic tanks and soak pits Wastewater produced during hydro-testing and cleaning of pipeline will be collected in lined pits and evaporated or disposed of into nearby drainage channels with prior approval of concerned authorities Dispose wastewater from laundry, kitchen washings, and showers into separate soak pits Build soak pits in absorbent soil Construct soak pits to prevent surface runoff entry Design soak pits to accommodate wastewater generated during the total duration of the operation Ensure provision of grease pits at kitchen drain outlets In case the soak pits get filled during the operation, grey water will be transferred to the nearest municipal drains with the formal approval of the concerned authorities No solid waste will be disposed of in the field Recycle combustible and non-combustible waste Burning of waste shall not be allowed Wash vehicles in designated areas within campsite Check vehicles for fuel or oil leaks All fuel and oil storage areas will have a concrete pad underneath to prevent soil contamination in case of leaks or spills All fuel tanks will be properly marked to highlight their contents Fuel and oil storage areas will have secondary containment in the form of concrete or brick masonry bunds Use dedicated vehicles for fuel and oil transfer operations

No	Environmental Aspect	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
										Use drip pans to avoid drips and spills Check fuel tanks for leaks Incineration or Bioremediation to treat soils contaminated with oil spills A spill prevention and contingency plan will be prepared to deal with moderate and major spills Ensure provisions for proper fuel and oil, storage and handling Recycle used oil and vehicle related waste Incinerate all clinical wastes Maintain generators, compressors and vehicles in good condition Minimize dust emissions by good management practices Food wastes will not be left in the open. Food waste will be buried in a bury pit

No	Environmental Aspect	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
8	Community issues		N	0	1	1	1	D	MCI	Manage and maintain a community complaints register Disburse compensation amounts in an equitable and transparent manner Pay compensation amounts as soon as possible Loss of standing crops, traditional land rights and community ownership will be given due consideration while determining compensation amounts Settle compensation amounts based on prevailing market rates Comply with all EIA mitigations related to waste, noise and dust emissions If there are opportunities, Prime Pakistan and its contractor will employ local unskilled and skilled residents during the project activities Ensure equitable and transparent recruitment of locals Local residents living closest to the project location will be given priority in the employment process Local sources of drinking water will be used only after complying with relevant requirements of the EIA Flow of water in surface water body will not be impeded Repair or compensate any damage caused by project activities to any surface water body, local roads or other infrastructure Strict compliance will be observed to Prime Pakistan's HSE guidelines Train drivers in responsible and safe driving practices Inform local communities about the progress of various project activities Project staff will respect cultural norms Provide appropriate offsets from sites of religious, cultural or archaeological significance

No	Environmental Aspect	Description of Impact	Conditions	Consequence				Increasing Probability	Significance	Management Program
				People	Assets	Environment	Reputation			
9	General		N	0	0	1	1	B	MCI	Restore soak pits after project completion Ensure that after restoration activities the campsite is clean and that no refuse has been left behind Remove all concrete structures Avoid using local fuel wood Take photographs of access tracks, campsite and pipeline route before the project construction. These will be useful during the area restoration

N – Normal, A – Abnormal, E – Emergency

Appendix D

Proposed Waste Management Plan

Appendix D – Proposed Waste Management Plan

D.1 Introduction

D.1.1 Project Background

Prime Pakistan intends to carry out drilling and associated development activities in its SW Miano-III block located in districts Sukkur and Khairpur of Sindh province, while minimizing the environmental impact and ensuring responsible waste management. This Waste Management Plan (WMP) outlines the strategies and procedures that Prime Pakistan will implement to effectively manage and dispose of waste generated during the project.

D.1.2 Objectives

The present document outlines how the main typology of waste generated during the project activities will be managed in accordance with applicable laws, regulations, recognized good international industry practice, wherever applicable. The primary objectives of this WMP are to:

- Ensure compliance with all applicable laws and regulations;
- Minimize waste generation through efficient planning and practices; and
- Minimize impacts to the environment from waste generation by:
 - ensuring appropriate treatment of wastes to reduce toxicity and/or volume; and
 - ensuring responsible disposal at authorized facilities.

D.1.3 Roles and Responsibilities

Prime Pakistan will be responsible for the management of waste that will be generated during the drilling and associated development activities and will also ensure that the contractors will operate in compliance with limits and requirements set by the applicable legislation, in order to avoid negative environmental consequences.

D.2 Legislative Framework

Following regulations have been given due consideration and where possible incorporated in the mitigation measures and the Environmental Management Plan (EMP).

- **National Hazardous Waste Management Policy, 2022:** This policy aims to regulate the safe handling and disposal of hazardous waste, with a primary focus on environmental and public health concerns. It offers guidelines for waste generators, regulators, and stakeholders to improve practices and reduce risks associated with hazardous substances. Emphasizing pollution prevention and resource conservation, the policy encourages collaboration among government, industries, and communities. It strives to nurture a

culture of responsibility towards environmental protection through stringent enforcement and continuous monitoring measures. By ensuring compliance with regulations and promoting sustainable waste management practices, it aims to safeguard ecosystems and public health for the well-being of present and future generations.

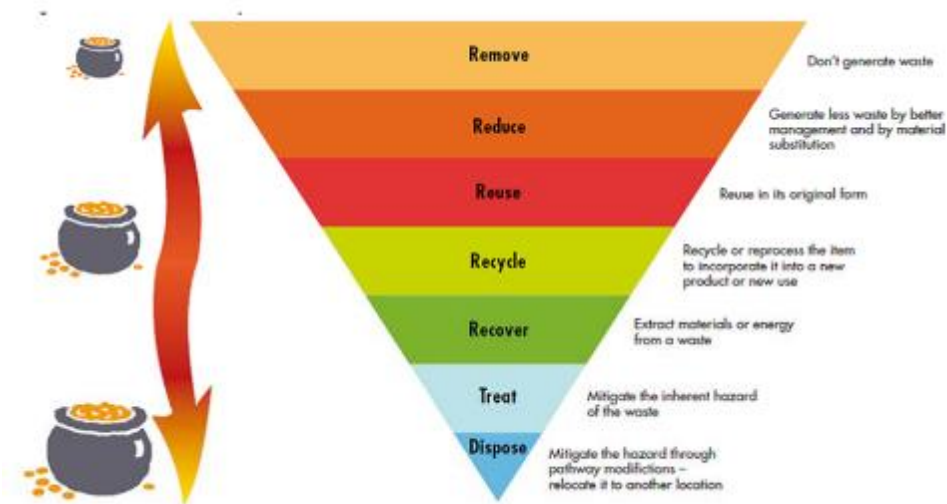
- **Sindh Environmental Protection Act, 2014:** Basic legislative tool empowering the Government of Sindh to frame and enforce regulations for the protection of the environment in the province of Sindh. The SEPA Act 2014 is broadly applicable to air, water, soil and noise pollution and also sets out requirements for waste handling, storage, transportation, and disposal. Penalties have been prescribed for those contravening provisions of the Act.
- **Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021:** These regulations provide guidelines for conducting environmental assessments to acquire licenses which will be needed by the waste contractors willing to handle, store, treat and dispose waste in the jurisdiction of Sindh.
- **Hazardous Substances Rules, 2014:** These Rules were notified to streamline procedures for issuance of licenses to industries / businesses that generate hazardous waste, safety precautions for workers and devices the methods for the removal of hazardous wastes in an environmental friendly manner. The rules also specify procedures to be adopted for import, transport and disposal of hazardous waste; and identify two hundred and forty-three hazardous substances and synthetic chemicals.
- **Sindh Environmental Quality Standards, 2016:** The Sindh EPA has established the environmental standards for Industrial wastewater, Effluents, Domestic sewage, Industrial air emissions and ambient air, noise for vehicles and drinking water quality standards, 2016. These standards provide discharge limits for environmental parameters to be complied with to ensure environmental compliance against Sindh EPA. Prime Pakistan should ensure that waste disposal methods do not exceed these standards and cause environmental contamination.
- **Self-Monitoring and Reporting Rules, 2014:** As per rules set by this system, provincial industries have to monitor effluents and emissions in compliance with the SEQS and report it to Provincial EPA. This system classifies industry into three categories A, B and C each corresponding to a specified reporting frequency. Proposed project activities lies under 'Category B' for both liquid effluent and gaseous emissions (priority parameters provided in Table A & B of Schedule-IV of these Rules, 2014) and thus shall submit Environmental Monitoring Reports to Sindh EPA on quarterly basis.

- **Oil and Gas Exploration and Production (E&P) Sectoral Guidelines, 1997:** This identifies and explains issues that should be observed as a legal instrument during exploration or production of oil and gas. Prime Pakistan must comply with the management provisions; especially for land use, wastewater discharge, drilling fluid and drilling wastes, outlined in these regulations.
- **Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal:** The objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as “hazardous wastes” based on their origin and/or composition and their characteristics.

It is crucial for Prime Pakistan to consult with local authorities, especially SEPA, to ensure full compliance with the specific regulations and requirements applicable to their project in SW Miano III block.

D.3 Waste Minimization Strategy

As pre-project planning, Prime Pakistan will conduct waste assessment and identify implementing measures to reduce waste generation. The international principles of waste management will include the incorporation of a hierarchy of management practices that is integral to the development of the strategy for dealing with wastes. This hierarchy is frequently expressed in terms of reduction, reuse, recycling and, finally, residue treatment and disposal. Where reasonable and appropriate, waste management activities will be performed in accordance with the internationally recognized waste management hierarchy, shown in the following figure.



In order of preference, the aim is to:

- **Reduce** the amount of waste generated. Collectively this is known as ‘reduction at source’ and may be achieved through equipment or technology

modifications, process or procedure modifications, reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training or inventory control;

- **Re-use** materials, where appropriate, in their original form, such as re-use of chemical containers, that can be reused multiple times using an approved chemical vendor to refill chemical 'x' into the same used chemical 'x' container with the correct choice of container material and stock return procedures;
- **Recycle** wastes, where appropriate, such as scrap metal, plastic and/or tyres;
- **Recover** as many materials as practical from the remaining waste, in terms of conversion of wastes into usable materials;
- **Treat** wastes as necessary to render them less hazardous and/or to enable them to be reused or recycled, through
 - biological methods (composting, if appropriate, materials can be recycled);
 - thermal methods (incineration);
 - chemical methods (neutralization, stabilization);
 - physical methods (filtration, centrifugation, compaction or shredding);
- **Dispose** of residual wastes responsibly at authorized facilities, such as discharge to landfill.

The drilling and associated activities' wastes will be managed in accordance with the principles of the Waste Hierarchy.

D.4 Waste Categorization and Quantification

The waste generated during the drilling and development project can broadly be categorized as:

- **Drilling Waste:** Including drilling mud, cuttings, and contaminated materials.
- **Construction Waste:** Consisting of debris, scrap materials, and packaging waste.
- **Hazardous Waste:** Such as chemical containers, lubricants, and contaminated soil.
- **Solid Waste:** General waste from offices, campsites, and facilities.
- **Wastewater:** Generated from drilling activities, sanitation, and other operational processes.

The wastewater and the amount of solid waste expected to be generated as a result of the project activities (each well site) is tabulated below.

Table D-1: Approx. Quantification of Domestic Wastewater and Solid Waste

Parameter ^a	Generation
Domestic Wastewater	
Construction of well site (Liters per day)	6,400

Parameter ^a	Generation
Drilling operation (Liters per day)	32,000
Solid Waste (per month)	
<i>Construction phase (all activities)</i>	
Recyclable solid waste generation (kg)	98
Oil waste produced (Liters)	9
Food waste generation (kg)	60
Other hazardous waste (kg)	7
<i>Drilling phase</i>	
Recyclable solid waste generation (kg)	2,500 – 3,000
Oil waste produced (Liters)	560
Food waste generation (kg)	120
<i>Well Head Surface Facility/Flow Line</i>	
Recyclable solid waste generation (kg)	98
Oil waste produced (Liters)	9
Food waste generation (kg)	60

Note: a: Values have been calculated based on HPK environmental monitoring record for various O&G project activities.

D.5 Proposed Waste Disposal Methods

Categories of wastes generated during construction, drilling and flow line laying phases of wells along with their proposed methods of disposal are discussed below:

- Clinical wastes – These will be stored separately from other wastes and provided to an approved waste contractor for appropriate final disposal i.e. incineration.
- Combustible wastes – Combustible wastes will include kitchen wastes, paper, packaging material etc. It will be stored separately in waste segregation containers. Afterwards all combustible wastes will be provided to waste contractor for appropriate disposal. All kind of food waste will be buried properly.
- Recyclable or re-usable wastes – These will include used oil, glass, tin, metals, workshop wastes etc. It will also be stored separately in waste segregation containers. All recyclable wastes will be handed over to waste contractor for recycling or re-use.
- Drill cuttings and mud – Water Based Mud (WBM) will be used during drilling. The drill cuttings and mud will be stored at the well site in the lined reserve pits. After completion, the cuttings will be buried in lined pits while and mud will be recycled where possible and utilized for spud/plugging or otherwise buried in lined pits after dewatering.

- Produced formation fluids - Produced formation fluids will be collected inside the lined waste pit at each well site. In case the fluids are discharge into the flare pit, the soil at the sides of the flare pit will be excavated and disposed of into the lined waste pit at the well site. Produced water can also be re-injected in the deep subsurface formations, wherever possible.
- Septic tank and soak pits shall be provided at rig site and base camp for handling and disposal of black and grey water. Septic tank and soak pit shall be covered properly to avoid obnoxious smells in surrounding areas.
- Sprinkling of grey water will not be allowed, in case if septic tank gets filled with sludge, septic tank shall be emptied through vacuum truck and sludge shall be transferred to treatment facility or approved municipal drain for appropriate disposal after proper approval from the concerned municipal authority.

A summary of waste generated during the proposed drilling and construction activities, including type and description of waste and proposed waste disposal methods are provided in the following table.

Table D-2: Description of Waste Generated during Proposed Project Activities and Recommended Disposal Methods

Activity			Description	Recommended Disposal Method
Construction	Drilling	Flow Line		
✓	✓	✓	<i>Food waste:</i> Kitchen waste e.g. fruit, meat, vegetable residues etc.	Deposition in bury pit/composting
✓	✓	✓	<i>Recycleable & Non-recyclable waste:</i> Paper, plastic, cardboard, rubber, wood, glass, tin cans, metal scrap, aluminium cans, ferrous/non-ferrous materials, plastic or aluminum pipe protection etc.	- Reuse - Recycling - Incineration through SEPA approved contractor, if required
✓	✓	✓	<i>Oily & Hazardous waste:</i> Oily rags, used oil, batteries, mercury lighting etc.	- Recycling - Incineration through SEPA approved contractor, if required
✓	✓	✓	<i>Clinical waste:</i> Syringes, glass bottles, used bandages, expired drugs etc.	Incinerate at appropriate facility
✓	✓	✓	<i>Grey water:</i> Waste water from kitchen, laundry and showers	- To be first sent to septic tanks and finally disposed of in soak pits - In case, the soak pits get filled during the operation, grey water will be transferred to nearest municipal drains with prior approval of concerned authorities
✓	✓	✓	<i>Sewage/Black water:</i> Waste water from toilets	To be disposed of in septic tanks and then soak pits
	✓		<i>Produced formation fluids/water</i>	- To be disposed of in impermeable (HDPE) lined evaporation ponds - To be re-injected into deep subsurface formations where possible

Activity			Description	Recommended Disposal Method
Construction	Drilling	Flow Line		
	✓		<i>Drilling waste:</i> Drill cuttings, excess or spent drilling mud, rig wash water	Water Based Mud (WBM) will primarily be used during drilling. The drill cuttings and WBM will be stored at the well site in lined pit. The drilling mud will be allowed to evaporate inside the mud pit and also dry out. After that, the mud pit and the cuttings pit will be backfilled.
✓	✓	✓	<i>Minor Spill</i> Oil spills/soil contaminated by oil leakages or stains – Leaks from vehicles, equipment, or storage containers at campsites or work areas outside the campsite or oil or fuel stains produced during handling and transfer operations Quantity: Area and depth of soil contaminated; < 1m² and 0.3m respectively <i>Moderate Spill</i> Fuel, oil or chemical spills during transfer or handling operations. Quantity: Spill less than 200 litres <i>Major Spill</i> Spill during transportation of fuel, oil or chemicals or failure of the containment areas Quantity: Spill more than 200 litres	- Specialized treatment such as incineration or bioremediation - Best industrial guidelines will be followed - In case of chemical spill, the contaminated soil to be land filled
	✓		<i>Condensate</i>	To be transported and sold to the nearest refinery
✓	✓	✓	<i>Solid Waste:</i> Concrete, building materials, off cut pipe, plastic pipe protectors, plastic sheeting, cable drums etc	- Recycling - Land filling

D.6 Trainings

All Project personnel (including contractors and subcontractors) shall receive waste management awareness training as part of the site induction process. Toolbox talks, team briefings, safety meetings and periodic awareness campaigns shall be used to ensure an ongoing awareness and compliance with waste management procedures.

D.7 Monitoring and Auditing

Prime Pakistan shall conduct routine inspections to ensure compliance with waste management procedures/regulations, monitor the surrounding environment for any signs of contamination and take appropriate actions immediately, if required. It should be ensured that proper records of waste transportation and disposal are maintained. As a good practice, Prime Pakistan shall conduct periodic audits to assess the effectiveness of waste management practices and identify areas for improvement through the course of project activities.

D.8 Conclusion

This Waste Management Plan is prepared to propose the responsible management of waste generated during the proposed project activities. By adopting these strategies and practices, Prime Pakistan is expected to minimize environmental impacts, promote sustainability, and comply with applicable regulations.

Appendix E

Water Quality Analysis Reports

Customer's Ref: 10405/HPK/2324/DW/027

Date: 07-05-2024

Report to: **M/s. Halcrow Pakistan Pvt Ltd.**
3rd Floor, Business Enclave,
77-C, 12th Commercial Street, Phase 2 (Ext)
Commercial Area, DHA,
Karachi 75500, Pakistan.

Date of Sample Collection: **03-05-2024**
Date of Sample Received: **03-05-2024**
Samples collected /send by: **Provide by Client**
Sample type: **Ground Water Sampling**

Reference No: 462320.EIA.PP2024/01

Sampling ID: WS-01

Lab. Rpt. Rf. No.: 28371/ EGEL/HPK /DW/2324/75

ANALYTICAL TEST REPORT

Sr. No.	PARAMETERS	STANDARDS	UNITS	RESULTS	TEST METHOD
		NSDWQ - LIMITS			
1	Total Hardness as CaCO ₃	< 500	mg/L	263.8	EDTA Titration.Hach-8213
2	Total Dissolved Solids(TDS)	< 1000	mg/L	886	Hach 8160
3	pH value	6.5 – 8.5	SU	7.8	USEPA 150.1
4	Arsenic	≤ 0.05	mg/L	BDL	APHA-3120 B
5	Chloride(as Cl ⁻)	< 250	mg/L	>25	Hach 8206
6	Cadmium	0.01	mg/L	<0.01	ASTM D-3557
7	Fluoride(as F ⁻)	≤ 1.5	mg/L	4.9	USEPA 340.1
8	Lead	≤ 0.05	mg/L	<0.1	ASTM D-3559
9	Nickel	≤ 0.02	mg/L	BDL	ASTM D-1886
10	Iron	0.3	mg/L	0.85	AWWA* Method # 3120 B
11	Nitrate (NO ₃)	≤ 50	mg/L	3.14	Hach -8039
12	Sulphate	-	mg/L	227	AWWA* Method # 4110 B (Ion Chromatography Method)
13	TSS	-	mg/L	18	HACH, USA Method#8006
14	Calcium	-	mg/L	21.6	-
15	Magnesium	50	mg/L	37.4	Hach 8034
16	Phenolic Compound as (Phenols)	-	mg/L	BDL	USEPA-420.1

- NSDWQ=National Standard for Drinking Water Quality
- USEPA=United State Environmental Protection Agency method
- Hach USA, method
- BDL=Below Detection Limit
- ND= Not Detected

Note: -

- This report is not valid for any negotiations
- Report is valid for current batch(sample)
- The remaining portion of the sample will be discarded after 07 days unless otherwise instructed

Remarks: The Ground Water Sampling results are not well within guideline values set by NSDWQ

Prepared By	Section Incharge (EGEL)
-------------	----------------------------

The Analysis based on sample(s) provided to us by the Client. The interpretation or opinions expressed represent the best judgment. We have no responsibility and warranty or representation

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Web: www.everglab.com



Evergreen Environmental Laboratory

Environments

Customer's Ref: 10405/HPK/2324/DW/027

Date: 07-05-2024

Report to: M/s. Halcrow Pakistan Pvt Ltd.
3rd Floor, Business Enclave,
77-C, 12th Commercial Street, Phase 2 (Ext)
Commercial Area, DHA,
Karachi 75500, Pakistan.

Date of Sample Collection: 03-05-2024
Date of Sample Received: 03-05-2024
Samples collected /send by: Provide by Client
Sample type: Ground Water Sampling

Site ID: 462320.EIA.PP2024/01

Sampling ID: WS-02

Lab. Rpt. Rf. No.: 28371/ EGEL/HPK /DW/2324/76

ANALYTICAL TEST REPORT

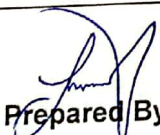
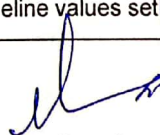
Sr. No.	PARAMETERS	STANDARDS	UNITS	RESULTS	TEST METHOD
		NSDWQ - LIMITS			
1	Total Hardness as CaCO ₃	< 500	mg/L	184.2	EDTA Titration.Hach-8213
2	Total Dissolved Solids(TDS)	< 1000	mg/L	423.1	Hach 8160
3	pH value	6.5 - 8.5	SU	7.3	USEPA 150.1
4	Arsenic	≤ 0.05	mg/L	BDL	APHA-3120 B
5	Chloride(as Cl ⁻)	< 250	mg/L	98.6	Hach 8206
6	Cadmium	0.01	mg/L	0.0351	ASTM D-3557
7	Fluoride(as F ⁻)	≤ 1.5	mg/L	3.2	USEPA 340.1
8	Lead	≤ 0.05	mg/L	<0.018	ASTM D-3559
9	Nickel	≤ 0.02	mg/L	BDL	ASTM D-1886
10	Iron	0.3	mg/L	0.32	AWWA* Method # 3120 B
11	Nitrate (NO ₃)	≤ 50	mg/L	1.32	Hach -8039
12	Sulphate	-	mg/L	128	AWWA* Method # 4110 B (Ion Chromatography Method)
13	TSS	-	mg/L	11	HACH, USA Method#8006
14	Calcium	-	mg/L	14.9	-
15	Magnesium	50	mg/L	41.2	Hach 8034
16	Phenolic Compound as (Phenols)	-	mg/L	BDL	USEPA-420.1

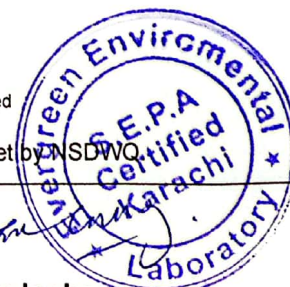
- NSDWQ=National Standard for Drinking Water Quality
- USEPA=United State Environmental Protection Agency method
- Hach USA, method
- BDL=Below Detection Limit
- ND= Not Detected

Note: -

- This report is not valid for any negotiations
- Report is valid for current batch(sample)
- The remaining portion of the sample will be discarded after 07 days unless otherwise instructed

Remarks: The Ground Water Sampling results are not well within guideline values set by NSDWQ

 Prepared By	 Section Incharge (EGEL)
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Evergreen Environmental Laboratory

Environments

EPA Certified Lab
EPA/LAB/Certificate-14/2022

Customer's Ref: 10405/HPK/2324/DW/027

Date: 07-05-2024

Report to: M/s. Halcrow Pakistan Pvt Ltd.

3rd Floor, Business Enclave,
77-C, 12th Commercial Street, Phase 2 (Ext)
Commercial Area, DHA,
Karachi 75500, Pakistan.

Date of Sample Collection: 03-05-2024

Date of Sample Received: 03-05-2024

Samples collected /send by: Provide by Client

Sample type: Ground Water Sampling

Site ID: 462320.EIA.PP2024/01

Sampling ID: WS-03

Lab. Rpt. Ref. No.: 28371/ EGEL/HPK /DW/2324/77

ANALYTICAL TEST REPORT

Sr. No.	PARAMETERS	STANDARDS	UNITS	RESULTS	TEST METHOD
		NSDWQ - LIMITS			
1	Total Hardness as CaCO ₃	< 500	mg/L	201.3	EDTA Titration.Hach-8213
2	Total Dissolved Solids(TDS)	< 1000	mg/L	998.1	Hach 8160
3	pH value	6.5 – 8.5	SU	7.7	USEPA 150.1
4	Arsenic	≤ 0.05	mg/L	BDL	APHA-3120 B
5	Chloride(as Cl ⁻)	< 250	mg/L	>48	Hach 8206
6	Cadmium	0.01	mg/L	<0.0163	ASTM D-3557
7	Fluoride(as F ⁻)	≤ 1.5	mg/L	3.3	USEPA 340.1
8	Lead	≤ 0.05	mg/L	<0.0114	ASTM D-3559
9	Nickel	≤ 0.02	mg/L	BDL	ASTM D-1886
10	Iron	0.3	mg/L	0.87	AWWA* Method # 3120 B
11	Nitrate (NO ₃)	≤ 50	mg/L	1.74	Hach -8039
12	Sulphate	-	mg/L	112	AWWA* Method # 4110 B (Ion Chromatography Method)
13	TSS	-	mg/L	18	HACH, USA Method#8006
14	Calcium	-	mg/L	34.9	-
15	Magnesium	50	mg/L	56.7	Hach 8034
16	Phenolic Compound as (Phenols)	-	mg/L	BDL	USEPA-420.1

- NSDWQ=National Standard for Drinking Water Quality
- USEPA=United State Environmental Protection Agency method
- Hach USA, method
- BDL=Below Detection Limit
- ND= Not Detected

Note: -

- This report is not valid for any negotiations
- Report is valid for current batch(sample)
- The remaining portion of the sample will be discarded after 07 days unless otherwise instructed

Remarks: The Ground Water Sampling results are not well within guideline values set by NSDWQ

Prepared By

Section Incharge
(EGEL)



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