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# EXECUTIVE SUMMARY

## Title and Location of Project

The title of the project is "Mining Lease for Coal Over an area of 403.29 acres situated near PARARA, District Chakwal". The mining lease was granted by Mines and Minerals Department, Government of the Punjab.

## Name of the Proponent

The details of the proponent are given below;

| Details of Proponent | |
|---|---|
| Proponent Name | MR. SYED GHULAM HUSSAIN |
| Address | 20-D MODEL TOWN, LAHORE |

## Name of Consultant Preparing the Report

The name of the consultant preparing the report is as given below;

| Contact Details | |
|---|---|
| **Consultant** | Prime Environmental Consultants |
| **Contact** | (+92) 321-7860915 |
| **Address** | Latif Plaza, Office No. 07-08, 69 Saeed Block Commercial area, Canal Bank Scheme, Lahore |
| **e-Mail** | primeenvironmentalconsultants@gmail.com |

The team involved in preparing the report is as;

| Sr. | Name | Qualifications & Brief Experience | Roles Assigned |
|---|---|---|---|
| 1. | Engr. Ali Mehdi | B.Sc. Mining Engineering | • GIS Expert<br>• Stakeholder Consultation |

| | | | |
|---|---|---|---|
| 2. | Ammara Afzal | Environmental Scientist M.s Environmental Science | • Preparation of Environmental Management Plan (EMP)<br>• Preparation of Environmental Monitoring Plan (EMP)<br>• Author of EIA Report |
| 3. | Zeba Haseeb | Environmental Scientist M.S Environmental Science | • Preparation of Environmental Management Plan (EMP)<br>• Preparation of Environmental Monitoring Plan (EMP)<br>• Author of EIA Report |
| 4. | Umer Saeed | Environmental Scientist M.S Environmental Science | • Site visits |

## Brief Outline of the Project

The project area is over 403.29 acres and involves mining coal underground. It is located near PARARA in Punjab's District Chakwal.

Pakistan holds 3,377 million tons (MMst) of proven coal reserves as of 2016, ranking 20th in the world and accounting for about 0% of the world's total coal reserves of 1,139,471 million tons (MMst). Pakistan has proven reserves equivalent to 331.1 times its annual consumption.

Punjab, being second largest (area-wise) province of the country, has vast mineral potential like coal, salt, iron ore, limestone, gypsum, silica sand and fire clay etc. The main coalfields of Punjab are in the Salt-Range and at Makarwal. The total coal resources are estimated at 235 million tonnes, of which 33 million tonnes are mineable. Punjab coal is classified as Sub-bituminous, and the heating value ranges from 9,472 to 15,801 Btu/lb. It has low ash and high sulfur, and is considered suitable for power generation.

The main objectives of coal mining are

- To enhance the contribution of the mineral sector to GDP through improved production.
- Expand the mining sector by focusing on the exploration and evaluation of mineral resources.
- To enhance public sector investment on resource mapping, Geo-database development and provision of physical infrastructure, roads and electricity etc. in the potential areas.
- To promote the facilitation role of the government for the prospective investor.
- To encourage and support exploration of minerals, particularly through the private sector.
- To promote environment-friendly mining practices and to take measures for mitigation of environmental hazards for sustainable development of the mineral sector.

## Major Impacts

Key impacts related to the construction phase include:

- Construction Noise
- Solid Waste
- Soil Contamination
- Air Pollution
- Community and Workers' Safety
- Employment Conflicts

Mitigation measures recommended to be incorporated into the project include running the machines and vehicles on good quality (low-sulfur fuels) in good working order, ensuring regular maintenance, tuning and servicing, and providing them with emission control devices, such as mufflers and silencers, etc. Water suppression, covered transportation and storage of the construction materials, and slow driving on unpaved roads will control dust emission. Regular testing for leakage detection will also be ensured. Solid waste

from construction activities will be used for flooring, while the remaining solid waste will be managed as per practices in the area. For community safety, irrelevant persons will not be allowed inside. The safety of the workers will be ensured by discouraging any careless attitude of workers and providing the workers with and encouraging them to use PPEs. A detailed analysis is given in **chapter 5.**

Key impacts related to the operation phase include:

- Wastewater
- Solid Waste
- Noise
- Impacts on Air Quality
- Acid Mine drainage
- Soil Contamination

Detailed analysis of operational impacts is given in chapter 5.

## Recommendations for Mitigation Measures

The potential environmental impacts resulting during construction and operational phase of the project and their possible mitigation measures are given in table below

- **Construction Phase:**

| Potential Negative Impacts | Recommended Mitigation Measures | Monitoring Responsibility | Parameters for Monitoring |
|---|---|---|---|
| • Dust emissions | • On exposed construction surface during windy periods fugitive dust generation will be suppressed by spraying water. | • Proponent/ contractor | • Air quality |

| | | | |
|---|---|---|---|
| | • The construction material will be covered with polyethylene sheets to prevent dust emissions. | | |
| • Soil erosion | • Exposed surface will be resurfaced and stabilized as soon as possible. | • Proponent/ contractor | • Soil |
| • Solid waste generation | • Solid waste may include waste/unused construction materials, which should be disposed of properly. | • Proponent/ contractor | • Solid waste management |
| • Vehicular Traffic and Noise | • Vehicles and other noisy equipment will be kept in good conditions and their regular maintenance will be done. | • Proponent/ contractor | • Noise level |
| | • Noisy construction activities will be carried out only during normal working hours. | | |
| • Health and Safety of Work Force | • The contractor will ensure that the workers are trained in safety procedures for all relevant aspects of construction. | • Proponent/ contractor | • Health and safety |
| | • Regular checks will be made to ensure that the contractor is following safety working procedures/safety measures. | | |

| | | | |
|---|---|---|---|
| | • Formal emergency procedures will be developed for construction site in case of an accident. | | |
| | • First aid kits and other necessary equipment will be kept available at site along with the list of emergency phone numbers to be contacted in case of any accident. | | |
| | • Waste produced during construction phase will be collected by vehicle for dispose of it at a particular dumping site of the industrial estate from it will be reused. Waste segregation units will be provided. Recyclable items will be provided to recycling contractors | | |
| • Water supply | • Water use will be planned depending upon the supply and timing to avoid and inconvenience. | • Proponent/ contractor | • Water supply |
| | • Water conservation practices will be adopted. | | |

| | | | |
|---|---|---|---|
| • Surface and Groundwater | • At project site, the septic tank will be installed the safe disposal of wastewater into the nearby drain. The storage of lubricant materials such as oil and grease will be confined to a specific area so that in case of any leakage or spillage, the lubricant materials do not contaminate the entire project site. | • Proponent/ contractor | • Surface and groundwater |

- **Operational Phase:**

| **Potential Negative Impacts** | **Recommended Mitigation Measures** | **Monitoring Responsibility** | **Parameters for Monitoring** |
|---|---|---|---|
| Dust emissions | In operational phase, dust generation by vehicles will be suppressed by spraying water.<br>Scrubbers will be used to control dust emissions | Proponent | Air quality |
| Noise | Use of PPEs (noise suppression equipment-ear mufflers etc.) will be ensured by the workers where noise levels are higher than 85 (dBA).<br>Mining activities will be ensured at daytime when background noise levels are high.<br>Vehicles speed limit will be maintained to avoid excessive vibrations. | Proponent | Noise |

| | | | |
|---|---|---|---|
| | Regular maintenance of machinery will be ensured.<br>All blasting operations will be carried out in compliance with conditions as specified in Coal Mines Regulations, 1926. | | |
| Waste water | Water conservation practices will be used.<br>Wastewater will be treated properly by septic tank and will be discharged into nearby drain.<br>Water use will be planned depending upon the supply and timing to avoid and inconvenience | Proponent | Wastewater management |
| Acid Mine Drainage | water stored on the surface tank is mixed with fine dust of calcium carbonate powder to mitigate its acidic factor | | |
| Flora and fauna | The unit includes a plan of the green yard area which is a positive impact on the flora and fauna. There is no significant fauna in that area. However, it is suggested that maximum number of trees should be planted by the management inside and outside the boundary wall in order to enhance aesthetics of the area. | Proponent | Biodiversity |
| Social impacts | During the operation stage, there will be no social issue for the nearby localities. Moreover, the residents may get opportunities to work in the refining unit which is a major positive impact of the project. | Proponent | Social impacts |

| | | | |
|---|---|---|---|
| Occupational health and safety | There may be occupational health and safety risks associated with different operational activities. Health risks may occur in case of unsafe and/or unfavorable work conditions The mitigation measures include:<br><br>• The workers should get trained in safety procedures for all relevant aspects of processes.<br>• Enforcement of work safety measures.<br>• Formal emergency procedures will be developed for the segregation hall in case of any accident.<br>• First aid kits and other personal protective equipment (safety gloves, goggles, welding shields etc.) Should be kept available. | Proponent | Health & safety |

## Proposed Monitoring

The EMP is prepared to ensure that the activities are undertaken in a responsible & non detrimental manner with the objectives of:

- Providing a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance.
- Guiding and controlling the implementation of findings and recommendations of the environmental assessment.
- Detailing specific actions deemed necessary to assist in mitigating the environmental impact.
- Ensuring that safety recommendations.

  Furthermore, the detailed EMMP has been given in **chapter 6**.

# 1. SCREENING AND SCOPING

## 1.1. Screening

Section 12 of Punjab Environmental Protection Act (PEPA), 1997 (Amended 2012) states:

"***No proponent of a project shall commence construction or operation unless he has filed with the Government Agency designated by Federal Environmental Protection Agency or Provincial Environmental Protection Agencies, as the case may be, or, where the project is likely to cause an adverse environmental effect an Environmental Impact Assessment (EIA), and has obtained from the Government Agency approval in respect thereof.***"

As per Review of Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) Regulations, 2000 made under Section 12 of Punjab Environmental Protection Act, 1997 (Amended 2012), current project (coal mining) falls under Schedule II (List of projects requiring EIA), Category C-I (Mining and processing of coal, gold, copper, sulphur and precious stones).

# 2. INTRODUCTION

## 2.1. Purpose of the Report

This report has been prepared to conform to the requirements of the Punjab Environmental Protection (Amendment) Act 2012 (PEPA), which states that:

"***No proponent of a project shall commence construction or operation unless he has filed with the Provincial Agency an initial environmental examination or where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Provincial Agency approval in respect thereof.*"**

Environmental Impact Assessment (EIA) report is being submitted to the environmental protection agency (EPA), government of the Punjab, Lahore in compliance with the legal requirements for Punjab Environmental Protection Act-1997 (amended 2012), section-12 for obtaining the environmental approval (EA) at the project site. The other relevant regulations and guidelines considered while preparing this EIA report will include:

- Policy and procedures for filling, review and approval of environmental assessments.
- Guidelines for the preparation and review of environmental reports.
- Guidelines for public participation.
- Guidelines for sensitive and critical areas.
- Detailed Sectoral guidelines.

Different environmental aspects like social, physical, biological etc and other related features of the project are highlighted in this EIA report. Measures necessary to be adopted to mitigate any environmental impacts on any part of the environment around are also described. All the important information is also provided as described under the format used to help decision makers, EPA Punjab in the present case, before issuing the desired environmental approval.

The main objective of the EIA study is to assess the environmental impacts likely to occur due to the construction of the roads improvement project, and to suggest mitigation measures to minimize the likely negative impacts. For achieving the above objectives, the study was mainly divided into following sectors:

- Identification of all requirements as set forth by Pakistan Environmental Protection Act. 1997 and the Guidelines for preparation of EIA reports, etc.
- Study of existing regulatory framework in Pakistan with reference to the developmental projects;
- Study of Guidelines for the preparation of EIA reports;
- Collection and scrutinizing data related to physical, ecological and socioeconomic, and physical recourses of the project area;
- Evaluation of data and identification of significant environmental impacts;
- Identification of necessary mitigation measures to minimize the negative impacts; and
- Preparation of an Environmental Management Plan.

## 2.2. Identification of the Project and Proponent

### 2.2.1. Details of the Project

The project title is "Mining Lease for Coal Over an area of 403.29 acres situated near PARARA, District Chakwal". Mining lease was granted by Mines and Minerals Department, Government of the Punjab

### 2.2.2. Details of the Proponent

The details of the proponent are given in Table 2-1;

***Table 2-1 Details of the Proponent***

| **Details of Proponent** | |
|---|---|
| Proponent Name | MR. SYED GHULAM HUSSAIN |

| | |
|---|---|
| Address | 20-D MODEL TOWN, LAHORE |

## 2.3. Details of Consultant

The details of the consultant are given in Table 2-2;

***Table 2-2 Details of the Consultant***

| **Contact Details** | |
|---|---|
| **Consultant** | Prime Environmental Consultants |
| **Contact** | (+92) 321-7860915 |
| **Address** | Latif Plaza, Office No. 07-08, 69 Saeed Block Commercial area, Canal Bank Scheme, Lahore |
| **e-Mail** | primeenvironmentalconsultants@gmail.com |

The team carrying out the project impact assessment is presented in the Table 2-3.

***Table 2-3 Consultant Team***

| Sr. | Name | Qualifications & Brief Experience | Roles Assigned |
|---|---|---|---|
| 1. | Engr. Ali Mehdi | B.Sc. Mining Engineering | • GIS Expert<br>• Stakeholder Consultation |
| 2. | Ammara Afzal | Environmental Scientist M.s Environmental Science | • Preparation of Environmental Management Plan (EMP)<br>• Preparation of Environmental Monitoring Plan (EMP)<br>• Author of EIA Report |
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| | | | |
|---|---|---|---|
| 4. | Umer Saeed | Environmental Scientist M.S Environmental Science | • Site visits |

## 2.4. Brief Description of Nature, Size and location of the Project

The project is about Mining Lease for Coal Over an area of 403.29 acres situated near PARARA, District Chakwal.

Pakistan holds 3,377 million tons (MMst) of proven coal reserves as of 2016, ranking 20th in the world and accounting for about 0% of the world's total coal reserves of 1,139,471 million tons (MMst). Pakistan has proven reserves equivalent to 331.1 times its annual consumption.

Punjab, being second largest (area-wise) province of the country, has vast mineral potential like coal, salt, iron ore, limestone, gypsum, silica sand and fire clay etc. The main coalfields of Punjab are in the Salt-Range and at Makarwal. The total coal resources are estimated at 235 million tonnes, of which 33 million tonnes are mineable. Punjab coal is classified as Sub-bituminous, and the heating value ranges from 9,472 to 15,801 Btu/lb. It has low ash and high sulfur, and is considered suitable for power generation.

The main objectives of coal mining are

- To enhance the contribution of mineral sector to GDP through improved production.
- To expand mining sector by focusing on exploration and evaluation of mineral resources.
- To enhance public sector investment on resource mapping, Geo-database development and provision of physical infrastructure, roads and electricity etc. in the potential areas.
- To promote facilitation role of the government for the prospective investor.

- To encourage and support exploration of minerals, particularly through private sector.
- To promote environment friendly mining practices and to take measures for mitigation of environmental hazards for sustainable development of mineral sector.

The location of the proposed mining is at given below;

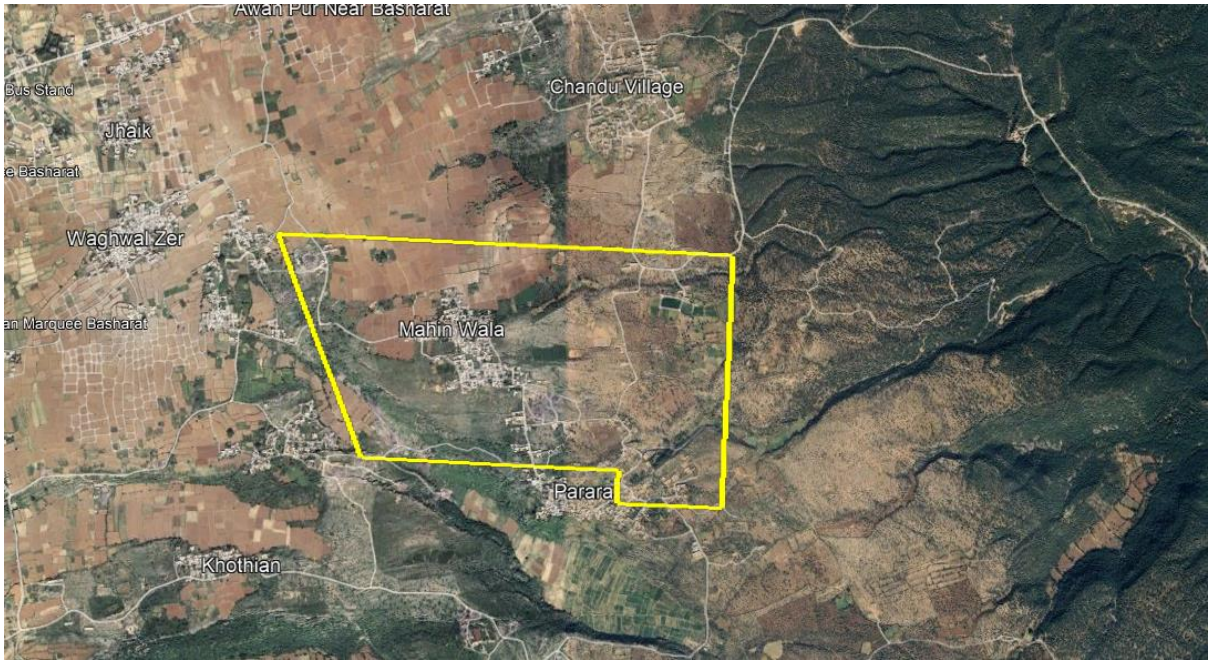



***Figure 2-1 Location of the Project on Google Earth***

# 3. DESCRIPTION OF THE PROJECT

## 3.1. Type & Category of the Project

As the project is about mining lease that falls in Schedule-II, Part-I of Punjab Environmental Protection Agency 's (Review of IEE and EIA) Regulations, 2000, the Guidelines for the Preparation and Review of Environmental Reports, an Environment Impact Assessment (EIA) of mining of coal is required. Proponent of the project has engaged Prime Environmental Consultants to undertake Environment Impact Assessment (EIA) study of mining project.

## 3.2. Objectives of the Project

a) Accelerate pace of development in the existing mines.
b) Enhance production, productivity coupled with safety by improvising with the adaptable technology-mechanization.
c) Undertake aggressive marketing to maximize domestic share.
d) To provide employment to the locals
e) Fuels like coal provide an excellent fuel for "base-load" generation because they can be burned on demand, generating electricity when it is needed.
f) Expand business through added exploration and exploitation by new entries based on techno-economical parameters.

## 3.3. Alternative considered and reason for rejection

Unlike industrial establishment the coal mining projects are pegged with the favorable geology in the given/granted area. There are proven coal reserves in the area. Coal existance is subject to geological variations.

The projects involving mining of minerals are located in the areas which geological favor the presence of coal or other minerals. The site selection needs very careful, well thought out and wise decision. The most important factors for such a site selection include availability of raw material and land, seismic stability of site, existence of basic infrastructure including roads, water,

manpower, proximity to electric transmission system, project economic viability with reference to specific site, land use policies, further expansion possibilities etc.

From the standpoint of environmental sustainability, the site selection is based on numerous factors including proximity from residential areas, protected areas, surface water bodies, wild life reserves etc. No site alternative was considered because site was already selected by the proponent and it lies within coal bearing formation. Site was not rejected because the geological formations support the existence of coal subject to exploration.

The project site is located in the area where geology favors the coal mining activities as enough reserves of coal are available. Coal mining operations cannot be carried out at a site where reserves are not enough. Hence, there is no alternative location available in this case.

Following are some of the additional parameters that favor coal mining in the respective region:

i. Favorable geology with coal bearing area.
ii. Easy extraction of the coal by available methodology.
iii. The project operation doesn't involve human settlements displacement or relocation.
iv. Mining of the coal in the respective zone has provided job opportunities to local people and improved their socio-economic status.
v. The coal production has contributed positively in the income stream of the national exchequer as well as contribution in GDP.
vi. The coal transportation from mine to market road is easily available.
vii. The project has a sustainable life span.
viii. The mining operations are undertaken up to the coal bearing strata with a geological depth of around 250-400 feet.

ix. Moreover, there is no railway line, reservoir, canal or public building within 2 km distance of the mining area.

x. No important religious, archaeological, recreational site, ecologically sensitive, declared protected area and human settlements exists within close vicinity of the selected site i.e., within 100 m which is considered to be a safe distance.

xi. The lease granted concedes with the fixed geology. The lease held in the past has been renewed for the same location based on satisfactory performance of the lessee. There is no alternative to the fixed geology at site. The grant of lease is specific to the lessee and coal discoveries in the leased area. The sequence of rocks being the same in salt range with small variations of thickness due to depositional environment. The working for coal in the Patala Shale remains an unchanged phenomenon.

In view of these facts, it can be concluded that the chosen site per force is fixed. Considering the facts that mine site is at a safe distance from sensitive receptors and has advantage of not only to be environmentally friendly but also potentially sound to enhance sustainable development in the region. Therefore, given site is the most suitable.

## 3.4. Location and Site Layout of the Project

The mining lease of coal is located in District Chakwal of Punjab. The project location is represented in Figure No. 3-1 and more detailed colored image is present in ***Appendix VI*** on A3 size.

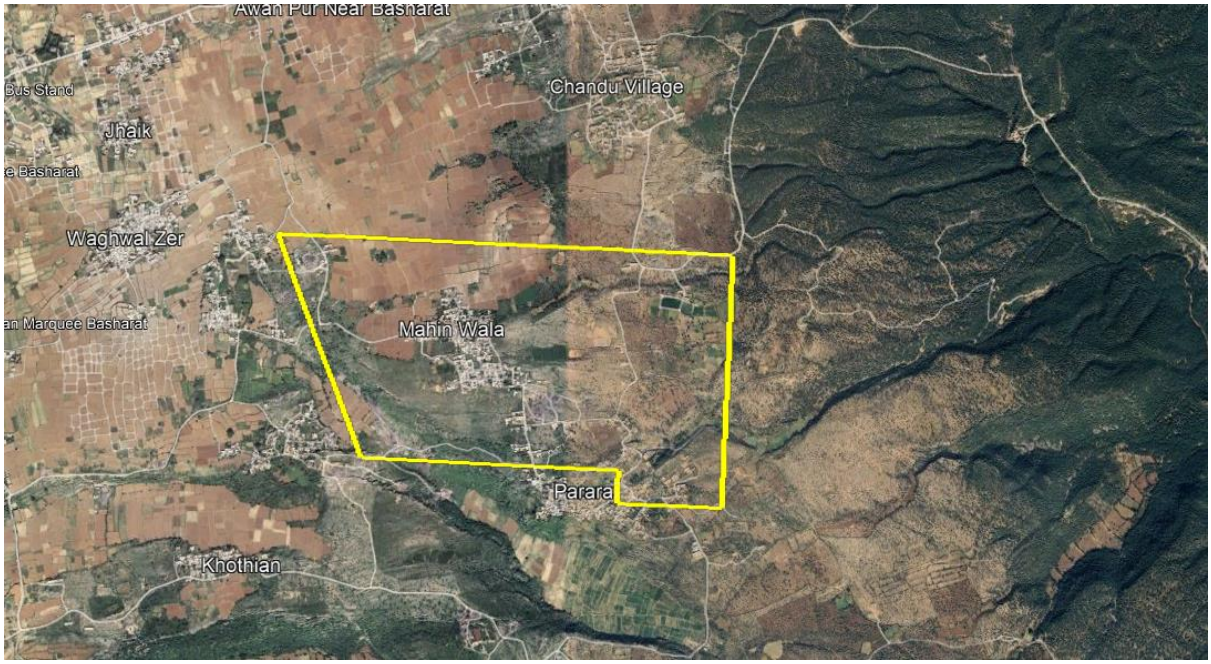



***Figure 3-1 Project Site presented on Google Earth***

The proposed site boundary primarily falls within mainly inhabited and presently unused area. The coordinates of the coal lease area are given in Table No. 3-

***Table 3-1Coordinates of the Coal Lease Area***

| Points | Easting(yds) | Northing(yds) | Easting(m) | Northing(m) |
|---|---|---|---|---|
| **A** | 3523340.00 | 1045000.00 | 3221742 | 955548 |
| **B** | 3522900.00 | 1046000.00 | 3221340 | 956462 |
| **C** | 3525000.00 | 1046000.00 | 3223260 | 956462 |
| **D** | 3525000.00 | 1044850.00 | 3223260 | 955411 |
| **E** | 3524520.00 | 1044850.00 | 3222821 | 955411 |
| **F** | 3524520.00 | 1045000.00 | 3222821 | 955548 |
| **Total Area = 403.29 Acres** | | | | |

## 3.5. Land Use on the Site

The land is not an agricultural land. However, coal is being extracted by the method of underground mining so change to the surface will occur.

## 3.6. Road Access

PARARA is in easy and close access of the proposed project site.

## 3.7. Vegetation Features of the Site

There is no vegetation cover on the project site. The area free of any vast tree cover and dense vegetation.

## 3.8. Cost and the Magnitude of Operation

The capital cost of the project is Rs. 20 million. There will not be any other activity except mining of coal.

## 3.9. Schedule of Implementation

The Project plans to be completed within 3 to 6 months after getting requisite approvals and NOCs from authorities. Project development schedule (tentative) is described hereunder:

***Table 3-2 Time Schedule for the Quarry Development***

| Sr. | Description | Months |
|---|---|---|
| 1 | Cost of exploration work | 03 |
| 2 | Office and Labor Shed | 03 |
| 3 | Access road | 04 |
| 4 | Mine Development | 18 |
| 5 | Machinery & Equipment Procurement | 02 |

## 3.10. Description of the Project

The various methods of mining a coal seam can be classified under two headings, surface mining and underground mining. Surface and underground coal mining are broad activities that incorporate numerous variations in equipment and methods, and the choice of which method to use in extracting a coal seam depends on many technological, economic, and social factors. The technological factors include, at a minimum, the number of seams, the thickness and steepness of each seam, the nature and thickness of the strata overlying the seams, the quality of the coal seams, the surface topography, the surface features, and the transportation networks available. Economic factors include energy demand and its growth, the supply and cost of

alternative sources of energy, coal quality and the cost of coal preparation, the selling price of coal, advancements in technology that affect costs of production, and environmental legislation. Social factors include prior history of mining in the area, ownership patterns, availability of labour, and local or regional government support.

It is a general rule that technological factors dictate a clear choice between surface and underground mining, whereas economic and social factors determine whether a coal reserve will be mined at all. Some coal reserves, however, are surface-mined first and then deep-mined when the coal seam extends to such great depths that it becomes uneconomical to continue with surface mining. The point where it becomes economically necessary to switch from one method to the other can be calculated with the aid of stripping ratios, which represent the amount of waste material that must be removed to extract a given amount of coal. Stripping ratios can also consider the selling price of coal, and a certain minimum profit can be added to the total cost of producing and marketing the coal for a more thorough cost-benefit analysis.

The method of mining is a function of mineral deposition, its environment, geological surrounding, seam thickness, its dip and nature of coal whether gassy or non-gassy, or fire prom or not. The Punjab coal seams are thin less than 2 feet which is a world record on coal extraction for such a thin coal seam.

The access to coal seam either through adits or shaft is made as the permanent access road ways to the coal seam. These openings are used for the passage of miners, machinery and for the passage of mined coal. There are three choices for making access roadways to the mineral deposit for underground mining i.e. shafts, tunnels and adits.

The shaft is opted where the strata is nearly horizontal in bedded deposit. The tunnels are opted for an almost vertical or nearly vertical stratum in a bedded deposit. The adits are artesian way of making access to the mineral deposit and are in practice since time in memorial. Worldwide the fastest means of

mineral transportation from underground to surface are shaft and tunnel. The adits are compromise in-between.

Shafts are sunk by using conventional drilling and blasting by artesian method which is not cost effective and takes 12-15 months with shaft diameter of 2.5 meter and average depth of 150 meters. The existing mine which have gone deeper and have expanded laterally are confronted with ventilation problem. Bore-raising from the last workstation to the surface will improve the ventilation. In nutshell, the shaft sinking and bore-raising technology must be adopted with imported machines with government support.

There are different underground Coal mining methods which are as follows:

1. Room and Pillar Mining
2. Long wall Mining
3. Short wall Mining

### 3.10.1. Room and Pillar Mining

In this method, a number of parallel entries are driven into the coal seam. The entries are connected at intervals by wider entries, called rooms, that are cut through the seam at right angles to the entries. The resulting grid formation creates thick pillars of coal that support the overhead strata of earth and rock. There are two main room-and-pillar systems, the conventional and the continuous. In the conventional system, the unit operations of undercutting, drilling, blasting, and loading are performed by separate machines and work crews. In a continuous operation, one machine—the continuous miner—rips coal from the face and loads it directly into a hauling unit. In both methods, the exposed roof is supported after loading, usually by rock bolts.

Under favorable conditions, between 30 and 50 percent of the coal in an area can be recovered during development of the pillars. For recovering coal from the pillars themselves, many methods are practiced, depending on the roof and floor conditions. The increased pressure created by pillar removal must be

transferred in an orderly manner to the remaining pillars, so that there is no excessive accumulation of stress on them. Otherwise, the unrecovered pillars may start to fail, endangering the miners and mining equipment. The general procedure is to extract one row of pillars at a time, leaving the mined-out portion, or gob, free to subside. While extraction of all the coal in a pillar is a desirable objective, partial pillar extraction schemes are more common.

At depths greater than 400 to 500 meters, room-and-pillar methods become very difficult to practice, owing to excessive roof pressure and the larger pillar sizes that are required.

### 3.10.2. Longwall mining

In the longwall mining method, mine development is carried out in such a manner that large blocks of coal, usually 100 to 300 meters wide and 1,000 to 3,000 meters long, are available for complete extraction. A block of coal is extracted in slices, the dimensions of which are fixed by the height of coal extracted, the width of the longwall face, and the thickness of the slice (ranging from 0.6 to 1.2 meters). In manual or semi mechanized operations, the coal is undercut along the width of the panel to the depth of the intended slice. It is then drilled and blasted, and the broken coal is loaded onto a conveyor at the face. The sequence of operations continues with support of the roof at the face and shifting of the conveyor forward. The cycle of cutting, drilling, blasting, loading, roof supporting, and conveyor shifting is repeated until the entire block is mined out.

### 3.10.3. Short Wall Coal Mining Method

In the shortwall mining method, the layout is similar to the longwall method except that the block of coal is not more than 100 meters wide. Furthermore, the slices are as much as three meters thick and are taken by a continuous miner. The mined coal is dumped onto a face conveyor or other face haulage equipment. The roof is supported by specially designed shields, which operate

in the same manner as longwall shields. Although a great future was envisioned for shortwall mining, it has not lived up to expectations.

The ventilation system in the mines is through mechanical exhaust fans installed at a return airway. The water problem is tackled through constant pumping from grade depth of 100-150 meters. The coal dust is suppressed underground by water sprinkling or as per legal requirement of limestone dust sprays. The temperature is controlled through the ventilation current underground. The strata are controlled through coal pillars and timber provided in the shape of doors erected at 2.5 to 3 feet apart. The timber used is Kikar.

### 3.10.4. Blasting Details

The hard rocks may be during developing or associated with rocks are fragmented by the use of appropriate explosive with different drilling and blasting pattern which is purely need based. The coal is manually cut and excavated while hard-stone in the development galleries or chapper are excavated by adopting conventional drilling and blasting using high explosive coupled with safety fuse and detonator. The amount of explosive to be used is procured on daily basis and utilized as per Rules and Regulations of Mines Act 1923.

- **Blasting Frequency**

The blasting frequency is almost once a day at each workstation requiring the support for use of explosive to the extent of its licensed limits i.e. 5 kg/day. Whenever, there are hard-rocks exposed in development galleries or chapper, drilling and blasting has to be carried out.

- **Method used for Blasting**

Conventional blasting method will be used with high explosive coupled with safety fuse and detonator.

- **Location Designated for the Storage of Explosives**

The Explosive is stored on the surface in an approved manner as per provision of Mines Act 1923. The amount of explosive to be used is procured on daily basis and utilized as per Rules and Regulations of Mines Act 1923.

### 3.10.5. List of Equipment& Machinery for Coal Mining

The list of equipment proposed to be used for coal mining operations is given in Table 3-3.

***Table3-3 List of Equipment for Coal Mining Operations***

| Sr. No. | Nomenclature | Purpose |
|---|---|---|
| 1. | Engine Generator | Power Generation |
| 2. | Compressor | Development |
| 3. | Fan blower | Ventilation |
| 4. | Haulage | Development |
| 5. | Water tank | Sprinkling |
| 6. | Pick Machine | Development |
| 7. | Cables (2600 ft) | Development |

### 3.10.6. Coal Transportation, Storage, Loading, & Unloading

The market requires coal to have a high quality and purity. The coal extracted from mines contains a mixture of fractions of different sizes, sometimes containing rocks or compost. Therefore, a preparation stage is needed, called "beneficiation" and the raw coal is divided into a series of clean, uniform and classified products, ready to be sold. In some cases, raw coal has a high quality that satisfies consumers' needs. In these cases, the "beneficiation" is not necessary and the coal can be simply broken into pieces and sieved in order to obtain a specific product.

A good preparation of coal before its combustion increases the homogeneity and efficiency of this combustible, reduces transport costs and its

displacement inside the plant produces less dust and reduces the emission of Sulphur oxides.

Once coal has been extracted, it is necessary to transport it to the plants where it will be used. For short distances, trucks will be used, while for longer distances trains, barges and ships will be employed. Recently coal pipes have been tested: the mineral is pumped after being transformed into dust and mixed with water. Preventive measures are taken at any stage during transport and storage, in order to reduce any environmental impact.

The details of coal transportation, storage, loading, & unloading are given below:

- **Coal Transportation**

The shaft usually follows mining. In this case the railway line is used to facilitate the towing of mines towed by a paved road. It is not uncommon for a trackless system to be taken from underground mines due to low volume and high distance and the lack of electricity in the national grid. Loading and unloading is done with an advanced method of mechanical levers. In some cases, with low production or low volume it is preferred as manual operation. Subway travel is usually a handful of mining vehicles carrying about one ton of coal.

Most of the mines used in the traditional system using donkeys do not need to be pierced by hand. The charcoal and stone cutting of the face is done by hand where the output of each man per face change is 0.75 tons and basically a total of 0.33 tons.

The transport of coal minerals from the active surface to the surface, is a major factor in the efficiency of underground mining. In the meantime, the coals will be loaded into bins / carts using shovels and picks and then pulled to the working surface to the top.

- **Coal Storage**

Coal will not be stored at site in the form of coal piles after extraction from coal face and haulage at the surface. Coal will be loaded onto trucks for transportation to market places/consumer end after haulage at surface.

- **Loading**

After haulage at the surface, coal will be loaded onto trucks from carts to be supplied to consumer end. Coal will be loaded from carts into trucks either using hand spades or shovels.

- **Unloading**

The unloading of coal is done by consumer or truck/tractor trolley owner/agency at the consumer area which is concern of consumer.

### 3.10.7. Manpower

The man power required for coal mining is described in Table 3-4.

***Table 3-4 List of Manpower for Coal Mining Operations***

| Sr. No. | Category of Staff | Strength |
|---|---|---|
| 1. | Mine Engineer | 01 |
| 2. | Mine Surveyor | 01 |
| 3. | Mine Sardar | 01 |
| 4. | Mine Sardar | 01 |
| 5. | Engine Operator | 01 |
| 6. | Pump Driver | 02 |
| 7. | Electrician | 01 |
| 8. | Accountant | 01 |
| Total | | 09 |

### 3.10.8. Water Requirements

The main water supply requirement is for drinking water and nothing in the mining process. The workers are being provided 2-3 liters of water per capita per day. For a 50 workers camp, the quantity of water required is about 100-150 liters per day.

### 3.10.9. Solid Waste

The coal seam is not very thick. The solid rocks associated with the coal seams are required perforce to be extracted for making the size of galleries within the prescribed limits of comfort. Generally speaking, the size is kept 6x6 feet in the gallery. The cavity created by the coal extraction provides enough space for hosting the solid rock dumping underground up to 40%. The surplus stones are hauled up and dumped on the surface on the hill slope in a way that natural drainage pattern is not blocked if required.

### 3.10.10. Process Flow Chart

The mining activities are carried out in a very coordinated way. From the selection of site till the mining and conclusion of project, the mining supervisors and laborer are trained to develop an understanding of complexity and sensitivity of the operations.

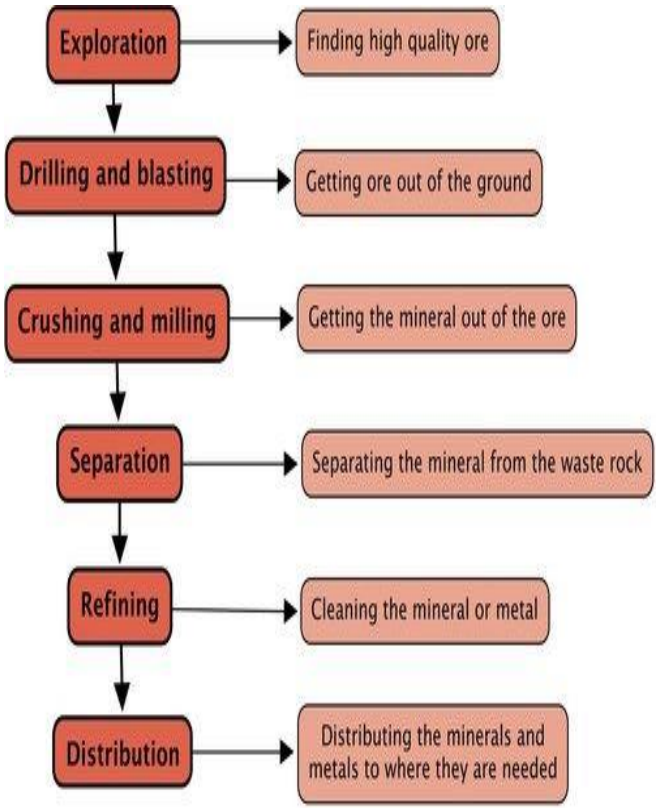



***Figure 3 Process Flowsheet***

- **Mode of Excavation**

The mode of excavation is manual. The mining will be carried out either by hand-spades or by hand picks. No machinery is used for extraction of coal from coal face. The coal mining is done at depth of about 400 to 500 feet. The coal deposits are generally present at such depths in the Salt Range.

- **Market of the Coal**

After loading into the trucks, coal will be transported to the market places based on demand. Trucks will be used for the transportation of coal to the market places. Coal may be marketed to Chakwal and nearby areas.

## 3.11. Restoration and Rehabilitation Program

Following steps can be done by guessing the restoration and restoration of the area:

- Waste dumps are contoured to flatten them out, to further stabilize them against erosion.
- Landfills are covered with topsoil, and vegetation is planted to help consolidate the material.
- Dumps are usually fenced off to prevent livestock denuding them of vegetation.
- The open pit is then surrounded with a fence, to prevent access, and it generally eventually fills up with groundwater.
- Tailings dams are left to evaporate, then covered with waste rock, clay if need be, and soil, which is planted to stabilize it.
- No human settlement within the secure area of the selected project area will be removed due to mining. No value building located in the area should be relocated or demolished. The mine has already been handed over to the opponent, therefore, no relocation and renewal is required.
- The leased mining process will be a surface mining process in which there will be minimal disruption to the plant and structural aspects of the project structure.
- The value of the site is due to economic activity, if not. It is like a barren land. The question of renewal therefore does not arise without redistributing the land formed by the excavated local mines
- A single location can be used for geo tours for tourists to perform other economic activities once the depots are depleted.
- The site may be used for reconstruction purposes.
- Trees will be planted in the project area through a dry forest planting process and the entire local environment will be greatly improved.
- This area can be used to reintroduce livestock

***Table 3-5 Restoration and Rehabilitation Program***

| **Measures for Land Rehabilitation & Restoration** | **Timeframe** | **Responsible Party** |
|---|---|---|
| There exists no human settlement within safe radius of the selected project site | - | - |

| | | |
|---|---|---|
| to be displaced owing to the mining operations. No structure of any significance stands at the site to be relocated or dismantled. Mine is already awarded to proponent, hence, no relocation and rehabilitation is required. | | |
| The details of the land leases documents are attached at the end of this EIA Report. The process of mining employed will be underground mining process in which least disturbance to the vegetation features and the infra-structure at the project site will occur. | - | - |
| The importance of the site is due to economic activity, otherwise. it is a replica of a barren land. The question of rehabilitation therefore doesn't arise except re-coursing the land formed by the cavities of the mined-out area | After Mine Closure | Proponent |
| The isolated site can be used for geo-tours to the visitors for generating alternate economic activity once the reserves are exhausted. | After Mine Closure | MMD |
| The site can be used for re-stocking the livestock. | After Mine Closure | MMD/ Livestock Department |
| Trees will be planted at the project area by using dry afforestation technique and the overall ecology of the area will be improved significantly. | Till Lease Tenure | Proponent |
| The land will be available for agricultural use. | After Mine Closure | MMD/ Concerned Authority |
| The site can be used for re-creational purposes. | After Mine Closure | MMD/ Concerned Authority |

# 4. DESCRIPTION OF THE ENVIRONMENT

The existing environment in the project area has been studied with respect to the physical, biological and socio-economic resources.

## 4.1. Baseline Physical Environment

Physical resources of the proposed study area include geology, topography, soil, climate, meteorology, ambient air quality, surface water, ground water and other existing pollutants prior to the operation of the project.

Chakwal District is in Pothohar Plateau of Punjab, Pakistan. It is located in the north of the Punjab province, Chakwal district is bordered by Khushab to its south, Rawalpindi to its north east, Jhelum to its east, Mianwali to its west and Attock to its north west. The district was created out of parts of Jhelum and Attock in 1985. Based on geography, topography and geology, the project area is briefly described below:

### 4.1.1. Topography and Geology

The study area is hilly and sub mountainous. The topography is rugged and elevation ranges from the 450 m to 500 m above the sea level. Hill torrents are present in the area which mostly runs from the north to south and drain the rain and storm water of the hilly area into deeper valleys and places. Population of the study area is about 25,000 including temporary settlements in that area. There is no such historical place is present in the study area. Mostly people of that area are in army and other part of the country for their income. Agriculture is rare due to the calcareous and mountainous region.

### 4.1.2. Meteorology of the District Chakwal

Chakwal is located in the Dhanni region of the Potohar in northern Punjab, which is a semiarid area with a shortage of irrigation systems and water sources for agriculture. Over 70% of the population engages in agriculture, mostly subsistence agriculture dependent on rainfall. Monthly average rainfall of base line period (1981-2010) is displayed in Figure below.

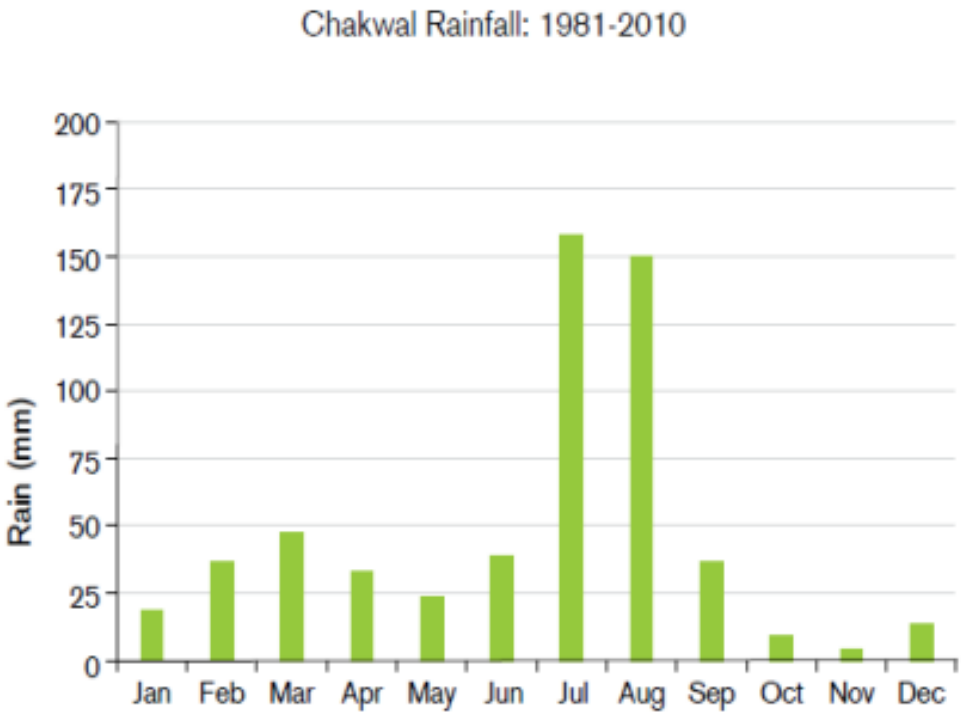
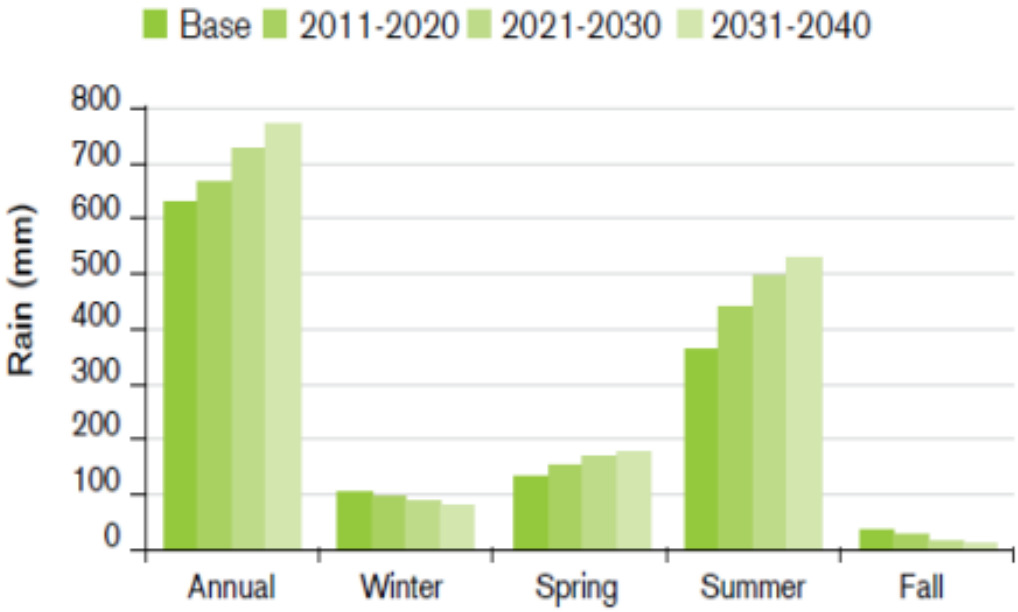



***Figure 4-1Monthly rainfall data of chakwal***

The computed rainfall scenarios using the base line data of 1981-2010, for each season with departures from base line period and the preceding decades are given below graph.



### 4.1.3. Temperature

The mean monthly maximum and minimum temperatures, according to the base line data (1981-2010) are displayed in the Figure below. The annual average temperature of Chakwal District is 29.6°C.

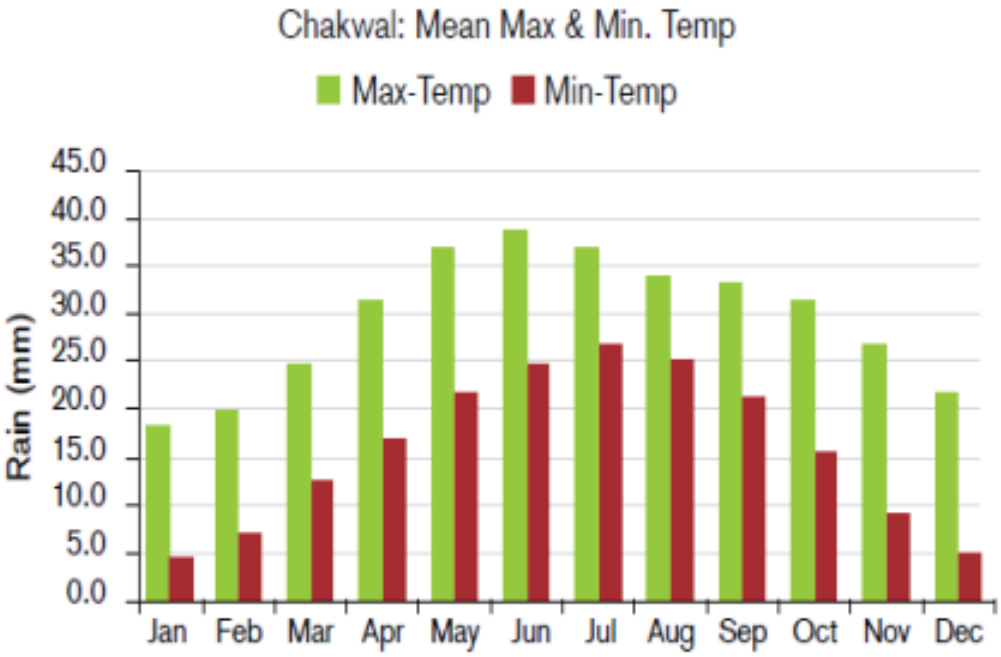



***Figure 4-3 Monthly temperature of Chakwal***

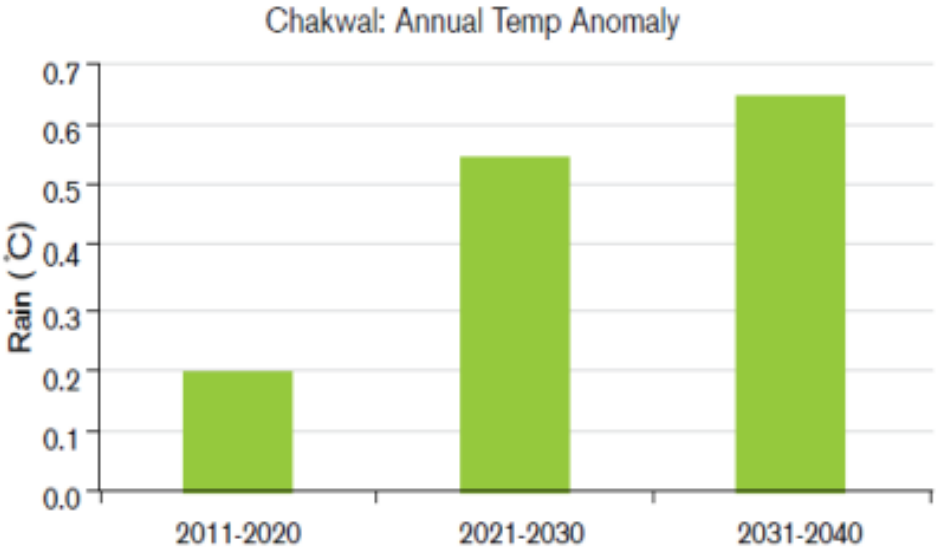


***Figure 4-4 Annual temperature of Chakwal***

### 4.1.4. Humidity

July, August and September are the most humid months in the area, whereas May and June are the least humid months. Average monthly relative humidity values at various locations in the project area are 64%.

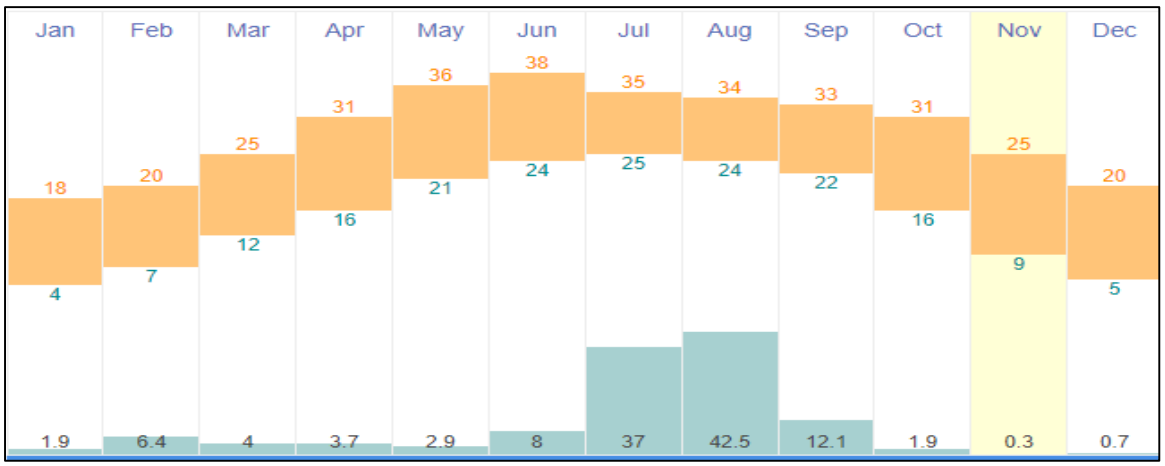



***Figure 4-5 Average Humidity***

### 4.1.5. Soils

Mostly area is covered by the mountains. Fertile land is rare in the study area. Small patches of the soil are present that are used by the house hold for the vegetable harvesting. Hard rocks are present all over the upper layer. Clay is also present at about 1-3 km distance from the proposed mining site. The soils are medium textured with considerable amount of clay materials. Soil formation of that area is occurred through the mechanical weather of the old alluvial deposit and loess due to the wind and water of the rains.

### 4.1.6. Climate

The meteorological data of the proposed study area was collected from the Pakistan Department of Meteorology (PMD) for the last 15 years. The climate of the area can be classified as true semi-arid, sub-tropical with long winter and sub-humid. The general feature are high June- July temperature with occasional hot, dry wind and dust storms, cold nights in winter and two rainy seasons. Unseasonal rain fall is also occur in the start of the winter Rain fall

pattern of the study area are as; 3. Mid Jun to mid September 4. December to March The wind mostly flow from the north to the south in the study are region. Mean annual maximum temperature of the study area reach 29°C and minimum is about 14°C. Humidity of the area is high at night except of the month of the May and Jun when it is about 58% at midnight and 46% at 0300 hrs. During the other month the humidity rage is about 70% to 80% while the midday humidity is low and range is 23%-26%.

### 4.1.7. Seismicity of the Project Area

According to seismic zoning of Pakistan the project area lies in seismic zone 2Band represents minor damage. Earthquake with high intensity for a fundamental period of more than 1 second may cause damage to infrastructure. Seismic zoning map of Pakistan is given in figure 4-6.

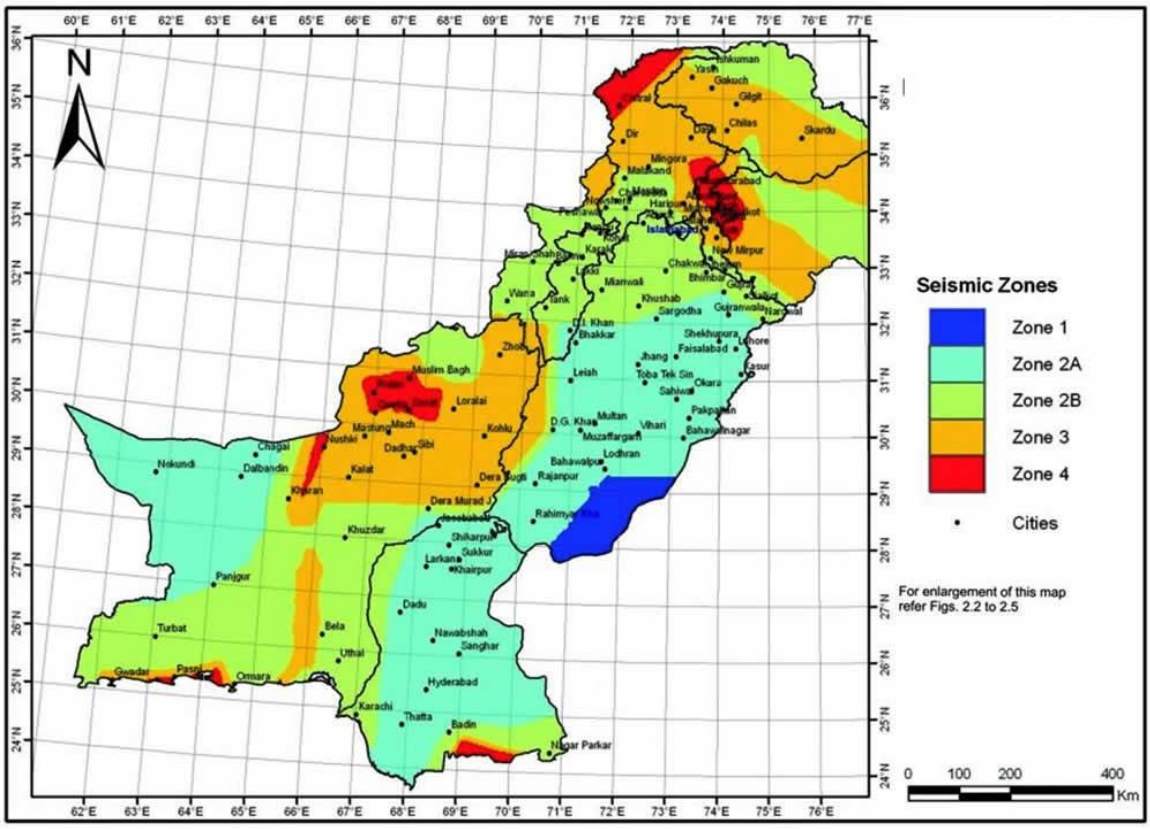



***Figure 4-6Seismic zoning map of Pakistan***

There are three main faults in the Salt Range:

- Kalabagh Fault (North South)
- Jhelum Fault (North South)
- Salt range thrust fault (East-West)

In the Region of Salt Range over all earthquake occurrence frequency trend is same and area representing the moderate seismicity.

### 4.1.8. Geography

The district is located between 33°40′38″N and 72°51′21″E. Chakwal district borders the districts of Rawalpindi and Attock in the north, Jhelum in the east, Khushab in the south and Mianwali in the west. The total area of Chakwal district is 6,609 square kilometers, which is equivalent to 1,652,443 acres (6,687.20 $km^2$). The southern portion runs up into the Salt Range, and includes the Chail peak, 3,701 feet (1,128 m) above the sea, and the highest point in the district. Between this and the Sohan river, which follows more or less the northern boundary, the country consists of what was once a fairly level plain, sloping down from 2,000 feet (610 m) at the foot of the hills to 1,400 feet (430 m) in the neighborhood of the Sohan; the surface is now much cut up by ravines and is very difficult to travel over.

- **Water Quality**

The Laboratory collected the underground water sample on the 06-06-2015 from the different villages for the water quality analysis of the study area. Water table of the study area is about 400 ft to 550 ft (Source local people during survey of villages).

Water typically is not considered desirable for drinking if the quantity of dissolved minerals exceeds 1,000 mg/L (milligrams per liter). Water with a few thousand mg/L of dissolved minerals is classed as slightly saline, but it is sometimes used in areas where less-mineralized water is not available. Water from some wells and springs contains very large concentrations of dissolved minerals and cannot be tolerated by humans and other animals or plants.

Many parts of the Nation are underlain at depth by highly saline ground water that has only very limited uses.

Dissolved mineral constituents can be hazardous to animals or plants in large concentrations; for example, too much sodium in the water may be harmful to people who have heart trouble. Boron is a mineral that is good for plants in small amounts, but is toxic to some plants in only slightly larger concentrations

- **Groundwater**

Ground water resources are found hidden and camouflaged into the surface of earth in the form of mobile and immobile state and exist as shallow and deep wells, confined and un-confined aquifers, springs and watersheds. Ground resourced waters are not easily susceptible to natural and anthropogenic derived contamination caused by Chemical/Biological pollution and thus is directly used for sensitive applications such as drinking even it is un-treated. The project area lies in the district of Chakwal; the groundwater table normally exists approximately 5 feet to more than 20 feet below the GSL.

- **Springs water**

Study area contains two main water bodies which are natural springs named Neelwan and Abbe-shafa. Local people use the drinking water from those sources. Currently there is no pipeline system or water supply is present in the proposed study. Water is good quality of both the springs.

## 4.2. Baseline Ecological Environment

### 4.2.1. Fisheries

The project area is almost free from any commercial fishing activity. There are no lakes, natural water springs are present at 4 km distant from the proposed project site. These springs have no fish. Therefore, Fishery or any worth mentioning aquatic biology in this area is out of question.

### 4.2.2. Biodiversity

Natural capital of a country mainly includes all of the country's wilderness areas and scenic landscapes, including also with their associated flora and fauna. Pakistan has a total of nine major ecological zones. The contribution of the "Natural Capital" is recognized at three distinct levels: species, genera, and communities (habitat and ecosystem) both collectively and within each level, the range or variety of the resources are referred to as the "Biological Diversity". The term has relevance for each of Pakistan's administrative units district, province, and particularly country. The more the number of species, genera, and habitats and ecosystems present within these units, the greater is said to be the Biodiversity. The biodiversity of the area, with this background, is discussed as under.

### 4.2.3. Flora

There is a very wide range of plant species in the study area. But proposed project site have very low vegetation and plants species. Following species are most commonly found in the study are of four villages. Amongst plants, the species which are most abundant in the Study area are Kau (Olea cuspidata), Phulai(Acacia modesta), Sanatha (Dodones viscosa), Gurgura (Monotheca buxifolia), and Pataki (Gymnospo Riaroyleana).

The general vegetation consists of dry deciduous scrub. The grass species which are dominant in the area are Sariala (Heteropogan contortus), Khawi (Cymbopogan jwarancusa), Mesquite (Prosopis juilfloro), and Karir (Capparis sphylla).

***Figure 4-7 Native species of project site***

### 4.2.4. Fauna

The species which exist in various areas of Chakwal district are:

- **Grey partridge**–found all over the district, especially in areas, which are sparsely populated.
- **Black partridge**–found along the seasonal channels and water holes in the bellas throughout the district.
- **Chakore**– found in dry rocky areas in the district especially in the ChoaSaiden Shah area.
- **See See partridge**–found at a number places in the district in the dry rocky area especially in the Kallar Kahar mountain belt leading into subdivision Talaga.

**Endangered Specie**

There are no game reserves or protected lands/areas or endangered or rare species either in the area in the range of 15km from the project site.

### 4.2.5. Forestry

The forests which exist naturally, since Chakwal lies in the subtropical, semiarid zone, are dry deciduous scrub, consisting of the plant varieties which are typical of these kinds of forests- keeker, kau, phulai, sanatha, wild beri, gurgura and potaki. The underbush mainly consists of saryala, khawi, mesquite and karir. In the plantations that have been carried out by the Forest Department and private farmers, apart from the naturally occurring species of trees, the sheesham, sufaida and to some extent the poplar trees have also been planted.

At present a total of 92382 acres of the district are under reserve forest and 57868 acres are under unclassed forest. The main reserve and unclassed forests in the district are at Diljabbah, Surullah, Drangan, Gandala, Khokhar Bala, Makhiala, Dandot, Chinji, Kot Kala, Simbli, Nurpur, Bagga, Sammarqand and Thirchak. Forests in Chakwal district are taken care of by the Chakwal Forest

Division, headed by the Divisional Forest Officer who is assisted by four Sub-divisional Forest Officers. The Chakwal Forest Division is spread over an area of 150250 acres which includes 375 km roadside and 40 km rail side plantations.

## 4.3. Baseline Socio-economic Environment

Socio-economic and other relevant information revealed from Multiple Indicator Cluster Survey (MICS) 2007-08. One of the main objectives of Multiple Indicator Cluster Survey (MICS) was to establish credible baseline for socio-economic status at each District and Tehsil Level.

***Table 4-1Summary of Socio-economic Indicators***

| *Socio-economic Indicators* | **District Chakwal** |
|---|---|
| Number of households | 1,270 |
| Number of under-5 children | 710 |
| Improved source of drinking water | 96.8% |
| Water treatment used in the household | 2.6% |
| Percentage of population using sanitary means of excreta disposal. | 69.5% |
| Proper disposal of solid waste | 1.9% |
| Literacy rate | 72.2% |
| Percentage of children for primary school entry | 67.2% |
| Total child labor | 1.9% |
| Had cough for more than last three weeks | 1.0% |
| Diagnosed with Tuberculosis during last one year | 0.2% |
| Diagnosed with Hepatitis during last one year | 0.6% |
| Employed | 87.6% |
| Unemployed and seeking job | 12.4% |
| **Household Utilities** | |
| Electricity | 0.1% |
| Natural Gas | 19.3% |

| | |
|---|---|
| Radio | 53.4% |
| TV | 71.2% |
| Cable TV | 10.5% |
| Telephone | 21.7% |
| Mobile | 79.0% |
| **Socio-economic Development** | |
| Livestock | 54.1% |
| Mean household size | 6.0% |
| Govt. hospitals | 37.6% |

### 4.3.1. Quality of Life Values

- **Population**

According to the 1998 census, the population was 1083725 with 12.15% living in urban areas. The district consists of three tehsils. Figure 5-8 shows the population difference of District Chakwal between 1998 and 2017.

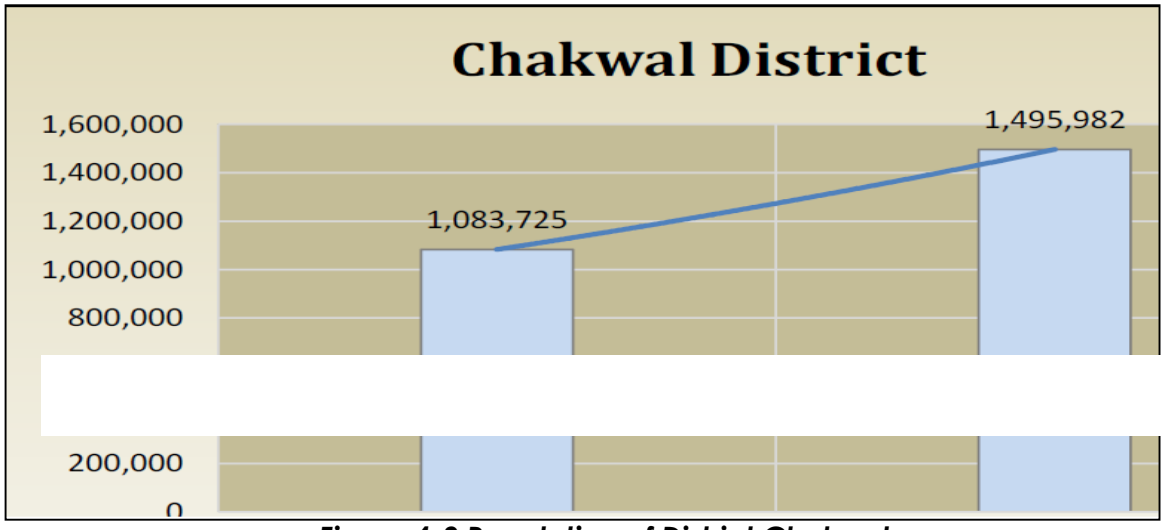



*Figure 4-8 Population of District Chakwal*

- **Health Facilities**

The coal cutters hail from Swat and as such are resident. Their First Aid and medical care is done by local dispensary . In case of health emergencies suggesting hospitalization, the patients are transferred to Mines Labor Welfare Hospital Choa Saiden Shah.

- **Education**

The primary health and education facilities are provided in the nearby town. The higher education both for boys and girls are available in Choa Saiden Shah, Kallar Kahar, Khewra and Chakwal.

- **Economic**
  - **Income Levels**

Generally, the people are poor. However, with increased job opportunities ; their income levels are bound to rise.

  - **Land Value**

The cultivation depends on rains; therefore, value of the land is not high.

- **Local Occupations and Employment**

Some of the locals are farmers. Many of them are employed in the mining business around as well as in the transport area. Other persons are doing labor work in Khushab, Chakwal, Islamabad, Faisalabad, Lahore and Gujranwala etc.

**Cultural Heritage**

The people of Chakwal carry very plain dresses. Men usually wear shalwar kameez or Dhoti Kurta, which are turbans for special events, with Chappals, Khusas, or Sandles. In the winter season they add a Sweater, Coat, or a Dhussa with it. The extra educated class also wears shirts with trousers. Women almost always wear shalwar kameez with a dupatta and a sweater or woolen shawl in winter. The culture of Chakwal is mainly based on the mode of living as taught in Islam, but Chakwal is the place where a large number of Hindus lived

before the independence of Pakistan. The people of Chakwal live a straight and simple life as emphasized by their religion.

## 4.4. Recreational Resources and Development:

The project area has no private recreational facilities.

Aesthetic Values:

Like the general trend among the citizens of the area, most of the people have low awareness about the environment. Even then, some people take the cleanliness and neatness of the environment lightly. Some people throw municipal solid wastes (MSWs) on the streets. A sense of personal responsibility to keep the environment clean as good citizens is even now lacking among a few people.

**Archaeological and Historical Treasures**

Archaeological or historical treasures within the project area are not available.

## 4.5. Lab Reports of Environmental Analysis

To assess the baseline conditions of the project area, the following environmental components were monitored.

- Ambient air quality
- Noise levels and
- Drinking water quality

Lab reports are enclosed with the application.

## 4.6. Suitability of the Site

The site does not fall in an environmentally sensitive area, and all commodities are at a suitable distance from the project site as they will not be impacted by the construction activities. Even locals will get more benefits and job

opportunities. No replacement, relocation, or rehabilitation is required for the development of the proposed project.

# 5. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

This section discusses the potential environmental impact of coal mining, methodologies for impact identifications, and characteristics of impacts, including nature, magnitude, extent and location, timing, duration, reversibility risk. The assessment carried out in this Section is based on potential impacts on overall environmental receptors within the project area.

## 5.1. Methodology for Impact Identification

The potential impacts of coal mining can be both positive (beneficial) and negative (adverse) depending on the resources and receptors involved, along with other parameters such as geographical scope (magnitude and extent), temporal scope (duration), and reversibility.

It is anticipated that this project will have positive impacts on sectors such as the economy, employment, and foreign exchange earnings, among others. Moreover, the project is expected to result in negative impacts of short-term duration and transient in nature.

Environmental sensitivity of the project area is described through a thorough review of the project activities, and the evaluation of the significance of impacts is carried out through Environmental Checklists and GIS and computer expert systems. In checklists, the impacts have been given a magnitude based on their severity. A detailed map of the project area is developed on GIS to study the impacts on nearby environmental settings. This chapter then suggests effective mitigation strategies to help combat the adverse nature of these impacts and delivers a monitoring scheme to manage them.

## 5.2. Characterization of Impacts

Impacts were characterized on the basis of the following parameters:

- Nature
- Duration

- Magnitude
- Extent
- Spatial Boundaries
- Reversibility

The impacts characterization for the project has been given in Table 5-1.

***Table 5.1 Characterization of Impacts***

| **Categories** | **Characteristics** |
|---|---|
| Nature | Direct: The environmental parameter is directly changed by the project. Indirect: The environmental parameter changes as a result of a change in another parameter. |
| Duration of impact | Short-term: Lasting only for the duration of the project such as noise from the construction activities. Medium-term: Lasting for a period of a few months to a year the project before naturally reverting to the original condition such as loss of vegetation due to the clearing of the construction site, contamination of soil or water by fuels or oil. Long-term: Lasting for a period much greater than medium-term impact before naturally reverting to the original condition such as loss of soil due to soil erosion and air emissions. |
| Geographical extent | Local, regional (spatial dimension) |
| Reversibility of impact | Reversible: When a receptor resumes its pre-project condition. Irreversible: When a receptor does not or cannot resume its pre-project condition. |
| Likelihood of the impact | High: Impact expected to occur under most circumstances Moderate: Impact will probably occur under most circumstances. Low: Impact could rarely occur at some time. |
| Significance of impact | Categorized as Positive or Negative. Based on the consequence, likelihood, reversibility, geographical |

| | |
|---|---|
| | extent, and duration; the level of public concern; and conformance with legislative of statutory requirements. |

***Table 5-1Characterization of Impacts***

| Environmental Component | Impacts | | Nature of Impact | | Duration | | | Spatial Boundaries | | | Likelihood | | | Reversibility | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Positive | Negative | Direct | Indirect | Short Term | Intermediate | Long term | Local | National | Global | Low | Moderate | High | Reversible | Irreversible |
| Water Resources | Nil | | | | | | | | | | | | | | |
| Acid Mine Drainage | Nil | | | | | | | | | | | | | | |
| Land Resources | ■ | | ■ | | | | ■ | ■ | | | | ■ | | | ■ |
| Air Quality | | ■ | ■ | | ■ | | | ■ | | | ■ | | | ■ | |
| Climate Change | Nil | | | | | | | | | | | | | | |
| Noise | | ■ | ■ | | ■ | | | ■ | | | ■ | | | ■ | |
| Solid waste | | ■ | ■ | | ■ | | | ■ | | | ■ | | | ■ | |
| Wastewater | | ■ | ■ | | ■ | | | ■ | | | ■ | | | ■ | |
| Flora & Fauna | ■ | | ■ | | | | ■ | ■ | | | | ■ | | | ■ |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Community Amenity | | ■ | | ■ | ■ | | | ■ | | | ■ | | | ■ | |
| Afforestation | ■ | | ■ | | | | ■ | ■ | | | n | ■ | | | ■ |
| Local Economy, Community Development, and Employment | ■ | | ■ | | | ■ | | ■ | | | | ■ | | ■ | |
| Resettlement | Nil | | | | | | | | | | | | | | |
| Health & Safety | | ■ | ■ | | | ■ | | ■ | | | | ■ | | | ■ |

## 5.3. Impact Significance

After the evaluation of all the potential impacts, the impact's significance is being given using an Impact matrix. The impacts significance of Physical importance, Ecological importance, Social importance is given using the matrix approach. The impacts significance is given based on the characterization of impacts. From Table 5-3, which shows the characterization of each impact, the following significance is given to each physical, biological, and socio-economic impact.

***Table 5.3 Significance of Environmental Impacts***

| **Environmental Parameters** | **Significance** |
|---|---|
| Water Resources | None |
| Land Resources | None |
| Air Quality | Require mitigation |
| Climate Change | None |
| Acid Mine Drainage | None |
| Noise | Require mitigation |
| Solid waste | Require mitigation |
| Wastewater | Require mitigation |
| Flora & Fauna | Acceptable |
| Community Amenity | Acceptable |
| Afforestation | Acceptable |
| Local Economy, Community Development, and Employment | Acceptable |

| | |
|---|---|
| Health & Safety | Require mitigation |

Anticipated environmental impacts are discussed as

## 5.4. Project location

The surrounding area is hilly and mostly barren land. The selected site is present on the belt which has abundant reserves of deposits of our concerned raw material. Moreover, there is no human settlement within the radius of the selected site and has good road infrastructure. Man power is available in the area. After environmental assessment of the study area the subject project site is most suitable to execute the project regarding the location environmental impacts.

## 5.5. Project Design

Mining activity will be done with proper fencing and specific area would be extracted or mined once in one time. Grazing and harvesting would be allowed on the reaming portion of the mining area other than the specific extracted area. There is no proper structure for this project only surface mining will be done that will exert no such impacts on the environment.

Following are the possible Environmental impacts due to the design

- Impacts Soil structure and soil bearing capacity
- Road infrastructure design
- Rain water harvesting capacity of the drainage system

Impact significance: low

Nature of impact: direct

Duration: NA

Timing: NA

Reversibility: NA

Likelihood: Low to Medium

Consequences: Low to Medium

Mitigation measures and recommendations

Following are the mitigation measures and recommendation to minimize the anticipated impacts.

- Proper design of fencing
- Proper Mining activity design
- Mining activity will not be done in scattered manner.
- One specific portion will be mined in one time.
- Road infrastructure should be according to the laws and regulations
- Waste water drainage should be design vast to bear the rain water capacity of the society.

## 5.6. Construction Stage

The impacts in relation to construction of mine includes the impacts resulting from; construction of access roads, establishment of workers camps at safe sites and distances, land clearing and leveling, drilling, and surveying etc. The impacts resulting from these activities mainly include:

- **Dust Generation**

Dust may be generated due to movement of machinery and vehicles at site for construction purposes. Dust may be generated during access roads development, land clearing and leveling etc. The mines are located in far flung areas away from population. Mining concedes with mountainous region void of population. Any access to the mineral deposit is done through jeep-able road which is improved by placing the shingle on top to avoid muddy and slippery situation. The movement of the truck on these "Katcha Roads" provides a phenomenal dust fanning which is rarely visible or seen. Hence the impact is almost nil.

- **Exhaust Emissions**

These emissions may result from the exhaust of vehicles and machinery operation at site. No exhaust emissions are generated due to operation of generators used for power generation as these generators operate on electricity rather than diesel.

- **Higher Noise Levels**

Higher noise levels and vibrations may be caused due to operation and movement of heavy machinery and vehicles at site and drilling if being carried out in case of hard rocks.

- **Loss of Vegetation**

Vegetation may be lost due to land clearing and leveling if comes in direct way of construction activities.

- **Solid Waste and Wastewater Generation**

Solid waste and wastewater may be generated from construction camps and offices. It will be disposed of as per the standards of TMA.

- **Community Amenity**

Disturbance to nearby community may occur due to dust and noise generation. Noise is associated with project operations. Excessive dust impacts may be harmful for some people, for example, those with respiratory conditions. The paving of the road in the mountainous region is done through a backhoe machine and not through drilling and blasting. The labor huts are placed in a contagious block close to the mines, keeping in view the safety and vigilance of the workers encamped. The mining leases/licenses are granted by Mines and Minerals Department while access to the lease to surface is left to the lessee and surface land owner for settlement. These local people, they blackmail the lessees to the last extent and are the biggest stumbling block.

**Preventive Measures**

- Controlled water sprinkling will be ensured to reduce $PM_{10}$.
- Maintain appropriate buffers between the site and receptors.
- Use of PPEs (face masks, etc.) will be ensured by the mine operators and staff
- Use of PPEs (noise suppression equipment-ear mufflers etc.) will be ensured by the workers where noise levels are higher than 85 (dBA).
- Construction activities will be ensured at the daytime when background noise levels are high.
- Vehicle speed limit will be maintained to avoid excessive vibrations.
- Regular maintenance of machinery will be ensured.
- Cutting of vegetation and trees will be avoided as far as possible.
- Afforestation will be carried out as much as possible.
- Solid waste will be managed efficiently. Solid waste at the site will be stored in containers covered with lids.
- Waste water will be disposed of as per the standards of TMA.

## 5.7. Operational Stage

The potential environmental impacts resulting during the operational phase of the project and their possible mitigation measures are given below.

### 5.7.1. Topographic/Soil

Land under consideration is mainly planed area with less undulating patches. Some area falls in the mountainous patches/topography.

**Mitigation Measure**

Based on the discussion above, the following measures are proposed:

- The mining activities will be very slow and spread over an estimated time period of more than 150 years.
- A restoration and reclamation plan will be developed to restore the natural landscape of the area.

- Plant nursery and garden will be developed to rehabilitate the native plants of the area.
- The mining site will be fenced in a way that the exit route for reptiles will be towards the natural habitat but not towards any human settlements. The technique of controlled and time-specific blasting will be ensured for the "safe habitat of the animals".
- The project proponent will make any possible efforts to limit the impact on flora and fauna.

**Residual Impact:**

If the mitigation measures are effectively implemented and keeping in view the length of time to bring about the change in topography, the overall average impact may not be considered significant.

Impact significance: mild to high

Nature of impact: Direct

Duration: Short-to medium-term

Timing: Construction & Operation phase

Reversibility: Possible

Likelihood: Low (unlikely), as the mitigation measures will ensure that vegetation clearing is minimized

Consequences: Mild or may be positive

### 5.7.2. Water Resources

There are no streams and canals available near the proposed site. Water requirement for the proposed mining project will be fulfilled by underground water by tub well and will be used during mining activity for the purpose of sprinkling on road and for drilling. In the mining area drinking water requirement is fulfilled by underground water from springs and by wells. Local people of the area extract ground water from Rocket motor (in their local language) and by

submersible pumps or motor pumps. Depth of ground water table is 450- 500 ft from the project site. There are no proper water channels within the radius of our study area. Rain water in the area flows down the hills or evaporate. There is no storm water or rain water storage facility in the area.

**Mitigation Measures**

- There is no storm water or rain water storage facility in the area. The subject project will construct check dams to harvest the rain water or storm water in the area that will be used for vegetation or for agricultural purposes.
- The other purpose of check dam is to store the percolated water to stable the disturbed water table.
- Water will be extracted only from the deep confined aquifer.
- Given that water is to be extracted from a confined aquifer whose recharge rate, (just as the actual volume of water available or its rate of depletion) is not known, the extraction will be monitored to ensure that it does not lead to irreversible environmental damage.

**Residual Impact:**

Post-mitigation residual impact on groundwater has been deemed acceptable if it meets the following criteria:

Nature of impact: Direct

Timing: Operation phase

Duration: Long-term; depends on the rainfall pattern and recharge regime of the deep aquifer

Reversibility: Yes

Likelihood: Moderate

Consequences: Low, as monitoring and corrective action will ensure that there is no adverse impact.

Impact significance: Low to moderate

**Contamination of Soil and Water**

Due to the machinery used during mining activity, raw material transportation vehicles, stored oil tanks, fuels, and other substances are the potential sources of soil contamination.

**Mitigation Measures**

- Mitigation measures to reduce the impact of waste effluents produced during project activities are listed below.
- Deep holes will not be located in the vicinity of proposed site.
- Tarpaulin sheets will be placed under generators, compressors, and oil tanks.
- Vehicles and other equipment will not be serviced outside of the designated areas. Vehicles and other equipment will not be repaired outside of the designated areas.
- No contaminated effluents will be released into the environment without having been treated.
- Sewage and other waste effluents will be handled to avoid contaminating surface and groundwater.
- Water from domestic and project related sources will be released into septic tanks.
- An appropriately designed septic tank will be used to treat sewage and outlets will release treated effluent into drain. The integrity of the entire system will be maintained and monitored.
- Septic tanks will be built at a safe distance from any water hole, stream, or dry streambed, to prevent the entry of surface water.
- Solid waste will be segregated and disposed of properly.

**Residual Impact:**

The residual impact of project activities on the soil and water quality of the area is expected to be insignificant once the suggested mitigation measures are put into effect. The residual effects are summarized below:

Nature of impact: Indirect

Timing: Construction & Operation Phase

Duration: Medium to long term

Reversibility: Yes

Likelihood: Low, as the proposed mitigation measures will ensure that soil and water are not contaminated.

Consequences: Mild to moderate, as the effluents released into the environment will have been adequately treated

Impact significance: Low to medium, based upon low likelihood and mild to moderate consequence

**Air Emissions**

Air emissions from project-related activities are likely to include:

- Dust due to proposed mining activity, construction and operation of the proposed project.
- Dust raised on dirt tracks by project-related vehicles.
- Dust from drilling of deep holes.
- Dust due to drilling and blasting of the rocks
- Combustion products from vehicles used for project-related activities

**Gaseous Emissions:**

Exhaust Fumes from Vehicles and Construction Machinery:

Emissions produced by vehicles and equipment will be similar to those produced by diesel generators in terms of the resulting pollutants (SO2, NOX, PM, etc.). However, the extent to which they are produced will be

considerably lower, since much smaller diesel engines are used in vehicles and construction machinery.

**Mitigation Measures**

None of the potential effects discussed above are expected to exceed acceptable limits. The mitigation measures given below will further reduce their impact, and ensure that they remain within acceptable limits.

- Water sprinkling on the site will minimize the dust pollution.
- All equipment, generators, and vehicles used during the project will be properly tuned and maintained in good working condition in order to minimize exhaust emissions.
- Vehicle speed will be reduced on track passing through or close to settlements.
- Imposing speed limits and encouraging more efficient journey management will reduce the dust emissions produced by vehicular traffic.
- Water will be sprinkled where necessary to contain dust emissions.
- All project vehicles will be checked regularly to ensure that engines are in sound working condition and are not emitting smoke.

**Residual Impact:**

After implementing the mitigation measures listed above, the residual impact of the proposed activities on ambient air quality is expected to be insignificant, as shown below:

Nature of impact: Direct

Duration: Short term

Timing: construction & operation

Reversibility: Not applicable

Likelihood: Low (unlikely) as mitigation measures will ensure that air pollution remains within acceptable limits.

Consequences: Moderate to High (Moderate in case of mechanical extraction and high in case of blasting)

Impact significance: Low, based upon low likelihood and mild to moderate consequence.

### 5.7.3. Acid Mine Drainage

Acid mine drainage, acid and metalliferous drainage (AMD), or acid rock drainage (ARD) is the outflow of acidic water from coal mines. Acid mine drainage (AMD) has been a detrimental by-product of coal mining for many years. At present, acid mine drainage continues to pose a potential problem in some areas, despite improved prediction and prevention techniques. Acid drainage is most susceptible to dissolve heavy metals particularly Iron, Zinc, Copper, Lead Mercury etc. due to its low pH value.

Acid mine drainage only occurs when there is water ingress into coal mines. In present case, there are no chances of water ingress into coal mines and hence no chances for acid mine drainage. Additionally, potential impacts of acid mine drainage are discussed with appropriate mitigation measures below. Noted, that these mitigation measures are not applicable for present case as there are no chances for acid mine drainage.

- **Potential Impacts**

Following are some of the impacts caused due to acid mine drainage.

**Surface and Groundwater Quality Contamination**

Acid mine drainage may have detrimental effects on surface and groundwater qualities. The heavy metals dissolved in acid mine drainage may leach into the groundwater and make it toxic. Similarly, it can also have adverse impacts on surface water qualities if mixed with it. If acid mine drainage mixed with surface water body, it can lead to severe Ph changes.

Additionally, heightened acidity reduces the ability of streams to buffer against further chemical changes.

**Soil Contamination**

Soil can be contaminated if it is exposed to acid mine drainage. The toxic elements present in the acid may dissolved in the soil and change its characteristics. If it passes from an agricultural land, it can reduce its fertility and disturb nutrients level in it. Acid mine drainage may also cause soil erosion which may increase turbidity levels in streams.

**Human Health**

Acid mine drainage causes serious threat to human health and ecological systems as it contains heavy metal contaminants. The heavy metals are not degradable and accumulate in living organisms causing various diseases and disorders.

**Aquatic Life**

Low pH of acid mine drainage results in solubility of heavy metals in water and its high concentration causes toxicological effects on aquatic life. Acute exposures of high concentration of metals can kill organisms directly while long term exposure can cause mortality and other effects. Long term exposures can cause stunned growth, lower reproduction rates, deformities and lesions. The accumulation of heavy metals in fish may be transferred to human beings through food chain.

- **Preventive Mitigation Measures**

The coal mining is generally done through underground mining method and as such there is no emission of Sulphur dioxide or other acidic fumes or smoke which may lead to the emergence of acid rain phenomena. The impact of acid rain and its possibility relating to underground coal mining is nil. The water peculating in the mines is through limestone beds which are non-acidic. The metalliferous mines having sulfide ores can have the chances of acidity. In

such cases the pumps used are specially galvanized for rotors or screw type pumps are used having impregnation of rubber. In case of muddy mines pulsatory pumps are used which are non-rotating and take care of acidity factor if available. Once the pumping is done, the water stored on the surface tank is mixed with fine dust of calcium carbonate powder to mitigate its acidic factor.

### 5.7.4. Soil and Groundwater Contamination from Coal Piles

As discussed earlier that coal is not stored at site in the form of coal piles or in some other form. Hence, soil and groundwater will not get contaminated due to coal piles. The shales extracted during the coal extraction will be filled in the goaf area underground while rest if brought up will be covered with a layer of impermeable mud.

### 5.7.5. Mine Workers Health and Safety

Coal mining deep underground involves a higher safety risk than coal mined in opencast pits due to problems associated with mine ventilation and the potential for mine collapse. However, there are safety risks associated with all forms of coal mining. Mining explosions are a safety risk in underground mining. Methane released from the coal seam and surrounding rock strata during the process of mining can present a high risk of explosion at concentrations in air of 5-15%.

The proponent has not been deemed to have methane gas.

- **Preventive Measures**

The employment of worker is regulated through Labor Laws. The safety and health are regulated through the enactments of Mines Act 1923 and its subordinate laws. The mines are under the control of qualified mining engineers who conducted the mining operations as per legal requirement and SOPs.

The super-inspection is carried out by the Regulatory Staff appointed under the Chief Inspectorate of Mines. The medical staff appointed under the Chief

Inspectorate monitor sanitation and hygiene conditions as health protection of mine workers at mines.

*5.7.5.1. Provision of First Aid Facility*

At workplace workers and employers have enough information, knowledge and training regarding first aid treatment in case of any emergency. The Inspectorate of Mines in collaboration with Halal e Ahmed and local medical staff arrange refresher courses for First Aid. The employees take due advantage of such opportunities along with other companies.

*5.7.5.2. Safety Trainings*

Workers and all the staff is provided with proper training about the work and safety practices. Regular training courses are being organized by the training wing of Inspectorate of Mines Punjab and Pakistan Mine Owners Association. The lessee sends its trainees for such courses subject to available seats.

*5.7.5.3. Use of Drugs and Narcotics*

Drugs and narcotics are strictly prohibited. Smoking will be only allowed in rest timings at properly isolated places.

*5.7.5.4. Provision of Personal Protective Equipment*

To control any health and safety risk and to reduce the magnitude of any adverse impact, the workers are required by law to have the PPEs such as safety helmet, safety googles, rubber gloves, long shoes, safety lamps/torches etc. Requisite PPEs will be provided to employees wherever necessary.

### 5.7.6. Emergency Response Plan (ERP) for Accidents/Collapse

ERP is prepared for underground coal mines to act in emergency situations. Following are some of the objectives to ERP:

- To provide an effective response to emergency situations.
- To develop responsibility levels and support coordination.

- To minimize the effect of emergencies on personnel, on the surrounding communities, and on the public.
- To minimize injury; damage to environment; property damage; damage to equipment; and losses to process that result from emergencies.
- To ensure timely communication and cooperation with government and outside agencies.
- To provide suitable information to be conveyed to the public.
- To define the Emergency Response Team as the combination of: site personnel in the area of the emergency, personnel from other areas, Mine Rescue Team, and other off site emergency personnel as needed.

Chief Inspectorate of Mines (CIM) is responsible for mines safety. Rescue stations are established by CIM at the mining areas. Emergency situations are responded through these rescue stations. Mines Labor Hospitals are also established in mining areas. All health and safety measures are made in compliance with Mines Act, 1923.

### 5.7.7. Climate Change

Coal mining activities doesn't directly contribute in climate change. The mining is done underground and as such no climatic change is expected of it. Mining activities underground, do not release any greenhouse gas into atmosphere which have potential of climate change/global warming.

## 5.8. Summary of Potential Impacts

The summary of the positive and the negative impacts observed on the environment by the mining of coal on the project area has been summarized in Table 5-5. The impacts have been given magnitude based on the scaling given below.

***Table 5-2 Scale Range***

| Scale Range | 0 to 5 |
|---|---|
| **Major Impact** | 5 |
| **Moderate** | 4 |
| **Intermediate** | 3 |
| **Minor** | 2 |
| **Low** | 1 |
| **No Impact** | 0 |

Positive impacts are given (+) sign while (-) sign is used for negative impacts. The mitigation measures will be explained after a short while.

***Table 5-3 Environmental Screening Matrix***

| Description | Physical | | | Biological | | Socioeconomic | | |
|---|---|---|---|---|---|---|---|---|
| | Soil Contamination | Air Quality | Water Quality | Flora | Fauna | Noise | Land Acquisition and Compensation Issues | Safety Hazard, Public Health |
| Land Acquisition | N | N | N | N | N | N | N | N |
| Contractor Mobilization | 0 | -1 | 0 | N | 0 | -1 | N | -1 |
| Construction Camp Establishment | -1 | -1 | -1 | -1 | -1 | -2 | N | -1 |
| Construction Camp Operation | -1 | -1 | -1 | -1 | -1 | -1 | N | -1 |
| Site Preparation | -2 | -1 | -1 | -1 | -1 | -1 | N | -1 |
| Exploration | -2 | -2 | -1 | -1 | -1 | -2 | N | -2 |
| Laying of Services | -1 | -1 | -1 | -1 | -1 | -1 | N | -2 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Exploration Materials Supply | -1 | -1 | N | 0 | 0 | -1 | N | -1 |
| Transportation | 0 | -1 | N | 0 | 0 | -1 | N | -1 |
| Solid Waste Disposal | -2 | -1 | -2 | -1 | -1 | -1 | N | -1 |
| Waste Effluent Disposal | -1 | -1 | -1 | -1 | -1 | 0 | N | -1 |
| Mining Activity | -1 | -2 | -1 | -1 | -1 | -2 | N | -2 |

**Key:** -2: High negative impact; -1: Low negative impact; 0: insignificant/negligible negative; +1: low positive impact; +2; High positive impact,

N: no Impact

## 5.9. Potential Environmental Enhancement Measures

- All vehicles used in the coal mining will be regularly inspected and maintained.
- Extracted coal will be transported to the market places according to proper management practices.
- Vegetative buffers will be maintained regularly to keep them in good condition.
- The labor force will be trained to use personal protective equipment to avoid any accident/ near miss at site.
- The vehicles used for transportation of coal will be properly designed, covered and cleaned to avoid any risk while departing to and from the project site.
- Extensive plantation will be done in and around the project site to enhance the environmental quality.
- Environmental Management and Monitoring Plan (EMMP) will be strictly operational throughout the project life. All monitored data will be reported to the EPA Punjab, Lahore for scrutiny at their end.

# 6. ENVIRONMENTAL MANAGEMENT & MONITORING PROGRAM

## 6.1. Introduction

This section presents the environmental management plan (EMP) for the proposed project. The EMP specifies the mitigation and management measures which the Proponent will undertake and shows how the Project will mobilize organizational capacity and resources to implement these measures.

The EMP covers information on the management and mitigation measures that will be taken into consideration to address impacts in respect of the operational phase of project.

## 6.2. Objectives

The primary objectives of the EMP are to:

- Facilitate the implementation of the mitigation measures identified in the EIA.
- Define the responsibilities of the HSE manager of proposed project.
- Define a monitoring mechanism and identify monitoring parameters in order to:
- Ensure the complete implementation of all mitigation measures.
- Ensure the effectiveness of the mitigation measures.
- Provide a mechanism for taking timely action in the face of unanticipated environmental situations.
- Identify training requirements at various levels.

## 6.3. Schedule of Implementation of EMMP

The implementation of EMMP should be carefully coordinated with the design and operational program of the project. This will ensure the implementation of relevant mitigation measures at the appropriate project stages. It will also ensure

that adequate resources are properly allocated to achieve the desired results. This EMMP has been prepared to satisfy the requirement of "IEE and EIA Regulations, 2000".

## 6.4. Environmental Management Team along with their roles and Responsibilities

The overall responsibility for compliance with the environmental management plan rests with the project proponent.

Roles and Responsibilities:

Environmental Management should become an integral part of policy of proposed project. Therefore, committing to reduce the environmental impacts will reflect the management approach and believe that good performance in this area is synonymous with running well managed efficient proposed project operation. During the construction main responsibility of environmental performance will be followed by the EHS Officer on daily basis.

In case of normal operational phase, main responsibility for environmental performance will be supervised by the site manager while daily management will be performed under the site officer who in turn charges of environmental matters. Under their surveillance, environmental management during operations will be performed as per mitigation and monitoring plans outlined in this EIA. A brief role and responsibilities is given below;

- Top Management

Environmental management plan will regulate by the top management of proposed incinerator plant; therefore, they will play an important role. Some of the key roles and responsibilities are given below;

- To cooperate and consult with relevant environmental agency in order to perform in better way.
- To evaluate the progress of development and implementation of this management plan.
- To approve any change in decision making with the consultation of respective managers, if appropriate.

The following functionaries will be involved in the implementation of EMP:

- Project Proponent
- HSE/Project Manager
- In-Charge Administration
- Supervisor of project
- Environmental Engineer
- **Project Manager**

The role of project manager is very important. The success of an EMP will mainly depend upon effective management of the EMP by project manager. Some of the key roles and responsibilities given to project manager are given below;

- Ensure that contractor is aware of all specifications, legal constraints, standards and procedures pertaining to the project specifically with regards to environment.
- Ensure that all stipulations within the EMP are communicated and adhered to by the contractor.
- Monitor the implementation of EMP throughout the project by means of site inspections and meetings.
- Be fully aware of the environmental assessment of the project, the conditions of approval of EIA and all relevant legislations.
- To monitor the progress of development and implementation of this management plan.

- To improve coordination and exchange of communication between higher management and staff.

- **Contractor for Construction and Operation**

On behalf of contractor, the main responsibilities of all matters pertaining to environment will be that of chief of the assigned contractor. Following are the roles and responsibilities of contractor.

- To carry out constructional and operational activities in an environment friendly manner.
- Shall propose measures to minimize environmental impacts during constructional and operational phase and submit to environmental officer.
- In case of having impacts on the environment, the contractor will inform to project manager in time to get instructions and to take next step.
- Comply with the environmental management specifications.
- Maintain a public complaint register.
- Submitting a report at each site meeting which will document incidents that have occurred during the period before the site meeting.

## 6.5. Proposed Monitoring Program to assess performance or output of EMP

Following aspects need to be monitored regarding the subject project during pre-construction, during construction and post construction.

- Air quality
- Water quality
- Noise level

- Management of utility services including water supply, sewerage disposal, electric supply and solid wastes.

***Table 6-1Environmental Monitoring Plan***

| Environmental Component | Frequency | Responsibility |
|---|---|---|
| **Construction Phase** | | |
| Air Quality | Quarterly basis | Proponent |
| Noise Levels | Quarterly basis | Proponent |
| Water Quality | Quarterly basis | Proponent |
| **Operational Phase** | | |
| Air Quality | Quarterly basis | Proponent |
| Noise Quality | Quarterly basis | Proponent |
| Wastewater Quality | Bi-annually | Proponent |
| Drinking water Quality | Quarterly | Proponent |

## 6.6. Environmental Budget

The environmental budget of the project has been given in Table 6-2.

***Table 6-2 Environmental Budget Breakdown***

| Sr. No. | Item/Activity | Quantity (No.s) | Budget (PKR) | Description |
|---|---|---|---|---|
| 1. | Plantation Campaign | 100 | 20,000/- | Cost includes plantation and maintenance up to 5 years |
| 2. | Cost of EMMP | - | 95,000/- | Installation + Operational Phases |

| | | | | | |
|---|---|---|---|---|---|
| 3. | Environmental Monitoring | Air Quality Monitoring | 01 | 10,000 | 01 sample @ 10,000/- per sample |
| | | Noise Level Monitoring | 02 | 15,000 | 02 samples @ 7,500/- per sample |
| | | Drinking Water Quality Monitoring | 01 | 10,000/- | 01 sample @ 10,000/- per sample |
| 4. | Miscellaneous | | | 50,000/- | Lump sum |
| Total Environmental and Social Management Cost | | | | 200,000/- | |

## 6.7. Environmental Management Plan

***Table6-3: EMP for Construction Phase***

| **Potential Negative Impacts** | **Recommended Mitigation Measures** | **Monitoring responsibility** | **Parameters For Monitoring** |
|---|---|---|---|
| Dust emissions | On exposed construction surface during windy periods fugitive dust generation will be suppressed by spraying water.<br>The construction material will be covered with polyethylene sheets to prevent dust emissions. | Proponent/ contractor | Air quality |
| Soil Erosion | Exposed surface will be resurfaced and stabilized as soon as possible. | Proponent/ contractor | Soil |
| Solid Waste Generation | Solid waste may include waste/unused construction materials, which should be disposed of properly. | Proponent/ contractor | Solid waste management |

| | | | |
|---|---|---|---|
| Vehicular Traffic And Noise | Vehicles and other noisy equipment will be kept in good conditions and their regular maintenance will be done. | Proponent/ contractor | Noise level |
| | Noisy construction activities will be carried out only during normal working hours. | | |
| Health And Safety of Work Force | The contractor will ensure that the workers are trained in safety procedures for all relevant aspects of construction. | Proponent/ contractor | Health and safety |
| | Regular checks will be made to ensure that the contractor is following safety working procedures/safety measures. | | |
| | Formal emergency procedures will be developed for construction site in case of an accident. | | |
| | First aid kits and other necessary equipment will be kept available at site along with the list of emergency phone numbers to be contacted in case of any accident. | | |
| | Produced during construction phase will be collected by vehicle for dispose of it at a particular dumping site of the industrial estate from it will be reused. Waste segregation units will be provided. Recyclable items will be provided to recycling contractors | | |

| | | | |
|---|---|---|---|
| Water Supply | Water use will be planned depending upon the supply and timing to avoid and inconvenience.<br>Water conservation practices will be adopted. | Proponent/ contractor | Water supply |
| Surface and Groundwater | At project site, the septic tank will be installed the safe disposal of wastewater into the nearby drain. The storage of lubricant materials such as oil and grease will be confined to a specific area so that in case of any leakage or spillage, the lubricant materials do not contaminate the entire project site. | Proponent/ contractor | Surface and groundwater |

***Table 6-4 EMP for Operational Phase Impacts***

| **Potential Negative Impacts** | **Recommended Mitigation Measures** | **Monitoring Responsibility** | **Parameters for Monitoring** |
|---|---|---|---|
| Dust emissions | In operational phase, dust generation by vehicles will be suppressed by spraying water.<br>Scrubbers will be used to control dust emissions | Proponent | Air quality |
| Noise | Use of PPEs (noise suppression equipment-ear mufflers etc.) will be ensured by the workers where noise levels are higher than 85 (dBA).<br>Mining activities will be ensured at daytime when | Proponent | Noise |

| | | | |
|---|---|---|---|
| | background noise levels are high.<br>Vehicles speed limit will be maintained to avoid excessive vibrations.<br>Regular maintenance of machinery will be ensured.<br>All blasting operations will be carried out in compliance with conditions as specified in Coal Mines Regulations, 1926. | | |
| Waste water | Water conservation practices will be used.<br>Wastewater will be treated properly by septic tank and will be discharged into nearby drain.<br>Water use will be planned depending upon the supply and timing to avoid and inconvenience | Proponent | Wastewater management |
| Acid Mine Drainage | water stored on the surface tank is mixed with fine dust of calcium carbonate powder to mitigate its acidic factor | | |
| Flora and fauna | The unit includes a plan of the green yard area which is a positive impact on the flora and fauna. There is no significant fauna in that area. However, it is suggested that maximum number of trees should be planted by the management inside and outside the boundary wall in order to enhance aesthetics of the area. | Proponent | Biodiversity |

| | | | |
|---|---|---|---|
| Social impacts | During the operation stage, there will be no social issue for the nearby localities. Moreover, the residents may get opportunities to work in the refining unit which is a major positive impact of the project. | Proponent | Social impacts |
| Occupational health and safety | There may be occupational health and safety risks associated with different operational activities. Health risks may occur in case of unsafe and/or unfavorable work conditions<br>The mitigation measures include:<br>• The workers should get trained in safety procedures for all relevant aspects of processes.<br>• Enforcement of work safety measures.<br>• Formal emergency procedures will be developed for the segregation hall in case of any accident.<br>• First aid kits and other personal protective equipment (safety gloves, goggles, welding shields etc.) Should be kept available. | Proponent | Health & safety |

## 6.8. Proposed EMP Reporting and Reviewing Procedures

### 6.8.1. Aim

In the context of coal mining, the monitoring and evaluation is carried out to achieve following objectives:

- To access whether the project site is being managed in a sustainable manner as planned or certain bottlenecks are experienced both qualitatively and quantitatively.
- To ensure compliance of environmental parameters (i.e. ambient air and noise) with PEQS.
- To ensure the implementation of mitigation measures for overall conservation of environment at the project site.
- To undertake effective environmental surveillance of the site.
- To assess effectiveness of mitigation measures and potential environmental enhanced measures.
- To ensure compliance with national environmental obligations.
- To monitor rehabilitation of recovered land including afforestation.

### 6.8.2. Environment, Health &Safety Policies

*6.8.2.1.Environment Policy*

The environment policy right from initiation of project installation to its proper operations will be based on:

- Compliance of applicable regulatory requirements;
- Conservation of natural resources;
- Assurance of sustainable development;
- Maintaining a safe working environment;
- Providing high environmental expertise and know-how; and
- Regular training and refresher courses to achieve continuous improvement of environment.

*6.8.2.2.Health & Safety Policy*

The proponent identifies safety and health of the personnel as integral part of every work aspect at every level. In addition to compliance with the statutory rules and regulations as the minimum acceptable, the proponent will set nationally acceptable standards for practice and will intend to achieve the above by the following:

- Provide adequate and continuous training to all personnel;
- Prepare an over-all safety & health manual giving general requirements of leadership, planned inspections, job analysis & procedures, emergency preparedness, organizational rules, necessity and use of protective equipment, health control, etc.;
- Systematic evaluation & measurement of system performance at all operational levels and continuously update the over-all safety & health manual;
- Carrying out regular publicity campaigns effective personnel safety and health conscious; and
- To employ a person as in-charge for planning, training & safety and make him responsible for implementation of safety and health policy.

## 6.9. Training Needs

Training for the management/contractors/engineers and workers on environmental aspects of the project will be arranged. It will be imparted by a team of experienced trainers.

- **Training of mining staff:**

Training of mining staff & workers will be the part of the TORs regarding the subject project. The provisions given in EIA Report Chapter Screening of Potential Environmental Impacts & Their Mitigation Measures will be followed.

TORs will be including the training and submission of reports in the following area:

- Handling of Machineries in a safe way.
- Proper fencing design.
- Proper blasting training and schedules
- Use of PPEs
- Maintenance of vehicles and submission of Environmental Monitoring Reports Maintenance of Water Consumption records
- Testing of water and waste water and submission of Environmental Monitoring Reports
- Placement of safety signs/boards during construction
- Sprinkling of water on the roads and dusty tracks
- Monitoring of generator emissions Training regarding all other aspects of HSE will be ensured by the contractor during the mining activity

# 7. INVOLVEMENT OF STAKEHOLDER'S / PUBLIC CONSULTATION

## 7.1. Introduction

Stakeholder's consultation is a tool used for communication with a diverse group of stakeholders having multifarious aims such as information dissemination, exchanging views, soliciting feedback and suggestions on issues pertaining to the project, plan future actions. This practice initiates a need assessment and identifies areas of concern for all the parties that maybe affected by the project activities.

Stakeholders by definition are all those people and institutions who have an interest in the successful design, implementation and sustainability of the project. This includes those positively and negatively affected by the project.

## 7.2. Benefits and Objectives of Stakeholder's Consultation

Consultation with stakeholders leads to an overall better understanding of the project on the part of the communities and gives the Proponent a clearer understanding of the stakeholders' perspective. Effective public consultation can add substantial value to the EIA study process. The information gained through public consultation on the stakeholders' concerns, interests, and their ability to influence decision-making helps identify key cause of environmental problems.

This can be used to evaluate direct and indirect environmental impacts and assess short term and long-term resource use implications. The input from local communities and NGOs can help evaluate alternatives and strengthen the management planning by incorporating local input and know-how.

An informed public will better understand the tradeoffs between project benefits and disadvantages; be able to contribute meaningfully to the project design; and have greater trust with the project Proponent and support for the project, says the Asian Development Bank. These factors contribute towards improved

project implementation sensitized to the human environment of the area. The objectives of stakeholders' consultation are to:

- Promote better understanding of the proposed operation through explaining its objectives and its potential positive and negative impacts.
- Identify and address 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.
- Instill trust between various stakeholders and the Proponent to promote cooperation.

## 7.3. Identification and Classification of Stakeholders

During the field survey, significant efforts were made to identify the possible categories of stakeholders and their stakes. Identification of stakeholders is important for the sustainability of a developmental project and helps to evaluate and envisage the role of stakeholders. The influence or impact of the project on stakeholders can be elaborated in the form of a matrix and the mitigation measures are proposed accordingly. All the stakeholders had different types of stakes according to their professions.

## 7.4. Methodology for Consultation

Stakeholder consultation is a two-way flow of information and dialogue between the project Proponent and stakeholders, specifically aimed at developing ideas that can help shape project design, resolve conflicts at an early stage assist in implementing solutions and monitor ongoing activities.

Various techniques are used worldwide to carry out the stakeholder consultation that includes discussions, meetings and field visits. A series of scoping sessions and

formal focus group discussions were carried out with environmental experts and individuals. The meetings were held at various locations.

## 7.5. Key Consulted Stakeholders

The stakeholders consulted in this case are public as well as environmental experts and individuals working in profession of environment. The list of stakeholders consulted and their feedback is given below.

The organizations consulted are as under:

- Chief Inspectorate of Mines Punjab its related field office
- DG Mines and Minerals Punjab, its related field office
- Representative of the Forest Department of the area
- Surface Landowners
- Nearby Village Numberdar
- Mines Labor Welfare Commissioner
- Civil Defence Officer

Each department was contacted to seek wisdom during an interaction of 4-6 man-hours each.

### 7.5.1. Responsible Authority

The proponent is the responsible authority to take all measures prior to the mining activity.

### 7.5.2. Other departments and agencies

For the impact analysis detailed meetings of local community, education institutes, health institutes, hospital and NGOs were held with the management. Issues were discussed that may affect the environment and also the implementation of proposed project. All possible mitigation measures were considered and incorporated in the Environmental Management Plan. Scoping

sessions, focused group discussion and way side consultations were held with the relevant stakeholders in the area. The purpose of such consultations is to obtain the feedback from the relevant persons.

### 7.5.3. Environmental Practitioners and Experts Team

Experts visited the project site, had discussions with stakeholders and consulted with the local people of nearby and other villages to evaluate the project socio-economic impacts. People of the area belong to different professions like mostly belong to employment, own businesses, doctors, some in abroad, in Army, teaching, in agriculture, etc. Women were also consulted for their point of view regarding the betterment of the area by this project, some of them communicated but according to social value of the area they mostly hesitate to communicate comfortably and get pictured. People provide the massive information about the project and have positive remarks regarding the project development.

### 7.5.4. Affected & Wider Community

There is no affected community present in the radius of our study area. The team has consulted with the inhabitants of the different villages. They provided positive remarks regarding the subject project and in the favor of the subject mining activity for the proposed project.

### 7.5.5. Summary of Concerns of Consulted Stakeholders

The summary of stakes of consulted stakeholders is given below.

- The activities of the project must be studied in detail to assess all the impacts resulting from the project.
- All the environmental parameters i.e. ambient air quality, noise levels and water quality must be kept within permissible limits of PEQS.

- Project specific mitigation measures must be implemented during project's lifecycle.
- A proper Environmental Management and Monitoring Plan should be prepared to reduce adverse environmental impacts.
- Waste management must be taken into consideration (if generated during project activities).
- Management practices suggested in EMMP for solid waste should be implemented during operation of the project.
- The findings of the EIA report must be incorporated into the design and planning phase of the project.
- The EIA report should be compiled appropriately according to reporting style as suggested in Guidelines/Checklist.
- The project holds a good economic circulation. The advantages of the project seem more than its disadvantages. Therefore, the project should be operational as soon as possible.

**List of Individuals Consulted**

| Sr. | Names/ Person consulted | Concern/Comments |
|---|---|---|
| 1. | Chief Inspectorate of Mines Punjab | Mining activity should follow rules and regulation.<br>No mining activity should be done without submitting environment report to EPA. |
| 2. | DG Mines and Minerals Punjab | PPEs should be given to the workers.<br>No Natural reserve will be affected by the project activity.<br>Proper implementation of mitigation should be done.<br>Job Opportunities will be provided to locals. |
| 3. | Representative (Forest Department) | The proposed project should not affect any forest or within the vicinity of the forests. |

# 8. CONCLUSIONS AND RECOMMENDATIONS

At the end of this EIA study, following conclusions are drawn and recommendations have been given accordingly.

***Table 8-1 Conclusions and Recommendations***

| **Conclusions** | |
|---|---|
| **General** | • The coal extraction is very crucial for meeting increased energy demands on national as well as international level.<br>• All the positive and negative impacts resulting from the coal mining operations have been studied in due detail on environmental settings. All the negative impacts have been given magnitude based on the defined criteria and scoring.<br>• Mitigation measures have been suggested for each negative impact resulting from the coal mining activities. |
| **Physical Environment** | • No wastewater will be generated during project activities. The water, if exposed during underground coal mining will be used for drinking purposes.<br>• The type of solid waste produced at the surface will be food waste only. The solid waste produced underground will consist of material excavated for mine space widening.<br>• The food waste at the surface will be disposed of in covered containers to avoid any waste littering. The solid waste underground will be used to fill up the cavities formed due to coal extraction. This will save the transportation cost of solid waste to dispose of at the surface. It will also provide additional support to the mine against subsidence.<br>• Proper mitigations may be adopted in the preliminary design including safe and environmentally friendly disposal of solid waste. |

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| | • Physical impacts like soil contamination, water contamination, air pollution, high noise level, etc. are of temporary nature. However, during the operational stage by adopting abatement technologies and development of buffer zones and green areas intensity of negative impacts can be minimized.<br>• All the baseline environmental parameters including ambient air and noise are well within the permissible limits of PEQS.<br>• There are no human settlements present within the vicinity of the project site. The settlements are away from the coal mines at safer distances. All the sensitive receptors are at a safer distance from the project area. |
| **Biological Environment** | • No forest area or wildlife sanctuary exists within the vicinity of the Project Area, which may be affected by the Project. Few reptiles like lizards and snakes will be disturbed by the Project activities and may have to move into nearby areas. This will be a temporary insignificant impact. Anyhow the outskirts blank area is to be covered with green trees so project site will not give barren look. |
| **Socio-economic Environment** | • The other social issues like safety of public and workers, security problems, community accessibility issue, women accessibility to fields for their daily routine life etc. will be of temporary nature.<br>• The mining activities will provide additional job opportunities to the community of the area. The project will raise the income levels of the population of the area.<br>• Social cohesion is optimal.<br>• The environmental cost is negligible.<br>• The proponent is committed to ensure eco-friendly, sustainable, safe and sound environment. |
| **Recommendations** | |
| **General** | • All measures as suggested in EMP should be adopted |

| | |
|---|---|
| | to minimize adverse impacts.<br>• All appropriate environmental management & monitoring measures detailed in this report, together with any other environment management commitments should be implemented throughout out the entire life of the project.<br>• Environmental Management and Monitoring Plan proposed will be implemented in the true spirit throughout the lifespan of the project.<br>• Regular monitoring and auditing will be taken by the management to ensure the compliance of all the mitigation measures.<br>• Environmental monitoring will be carried out as suggested and communicated by EPA, Punjab. |
| **Physical Environment** | • The mining site and the road links should adopt such measures and select such machinery and their operations to minimize the dust spread.<br>• Dust suppression machine should be available on each site for wetting of all the materials to avoid effects of dust such as respiratory diseases.<br>• Water contamination, air pollution and high noise levels will be controlled with the use of good engineering practices.<br>• Proper measures will be taken to control the air emission or high noise levels.<br>• Transportation vehicles and equipment must be properly maintained and tuned well. |
| **Biological Environment** | • Extensive plantation must be carried out throughout the tenure of lease as an environmental enhancement measure. |
| **Socio-economic Environment** | • Periodic monitoring on occupational health and safety must be conducted to avoid workplace hazards.<br>• Proponent will take due care of the local community and its sensitivity towards local customs and traditions. |

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|---|---|
| | • Safety signs or boards will be placed wherever needed within the premises of the Project site.<br>• Personal Protective Equipment (PPEs) will be provided and ensured that they are used by the workers during working hours. The workers working near the noise generating machines will be strictly required to use ear muffs/ plugs.<br>• Fire extinguishers or firefighting equipment will be provided at well notified points to cope with fire events.<br>• Good housekeeping will be ensured by the management.<br>• First aid medical facility will be provided at the project site. |

# APPENDIX

# APPENDIX-I: GLOSSARY

**Act** means the Pakistan Environmental Protection Act, 1997.

**Air pollution**: The condition in which air is contaminated by foreign substances, or the substances themselves. Air pollution consists of gaseous, liquid, or solid substances that, when present in sufficient concentration, for a sufficient time, and under certain conditions, tend to interfere with human comfort, health or welfare, and cause environmental damage. Air pollution causes acid rain, ozone depletion, photochemical smog, and other such phenomena.

**EIA (Environmental Impact Assessment):** It is the process of identifying, predicting, evaluating and mitigating of effects of biophysical, social and other relevant proposed projects and physical activities prior to major decisions and commitments being made.

**EMP (Environmental Management Plan):** An EMP is a site-specific plan developed to ensure that all necessary measures are identified and implemented in order to protect the environment and comply with environmental legislation.

**Environmental Impact:** Possible adverse effects caused by a development, industrial, or infrastructural project or by the release of a substance in the environment.

**Topography:** Physical features of any area including soil, water and air are called topography.

**Fauna:** Word used for combination of all the species of animals.

**Flora:** Word used for combination of all the species of plants.

**IEE (Initial Environment Examination):** Initial examination of projects for identification of hazards of project.

**NOC (No Objection Certificate):** It is a kind of clearance issued by EPA necessary for any project to be constructed.

**Particulate Matter:** Minute airborne liquid or solid particles (such as dust, fume, mist, smog, smoke) that cause air pollution. Particulate matter may vary greatly in color, density, size, shape, and electrical charge, from place to place and from time to time.

**PEPA (Punjab Environmental Protection Act 1997) Amended 2012:** An act to provide the protection, conservation, rehabilitation and improvement of environment, for the prevention and control of pollution and promotion of sustainable development.

# APPENDIX-II: LIST OF ABBREVIATIONS

| | |
|---|---|
| NOC | No Objection Certificate |
| EA | Environmental Approval |
| OHS | Occupational Health and Safety |
| MICS | Multiple Indicator Cluster Survey |
| mm | Millimeters |
| EPA | Environmental Protection Agency |
| IEE | Initial Environmental Examination |
| NEQS | National Environmental Quality Standards |
| EMP | Environmental Management Plan |
| EMP | Environmental Monitoring Plan |
| GOP | Government of Pakistan |
| km | Kilometer |
| m | Meters |
| NGO | Non-Governmental Organization |
| BDL | Below Detection Limit |
| SWM | Solid Waste Management |
| TMA | Tehsil Municipal Authority |
| PPC | Pakistan Penal Code |
| PEPA | Pakistan Environmental Protection Act |
| NDWQS | National Drinking Water Quality Standards |
| LAA | Land Acquisition Act |
| sq mi | Square Miles |
| PPE | Personal Protective Equipment |
| MMD | Mines and Minerals Department |
| CSR | Corporate Social Responsibility |
| CKL | Chakwal |
| M. Tons | Metric Tons |

| | |
|---|---|
| in | Inches |
| GLS | Ground Level Surface |
| MTa | Metric Tons Annually |
| TPD | Tons Per Day |
| HSE | Health Safety and Environment |

# APPENDIX-III: SOURCE OF THE DATA (REFERENCES)


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- Punjab Environmental Quality Standards for Drinking Water.
- PunjabEnvironmentalQualityStandardsforMotorVehicleExhaustandNoise.
- Punjab Environmental Quality Standards for Ambient Air.
- Topographical Maps of Punjab.
- Punjab Environmental Quality Standards for Noise.
- The Canal and Drainage Act, 1873.
- The Punjab Plantation and Maintenance of Trees Act, 394.
- The Punjab Wildlife (Protection, Preservation, Conservation and Management) Act and Rules, 394.
- Information and data provided by the project proponent.
- Technical design data related to the project.
- Information gathered through discussions with the project related persons of the project proponent.
- 29."Guidelines for Self-Monitoring and Reporting by the Industry (SMART)," Final Report, March 1998, approved by PEPC, August 1999
- Mining & Environment by Prf. Bharat B. Dhar.

## APPENDIX IV: TERMS OF REFERENCE OF ENVIRONMENTAL REPORTS

# TERMS OF REFERENCE FOR EIA REPORT

The agreement hereinafter called Agreement, is made between M/s Prime Environmental Consultants (Consultant) and MR. SYED GHULAM HUSSAIN (Client) to prepare and carry out follow up of Environmental Study Report for obtaining Environmental approval under Section 12 of Punjab Environment Protection Act 1997 (Amended 2012) for proposed project of "Mining Lease for Coal Over an area of 403.29 acres situated near PARARA, District Chakwal"

The client has requested the consultancy firm to provide consultancy service to prepare and follow up of EIA Report and so that client may obtain Environmental Approval from EPA, Punjab under the Section 12 of PEPA 1997 (As Amended 2012) so mutually agreed terms and conditions are as under:

NOW THEREFORE, the parties here to hereby agree as follow:

- The client shall provide assistance and access to the information contained in the feasibility study, layout plan and other project relevant documents as and when required by the consultancy firm/consultant for performance of his obligations.
- The client shall provide all available data, maps, reports, etc. about the project including but not limited to layout plan of the project. Client will provide Lab Test Reports from EPA certified lab including noise level monitoring, wastewater analysis and stack emissions report or any report/document/information demanded by the EPA.
- The client will provide to the consultancy firm with the letter of introduction and authorization and other documents as may be needed to enable consultancy firm consultant to perform the service.

- Responsible to pay all the dues of the consultants as per the agreed terms and conditions.
- The consultancy firm/consultant shall carry out the services in accordance with the provisions of the agreement including:
- Shall follow up the EIA Report and other file required with due diligence necessary/required for obtaining its approval from EPA Punjab under the statutory requirements of PEPA 1997 (amended in 2012).
- Shall give the consultancy for the preparation of the detailed Environmental Management & Monitoring Plan for enhancing the environmental conditions during installation and operational phases such as mitigation measures for wastewater, solid waste, air emissions, plantation, management of surface runoff, mitigation of socially adverse impact, if any.
- Will follow up the EIA Report and file documents considering information/documents provided by the client.
- Shall examine the entire activities and list of the details of activities likely to cause adverse impacts during and after installation phase.
- Shall suggest mitigation measures for all such activities which may cause adverse impacts.
- Will evaluate all the activities during the installation and operational phases and recommend suggestions/actions to comply with PEQS.

| | |
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| For and Behalf of<br>M/s Prime Environmental Consultants<br>(Consultants) | For and Behalf of<br>MR. SYED GHULAM HUSSAIN<br>(Proponent) |

# APPENDIX-V: CONSULTANT TEAM

Prime Environmental Consultant has the expertise of highly diversified experience and has completed a total of more than 150 environmental studies across Punjab. The consultant has a range of expertise available in following areas:

a) Preparation of reports, IEE report, EIA reports.
b) Preparation of Environment Management Plans
c) Assessment of Impact of mining on environment and mitigating measures.
d) Stake Holder Consultations.

| Contact Details | |
|---|---|
| **Consultant** | Prime Environmental Consultants |
| **Contact** | (+92) 321-7860915 |
| **Address** | Latif Plaza, Office No. 07-08, 69 Saeed Block Commercial area, Canal Bank Scheme, Lahore |
| **e-Mail** | primeenvironmentalconsultants@gmail.com |

The team carrying out the research project is presented in the Table:

| Sr. | Name | Qualifications & Brief Experience | Roles Assigned |
|---|---|---|---|
| 1. | Engr. Ali Mehdi | B.Sc. Mining Engineering | • GIS Expert<br>• Stakeholder Consultation |
| 2. | Ammara Afzal | Environmental Scientist M.s Environmental Science | • Preparation of Environmental Management Plan (EMP)<br>• Preparation of Environmental Monitoring Plan (EMP)<br>• Author of EIA Report |

| | | | |
|---|---|---|---|
| 3. | Zeba Haseeb | Environmental Scientist<br>M.S Environmental Science | • Preparation of Environmental Management Plan (EMP)<br>• Preparation of Environmental Monitoring Plan (EMP)<br>• Author of EIA Report |
| 4. | Umer Saeed | Environmental Scientist<br>M.S Environmental Science | • Site visits |

# APPENDIX VI: ENVIRONMENTAL MAP