

EXECUTIVE SUMMARY

ES.1: Title & Location of the Project

Title:

"Mining for Extraction of Coal over an area of 1005.13 acres from a Coalmine near Dhok Chhab District Khushab, under a valid Lease bearing number ML- KHB-COAL-(05) from Mines & Mineral Department, GoPb"

Location:

Project is located at a distance of 14 kms (4 km single lane metalled road and 10 km shingle road) off take from village Padhrar along Chakwal Khushab Main Highway.

Brief:

This Project site Dhok Chhab Coalmine spreads over an area of 1005.13 acres near Dhok Chhab District Khushab under a valid Lease from Mines & Mineral Department, GoPb. The site is bound all around by wide open vacant lands owned by various landowners. There is no human settlement within 0.5 km radius of the site. The geographical spread of the minesite consists of fourteen points from Point-A to Point-P, which match with the below given geographical coordinates:

Points	Easting (YDS)	Northing (YDS)
A	63459.88	24807.74
B	64000	24619.47
C	63964.09	24631.69

Points	Easting (YDS)	Northing (YDS)
D	65953.03	23938.86
E	65935.15	23767.86
F	69685.14	22401.42
G	69383.92	21574.58
H	68617.50	21903.31
I	68635.56	21983.61
J	68550	22010
K	68640.04	22313.86
L	66072.13	23249.35
M	65935.59	22879.48
N	63205.24	23793.62
O	63261.45	23813.43
P	63485.78	24307.53

ES.2 Name of Proponent

Proponent: Usman Ahmad

Director

Lessee: Katha Digwell Mines (pvt) Ltd.

Katha Digwell Mines (pvt) Ltd. is the lessee, lease was granted by Mines & Minerals Department, GoPb. The lessee/proponent will take all requisite actions for obtaining environmental approval from EPA-Pb and their further implementation through himself / representative.

Being a small scale mining project, the project has setup only by the licensed and the authorized contractor having valid lease from the concerned regulatory agency in accordance with the applicable terms and conditions. This arrangement ensured setting up of the project with the highest parameters of safety and security.

ES.3 Name of Organization Preparing Report

"ENVIRONMENTAL AND SOCIAL TECHNICAL SERVICES", Lahore

Email: hsb.obaid@gmail.com

ES.4 Brief Outline of the Proposal

Originally coal lease was granted by department of Mineral Concessions Govt. of Pakistan Karachi on 31 -03-1954 over an area of 1351.55 acres to M/S The Katha Collieries Associations, 5 - Fazal building Beadon Road Lahore for a period of 30 years. This Area is situated near Dhok Chhab District Khushab.

Directorate of Industries and Mineral Development Punjab (Mineral Development Wing) reduced the area and lease was granted over 928.03 acres on 10-3-1991 vide letter number MD/ML-KHB-Coal(5)/ of 10-03-1991 upto 30-03-2004.

An area measuring 66.22 was added in this lease vide Directorate of Industries and Mineral Development Punjab letter number MD/APP-KHB-COAL (597)/91 of 23-08-1993.

Again an area of 10.88 acres was added vide Directorate Industries and Mineral Development letter dated 13-08-2000 thus making total area of this lease as 1005.13 acres. Its renewal was issued by Directorate of Industries and Mineral Department on 13-11-2003 for a period up to 30-03-2024.

Owing to reasonable deposits, the site is suitable for the commercial mining of coal. The leased site is being used for commercial extraction of coal in accordance with the conditions of the lease offer and best practices regarding development mining for extraction and transportation of the mined coal. The extracted coal is being supplied to its various users in the country.

Average output

Coal extraction is 18 – 20 tons per day. On an average one truck carries 8 tons of coal which is sold at the average rate of 20,000 pkr per ton.

Pit props sizes

Wooden pit props have length of 6 to 8 ft and girth from 18- 24 inches small wooden pieces of 2ft length are also used during new cutting of mines insides (working face). Mostly eucalyptus wood is being used for the purpose.

ES.5 Major Impacts

In terms of its cost, size, magnitude and socio-environmental impacts, the mining for extraction of coal can be termed as an activity of significance from the environmental standpoint. The lessee/proponent will carry out mining for extraction of coal in strict accordance with the terms and conditions of lease awarded via letter # ML. KHB- COAL (05) by the Deputy Director (Mines Development) Punjab.

Excavated coal will require deployment of certain essential machinery and equipment including, pointed hammers, spine, trolley, loaders, dumpers and trucks etc. Additionally, certain equipment and machinery for measuring, weighing, grading the extracted coal. In order to ward off the situations of risk and emergency, firefighting equipment (standalone fire extinguishers) will also be arranged and installed at the site. Some trees of indigenous varieties will also be planted during each plantation season during the currency of the lease to enhance environmental ambience of the site. The lessee / proponent have allocated a separate sum of Rs. 1 million for environmental enhancement, improvement of aesthetics and up-facing of the site's outlook. It has been found that

implementation and operation of the project will not be associated with any undesirable environmental and social impacts. Nevertheless, certain routine mitigation measures have been suggested to further enhance the environmental acceptability of the project. Some of the possible impacts could be the ones as described hereunder:

- **Impacts relating to land use change:** Not any permanent impacts of land use change are expected, as the land surrounding the coalmine site is not under any productive agricultural or other usage. Owing to this very position, there will not be any adverse land use change. The temporary land use changes will be reversed from rehabilitation and reclamation of the site upon closure of the mine *(This aspect has no environmental impact)*
- **Loss of livelihood and structural damages:** Not any permanent impacts relating to loss of livelihood or structural damage are expected, as the mining operations are being carried out on coal mine. There do not exist any built-up structures nor any sources of livelihood as might be impacted upon from mining operations. Likewise, there are neither any human population nor any built-up sites up to a considerable distance from the mining site *(This aspect has no social impact)*
- **Acquisition of houses and allied structures:** There are neither any built-up structures nor any houses on or up to a considerable distance from the mining site. The mining operations do not require acquisition of any land, houses or other structures. *(This aspect has no social impact)*
- **Cutting and removal of trees and crops:** Not any permanent impacts relating to cutting and removal of trees or field crops. The mining operations will not require or involve cutting of any trees or crops. Contrarily, seasonal tree plantation

around the site has been suggested as the premier step to improve aesthetics of the site *(This aspect has no environmental impact)*

- **Impeachment of easement rights of the local community:** Not any permanent impacts of impeachment of the easement rights of the local community as the mining operations are being carried out on coal mine area, owned and possessed by Mines and Minerals Department. *(This aspect has no social impact)*
- **Impacts on groundwater:** Not any permanent impacts of groundwater quality and quantity as the mining operations are being carried out on coal mine area. Except for some limited scale usages for normal human needs, groundwater is not required for any major operational activity under the project *(This aspect has no environmental and social impact)*
- **Impacts on surface water:** Not any permanent impacts on surface water resources as the mining operations are being carried out on coal mine site. However, as a result of heavy rainfall, the storm water may wash away surficial coal particles and may take them to the receiving water body *(This aspect has no environmental and social impact)*
- **Impacts of inadequate treatment and disposal of wastewaters:** Not any permanent impacts of inadequate treatment and disposal of wastewater. The mining operations are not producing any wastewaters. Hence, there does not arise any question of inadequate treatment/disposal of wastewater at all *(This aspect has no environmental impact)*
- **Impacts of inadequate disposal of the MSW:** Not any permanent impacts relating to inadequate treatment and disposal of MSW. The mining operations at coal mine,

do not generate any municipal type solid wastes. *(This aspect has no environmental impact)*

- **Impacts of generation of ambient or neighbourhood noise:** Not any permanent impacts of generation of excessive noise and vibrations, as there are not any vicinity residents to be affected from the mining operations. The noise and vibrations generated from mining operations is therefore not affecting any resident population. As regard the mine workers, they have been provided the requisite safety equipment to protect against noise and vibrations. Hence, there are not any impacts relating to this aspect *(This aspect has no social impact)*
- **Impacts on local air quality:** The coal dust produced during coalmining and coal loading operations may affect the local air quality temporarily during the span of operational activity. The dry fallout of the coal dust is not of much significance as there are neither any settled population nor any other important receptors within the coal dust zone. Dust, except human afflictions, are mitigable and can be avoided or countered by implementing the requisite mitigation measures.
- **Billowing of the drag dust:** No any permanent impacts of billowing of the drag dust. The drag dust produced during coalmining and coal loading operations may affect the local air quality temporarily during the span of operational activity. Likewise, billowing of the drag dust and fugitive dust from vehicular movement on the access road of the mine site, has got some impacts. Moreover, the transient impacts of fugitive dust and fine coal dust, except human afflictions, are mitigable and can be avoided or countered by implementing the requisite mitigation measures *(This aspect has no environmental and social impact)*

- **Impairment of air quality from exhausts of fossil fuel burning:** Not any permanent impacts on local air quality from exhausts of fossil fuel burning. There is not any direct fossil fuel burning with respect to any of the mining operations. The mining activities do not produce any fossil fuel exhausts, per se. *(This aspect has no environmental impact)*
- **Impacts on ambient air quality:** Coalmining operations affect the ambient air quality from billowing and flying off the fine particulate, fugitive and coal dust. The tiny particulate matter may remain suspended in the air for quite some time, particularly during the active mining operations. However, it is mitigable and is being controlled by frequent sprinkling of the road and the bare area with water *(The aspect under consideration has some environmental and social impact, which are mitigable)*
- **Likelihood of accidents and risks of personal injuries:** Coalmining, being an underground activity of digging and excavation of a carbonaceous matter is associated with number of risks, hazards and chances of accidents. Apart from the minor worksite injuries, the major accidents that might take place at a coalmine include the following:
 - Subsidence of the loosened area
 - Collapse of the mine (Possibility)
 - Spontaneous fire
 - Mine blast from accumulation of methane (CH₄) gas
 - Flooding and choking of mine

- Some of the above listed risks and hazards can be avoided by employing appropriate preventive and protective measures. As regard the minor personal injuries, most of the time, these are an unfortunate outcome of non-observance of the standard operating procedures, steps for carrying out a particular activity in a safe manner and non-compliance of the recommended precautionary measures. It is imperative that all workers, particularly those working inside the mine, use the requisite safety equipment and the right kind of tools, equipment and apparel while on work. *(The aspect under consideration has some potentiality of impact, most of which are mitigable)*
- **Impacts on local ecology, biodiversity and the habitat:** Coalmining over an extensive and wider area is factor to affect local ecology and biodiversity provided the area has some specific habitat and biodiversity features. As regard the present mine site, the same is devoid of any particular ecology, habitat and biodiversity. The wider area around the mine site is un-inhabited. Therefore, no likelihood of disturbance to neighbourhood communities. *(The aspect under consideration is without any impact and if there be any, are all mitigable)*
- **Social and cultural issues:** Not any permanent impacts relating to social and cultural issues. The minesite is a vacant and un-inhabited land owned and possessed by Mines and Minerals Department, Government of the Punjab. As there is no neighbourhood community or likelihood of impeachment of any public rights, there is no likelihood of any kind of social or cultural issues at all *(This aspect has no social impact)*
- **Impacts of likelihood of poor designing:** Not any impacts relating to likelihood of poor designing. All mining operations will be carried out in strict accordance

with the terms and conditions of lease as well as provisions of the Mining Concession Rules 2002. *(This aspect has no environmental impact)*

- **Likelihood of risks of personal injury:** The mining operations being a kind of hard activities, the risks of personal injuries and accidents cannot be ruled out. But, the same can be curtailed or minimized if exposure to the avoidable risks and site hazards is minimized. Nevertheless, likelihood of personal injuries from other causes cannot be ruled out altogether. Efforts should be made to minimize exposure to risks of personal injuries by instituting a dependable hazard assessment and risk avoidance strategy *(This aspect has no social impact)*

A detailed account of the genesis of the above-referred adverse impacts, their potentiality to affect the ambient environment and the measures for mitigations has been presented in the Chapter titled, "Environmental Impacts and Their Mitigations" as contained in this EIA Report. It would suffice here to state that if the mining operations are carried out in a sustainable manner, in accordance with the ESRMP and the mitigation measures, as are given in this EIA study, then the majority of these adverse impacts would become insignificant and of no relevance at all.

ES.6 Recommendations for Mitigation Measures

Besides presenting an in-depth analysis of the environmental and social impacts of the project, the EIA Report details a set of comprehensive mitigation measures and strategies for avoiding and countering the adverse environmental and social impacts of the project. Apart from the construction phase measures, additional measures for the operation phase activities have also been presented.

As regards the operation phase, the exposure to fugitive and coaldust can be avoided by using appropriate masks and other safety equipment. Likewise, probable extravagant use of freshwater at washrooms and other places can be minimized by fitting auto-shutoff taps. As regards treatment of the sanitation origin wastewater from the toilets, septic tanks of appropriate capacities be constructed and kept functional. The chances of subsidence can be mitigated by carrying out reclamation of the site upon closure of the mine. The environmental ambience of the site be enhanced by planting green trees, plants and exotic flora.

The most significant positive impact of the project is round the time availability of coal in sufficient quantities for the needs of the energy production sector, brick kiln industry, industrial concerns and domestic users in the country. It is a fuel of choice of the brick kilns in the country. Therefore, it is in high demand all over the country.

The above-mentioned socioeconomic and environmental benefits of the project far outweigh the potentially negative or the adverse impacts of the project, if any. Given the present state of affairs and ever increasing demand of coal in almost all parts of the country, the setting-up of the project for mining of coal is of great benefit for the people, area, and the environment for all times to come.

ES.7 Proposed Monitoring

The environmental, social and risk management plan (ESRMP), as given in this document, is meant to provide a reliable mechanism for addressing the adverse environmental and social impacts of the project. It presents a reliable system of mitigation and prevention of the adverse impacts in the form of environmental

guidelines, measures for risk and hazard avoidance, and institutional setup for implementing the ESRMP. The key components of the ESRMP will include environmental guidelines for the project sponsors, planners, design - engineers, contractors, vendors and suppliers of goods, commodities and services for the project, lessee / proponent and others concerned.

Apart from relevant focal persons for the various sub-components, there will be an environmental safety, health and social management unit (ESHU) headed by an environmental manager to cater for environmental and safety issues of the project right from planning stage to its lifelong operations. The job of the ESHU will be to ensure compliance of the environmental guidelines and implementation of the prescribed mitigation, safety, health, and hygiene measures at the site. The Environmental Manager will have an independent office and appropriate number of staff to assist him in smooth accomplishment of his duties.

CHAPTER 1

INTRODUCTION

1.1 Purpose of Report

Purpose of the instant report is to present a comprehensive Environmental Impact Assessment (EIA) of the project. The project simply is mining for extraction of coal from a coalmine near Dhok Chhab District Khushab and its transportation to various destinations for may be host of usages. Coal is used extensively in the boilers, energy production industry aid various other sectors of the country particularly in brick kilns. Owing to various factors, the demand of coal has gone-up manifold. The mining site spreads over an area of 1005.13 acres in District Khushab. The report presents review of the various likely environmental impacts of mining operations at the project mining site. In addition to the impacts relating to setting up of the mining for extraction tools and equipment, the report also presents an overview of the foreseeable and the likely impacts of the operation phase i.e., development of exploitation & mining extraction followed by transportation of the mined out coal to various destinations.

The EIA report presents a critical review of the project's activities and the processes operations during the – extraction as well as the subsequent operation phase. The report presents a review the nature, magnitude and implications of the environmental and the social impacts of the project against the standard environmental parameters as prescribed under the Punjab Environmental Quality Standards (PEQS). The environmental and social impacts of the various activities in relation to setting up of the project tools and

the process operations all during the lifelong operations of the project are the two key areas of focus of the study. Besides evaluating the environmental profile of the activity, the report also outlines a comprehensive mechanism for addressing the various environmental concerns particularly those relating to usage of freshwater for the various process and non-process activities. The report also suggests a long-term framework of monitoring the impacts of the process operations for early detection and remediation of the environmental issues that may come up during the operation of the project.

1.2 Identification of the Project & Proponent

Project:

As the name implies, the proposal in essence is safe and secure mining for extraction of coal from a designated and approved area measuring 1005.13 acres of a coalmine, Dhok Chhab District Khushab. The Mines & Minerals Department has granted mining rights to the lessee/proponent to mine out coal vide lease letter # ML. KHB- COAL (05) to commence the mining operations.

Owing to reasonable deposits, the site is suitable for the commercial mining of coal from here.

Proponent:

Katha Digwell Mines (pvt) Ltd. is lessee. The lessee/proponent will look after all the aspects concerning environmental approval from the EPA-Punjab. Lease will carry out all necessary steps and measures for installation of the mining machinery and removal of the bottlenecks and troubleshooting in the way of smooth carrying out of the mining operations.

1.3 Environmental Consultant

M/s "ENVIRONMENTAL AND SOCIAL TECHNICAL SERVICES" is acting as the accredited consultant for conducting a detailed and in-depth EIA of the project in accordance with the rules, regulations, guidelines and provisions of relevant laws in vogue.

1.4 Brief Description of the Project

Originally coal lease was granted by department of Mineral Concessions Govt. of Pakistan Karachi on 31 -03-1954 over an area of 1351.55 acres to M/S The Katha Collieries Associations, 5 Fazal building Beadon Road Lahore for a period of 30 years. This Area is situated near Dhok Chhab District Khushab.

Directorate of Industries and Mineral Development Punjab (Mineral Development Wing) reduced the area and lease was granted over 928.03 acres on 10-3-1991 vide letter number MD/ML-KHB-Coal(5)/ of 10-03-1991 upto 30-03-2004.

An area measuring 66.22 was added in this lease vide Directorate of Industries and Mineral Development Punjab letter number MD/APP-KHB-COAL (597)/91 of 23-08-1993.

Again an area of 10.88 acres was added vide Directorate Industries and Mineral Development letter dated 13-08-2000 thus making total area of this lease as 1005.13 acres. Its renewal was issued by Directorate of Industries and Mineral Department on 13-11-2003 for a period up to 30-03-2024.

Nature:

A project of mining for extraction of coal and its transportation to various destinations in an environment friendly manner under lease from Mines and Minerals Department, Government of the Punjab.

Average output

Daily coal extraction is 18 – 20 tons per day. On an average one truck carries 8 tons of coal which is sold at the average rate of 20,000 pkr per ton.

Pit props sizes

Wooden pit props have length of 6 to 8 ft and girth from 18- 24inches small wooden pieces of 2ft length are also used during new cutting of mines insides (working face). Mostly eucalyptus (working face) wood is being used for the purpose.

CHAPTER 2

POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 General

This section deals with the current policy as well as legal and administrative framework related to carrying out an Environmental Impact Assessment (EIA) of various projects. Like other Projects, the Project, before its execution, is required to go through an Environmental Assessment, in accordance with the provisions of the Pakistan Environmental Protection Act (PEPA 1997).

2.2 Existing Regulations and Legal Framework

This IEE Study has been carried out in the light of the policy guidelines of the Government of Pakistan, under the procedures and practices formulated by the Federal Environmental Protection Agency (EPA).

2.3 Relevant Legal / Institutional Framework

The applicable laws for the environmental study of the project are briefly given below. The proponent of the project will abide by the applicable laws and regulations.

A) Relevant Legal / Institutional Framework

On March 1, 1992, the Cabinet of Pakistan approved the National Conservation Strategy. It described the stark reality of the country's deteriorating resource base and its implications for what is still largely a nature resource-based economy. It sets forth the beginnings of a plan to integrate environmental concerns into virtually every aspect of Pakistani economic life.

The strategy has three overriding objectives: conservation of natural resources, sustainable development, and improved efficiency in the use of management of resources.

B) PEPO, 1983 AND PEPA, 1997

In 1983, the Government of Pakistan issued an Environmental Protection Ordinance (EPO), which has now been replaced by the PEPA, 1997, through an Act of Parliament.

Under Sec. 8 of Environment Protection Ordinance (EPO) 1983, it was necessary to carry out IEE / EIA for all development projects, but there were no IEE / EIA regulations under that ordinance.

Under section 12 of the Pakistan Environmental Protection Act (PEPA, 1997), it is mandatory to carry out an IEE / EIA of all development projects causing significant environmental effects.

C) National Environmental Policy 2005

Government of Pakistan (GOP) has notified National Environmental Policy 2005, for different projects / aspects in which guidelines / priorities have been given to undertake / commence the projects having significant environmental impacts.

D) Review of IEE and EIA Regulations, 2022

The GOP has issued Review of Initial Environmental Examination and Environmental Impact Assessment Regulations 2022, to review the Initial Environmental Examination (IEE) / Environmental Impact Assessment (EIA) Reports.

E) Guidelines for the Preparation and Review of Environmental Reports, 1997

The GOP has also framed guidelines for the preparation and review of IEE / EIA of projects in various developmental sectors.

F) Punjab Environmental Quality Standards (PEQS)

According to PEPA 1997, Punjab Environmental Quality Standards (PEQS) were established for municipal and industrial effluents and air emissions. The latest revision of PEQS carried out in year 2016 is attached as Annexure to this Report.

G) Guidelines for Sensitive and Critical Areas

GOP has issued Guidelines for Sensitive and Critical Areas in October, 1997. The objective of the guideline is to provide guidance to project proponents and other

stakeholders in the environmental assessment process, so that the projects are planned and sited in way that protects the values of sensitive and critical areas.

H) Policy and Procedures for the Filing, Review and Approval of Environmental Assessment, November-1997

Environmental Assessment is the Primary means of managing the approval of new development proposals in Pakistan. Environmental Assessment allows for the systematic examination of proposals, clear procedures which provide for the interest of relevant Government Departments and other stakeholders to carefully considered.

I) Guidelines for Public Consultation, Pakistan Environmental Protection Agency October, 1997

This guideline is part of package of regulations and guidelines which include:

- ❖ Pakistan Environmental Protection Act, 1997
- ❖ Policy and Procedures for filing, review and approval of environmental assessments.
- ❖ Guidelines for the preparation and review of Environmental Reports
- ❖ Guidelines for sensitive and critical areas.
- ❖ Punjab Environmental Quality Standards (PEQS)
- ❖ Detailed sectoral guidelines.

J) Punjab Wildlife Protection Act, 1974

This act was framed in 1974 by Province of Punjab and is about of protection and conservation of Wildlife.

K) Forest Act, 1927

This act was framed in 1927. The Forest Act, 1927 is still the basic charter for the forest departments in Pakistan. This law empowers provincial governments to manage forest areas.

L) Explosive Act, 1884

This act deals with explosives in prohibiting either absolutely or subject to conditions, the manufacture, possession or importation of any explosive which is so dangerous in character

that, in the opinion of the appropriate Government, it is expedient for public safety to issue the notification.

M) Punjab Local Government Ordinance, 2001

Schedules 4 and 8 of this Ordinance pertain to environmental pollution. Under the Ordinance, the local councils are authorized to restrict projects causing pollution to air, water or land. They may also initiate schemes for improving the environment.

N) Pakistan Penal Code, 1860

This defines the penalties for violations concerning pollution of air, water bodies and land. Sections 272 ad 273 of this Act deal with the adulteration of food or drink. Noise pollution has been covered in Section 268, which defines and recognizes noise as a public nuisance. “A person is guilty of a public nuisance who does any act or is guilty of an illegal omission which causes any common injury, danger or annoyance to the public or to the people in general who dwell or occupy property in the vicinity, or which must necessarily cause injury, obstruction, danger or annoyance to persons who may have occasion to use any public right”.

M) Punjab Mining Concession Rules 2002

These leases are granted and governed by Mine Act 1923, Punjab Mining Concession Rules 2002 and other relevant rules, circulars and notifications.

CHAPTER 3

DESCRIPTION OF PROJECT

3.1 Type & Category of Project

Type:

A project of mining for extraction of coal and its transportation to various destinations in an environment friendly manner under lease from, Deputy Director Mineral Development for Director of Industries and Mineral Development Government of the Punjab.

Category:

The mining and mineral processing operations are listed under Category-"C" - 1 of Schedule-II of the IEE/EIA Regulations 2022

3.2 Historical Overview

Ancient people mined coal by picking and scraping and used it for heating, cooking, and in ceremonial chambers as early as the 12th century AD; in the 14th century they used it industrially in pottery making. Small-scale mining of surface coal deposits dates back thousands of years. The Romans were exploiting all major coalfields by the late 2nd century AD. Coal was mined in America in the early 18th century, and commercial mining started around 1730 in Midlothian, Virginia. Coal-cutting machines were invented in the 1880s. Before this invention, coal was mined from underground with a pick and shovel. By 1912, surface mining was conducted with steam shovels designed for coal mining. Coal mining has had many developments over the recent years, from the

early days of men tunneling, digging and manually extracting the coal on carts, to large open cut and long wall mines. The various methods of mining a coal seam can be classified under two headings, surface mining and underground mining.

3.3 Objectives of the Project

The primary objective of the project is to extract coal over an area of 1005.13 acres near Dhok Chhab District Khushab for its supply and usage by the concerned industry and the coal consumers.

The commercial mining for extraction started only after taking over of the mining site (coalmine) by the lessee/proponent from the GoPb. The coal is then transported to the desired destinations. It is a fuel of choice of the brick kilns in the country. Therefore, it is in high demand all over the country.

The socioeconomic benefits coming in the wake of implementation of the project will help in uplifting lifestyle systems of the populace of the neighboring villages and towns. This can be counted as another important benefit of the activity. Similarly, impetus to commercial activities and creation of new job opportunities for the locals will come in the wake of implementation of the project. The setting up of the project will ensure timely availability of coal in the far off and distant areas and the dependent financial benefits for the people of those areas from trading of coal and the allied commercial activities. Thus, apart from these primary objectives, there are secondary benefits of implementation of the project, which are beneficial for neighborhood communities.

The underlying objective of the instant project is to ensure environmentally compatible coal.

Viewing in this backdrop, the primary objective of the instant project, apart from keeping the environmental pollution in check, is to ensure the abundant off-season availability of coal for the various consumers in the country.

The local tree plantation around the site will enhance environmental ambience and aesthetic outlook around the site and will help to reduce environmental pollution in the area.

3.4 Alternatives of the Project

The following alternatives were considered while carrying out EIA of the project.

- Abandonment of the Project (No Project Alternative)
- Changing Project's Scope (Downsizing or Upsizing)
- Shifting the Project to some other Site
- Process Modification Alternative

None of the alternatives which were considered, reviewed and examined were found a better choice than the instant project. All other alternatives were found either costly, time consuming, non-beneficial for the environment and of no advantage on any account compared to the instant project. Hence, they were all dropped.

3.5 Location & Layout of the Project

Location:

The site is coalmine spread over an area of 1005.13 acres near Dhok Chhab District Khushab. The site is bound all around by wide open vacant lands owned by various landowners. There is no human settlement within 0.5 km radius of the site. The

geographical spread of the mine site consists of fourteen points from Point-A to Point-P, which match with the below given geographical coordinates (**Table 3.1**).

Table 3.1: Location Coordinates of the Site

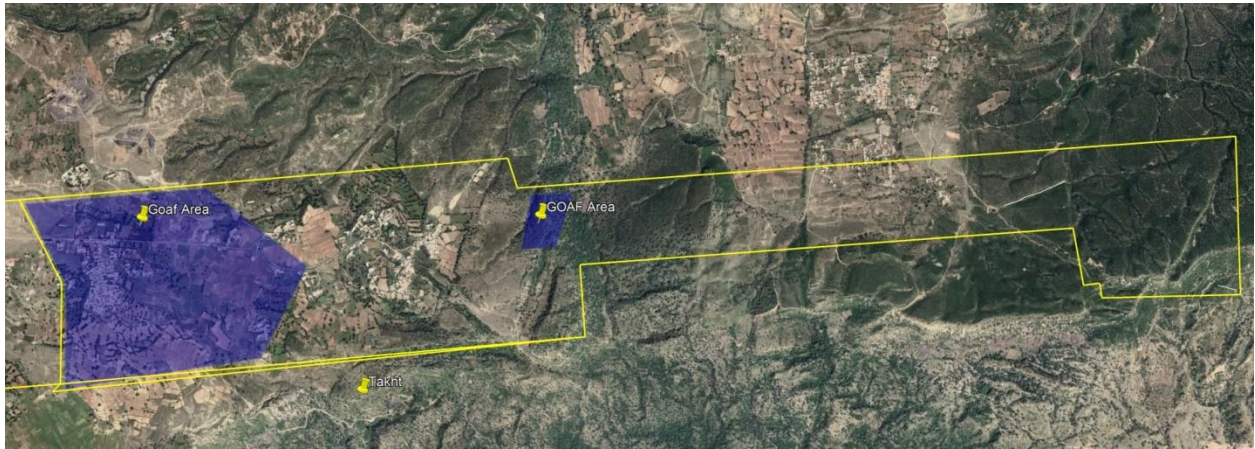
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M	65935.59	22879.48
N	63205.24	23793.62
O	63261.45	23813.43
P	63485.78	24307.53

3.6 Land Use of the Site

The site coal repository named as Dhok Chhab Coalmine, near Dhok Chhab District Khushab. The entire site and the surrounding area is all coalmine area under control of the Mines and Minerals Department, Government of the Punjab.

3.7 Road Access

Lease is situated at a distance of 14kms road (Portion 4km single lane metalled road and 10km shingle road) from Chakwal - Khushab main Road off take from village Padhrar.



3.8 Vegetation Features of the Site

The site is devoid of any vegetation features. However, seasonal plantation of the shadowy trees and development of the grassy patches near the site is to be done by the lessee/ proponent as a prime aesthetic enhancement measure. It is expected that plantation of new trees will add to scenic beauty, outlook and smoothness of the site and the vicinity and will reduce severity of atmosphere.

3.9 Magnitude of Operation and Cost

Magnitude of operation is to extract coal only. The mined out coal is transported to a transit depot near Chakwal - Khushab main Road 1km short of village Padhrar. Then it is sent to the intended destinations in an environmentally compatible manner. Coal is in great and ever increasing demand by the concerned industry in the country.

Cost affidavit is annexed at the end of the report.

3.10 Schedule of Implementation

The lessee/proponent installs the necessary mining machinery as a one-go activity on fast track basis and within the shortest possible time immediately upon completion of the requisite legal formalities and obtaining of the different NOCs & licenses from the concerned regulatory agencies of the Government, primarily the EPA-Pb. The lessee/proponent had already carried out necessary spadework regarding detailed surveys. This EIA Report is one of these preliminary steps towards completion of the requisite formalities. The landscaping and external beautification of the site is to be taken up side-by-side. Thus, by the time the installation of the mining machinery is complete, the entire site should present a beautiful and lush green.

The mining operations and setting up of the equipment is a continuous activity spanned over the entire validity period of twenty years. The various support operations will include laying of railing track for pulling out coal-loaded trolleys from deep inside the mine, fixation of support pillars (pit props) to stabilize the mine, installation of firefighting system and construction of parking lots for loading coal on the carriage vehicles. These support operations are accomplished side by side with construction of coal mine to ensure concurrent maintenance and timely setting-up of the project. The commissioning of the project comprised of the following essential components:

Operational Phase

- Taking Possession of the requisite landsite after legal formalities

- Preparation of the project documents, layout maps etc.
- Conducting studies such as environmental examination and economic feasibility
- Obtaining consents, approvals and NOCs from different regulatory agencies of the Government.
- Selecting the appropriate and the most efficient equipment
- Signing the contracts and agreements for various jobs, procurements, installations, and implementation or its sub components
- Clearing the site for installation of tools and equipment
- Removal of any unspent material or debris after installation and before commissioning of the project
- Carriage and transportation of mining tools
- Temporary worksite toilets and washrooms.
- Provision of small workshop for machinery repair and maintenance
- Boundary lights for nighttime
- Sustained supply line of the extracted coal
- Unloading of the mined out coal on the carriage vehicles
- Periodic inspection and testing of the machinery and equipment
- Upkeep of the site and other environmental enhancement measures and beautification (plantation of trees, shrubs and ornamental flowers)

- Maintenance and upkeep of the firefighting system (risk/hazard management)
- Ensuring round the clock security of the site
- Provision of medical cover for the workers
- Social wellbeing of the neighboring communities (corporate social responsibility)
- Provision of free dispensary to villages around the project site
- Environmental audit and compliance monitoring (annual as well as periodic)

The activities for accomplishing installation and operation:

- Essential hydrological, geological, studies and surveys of the site to ascertain the baseline environmental conditions, if and when needed
- Detailed environmental, economic, social, and cost-benefit feasibility and technical studies, if and when needed
- Monitoring and supervision of the installation and fabrication works for ensuring their proper execution quantitatively as well as qualitatively (Annual as well as periodic)

3.11 Brief Description of the Project

Originally coal lease was granted by department of Mineral Concessions Govt. of Pakistan Karachi on 31 -03-1954 over an area of 1351.55 acres to M/S The Katha Collieries Associations, 5 - Fazal building Beadon Road Lahore for a period of 30 years. This Area is situated near Dhok Chhab District Khushab.

Directorate of Industries and Mineral Development Punjab (Mineral Development Wing) reduced the area and lease was granted over 928.03 acres on 10-3-1991 vide letter number MD/ML-KHB-Coal(5)/ of 10-03-1991 upto 30-03-2004.

An area measuring 66.22 was added in this lease vide Directorate of Industries and Mineral Development Punjab letter number MD/APP-KHB-COAL (597)/91 of 23-08-1993.

Again an area of 10.88 acres was added vide Directorate Industries and Mineral Development letter dated 13-08-2000 thus making total area of this lease as 1005.13 acres. Its renewal was issued by Directorate of Industries and Mineral Department on 13-11-2003 for a period up to 30-03-2024.

The site is bound all around by wide open vacant lands and hills owned by various landowners. There is no human settlement within 0.5 km radius of the site. The geographical spread of the mine site consists of fourteen points from Point-A to Point-P, which match with the below given geographical coordinates (**Table 3.1**).

Table 3.1: Location Coordinates of the Site

Points	Easting (YDS)	Northing (YDS)
A	63459.88	24807.74
B	64000	24619.47
C	63964.09	24631.69
D	65953.03	23938.86
E	65935.15	23767.86
F	69685.14	22401.42
G	69383.92	21574.58
H	68617.50	21903.31
I	68635.56	21983.61

Points	Easting (YDS)	Northing (YDS)
J	68550	22010
K	68640.04	22313.86
L	66072.13	23249.35
M	65935.59	22879.48
N	63205.24	23793.62
O	63261.45	23813.43
P	63485.78	24307.53

The mining operations are carried out in conformity with the applicable standards and guidelines, as contained in the offer/lease award letter issued by the Licensing Authority.

3.11.1 Coal

Coal is a non-renewable fossil fuel formed from the remains of plants that lived and died about 100 to 400 million years ago. Coal is formed by geological processes that take millions of years to complete and is usually found in 'seams' (layers of up to several feet thick) deep underground. Coal is one of the world's most plentiful energy resources, and its use is likely to quadruple by the year 2020. Coal occurs in a wide range of forms and qualities. There are two broad categories: (a) hard coal, which includes coking coal (used to produce steel) and other bituminous and anthracite coals used for steam and power generation; and (b) brown coal (sub-bituminous and lignite), which is used mostly as on-site fuel. Coal has a wide range of moisture (2-40%), sulfur (0.2-8%), and ash content (5-40%). These can affect the value of the coal as a fuel.

Coal is a readily combustible rock containing more than 50 percent by weight of carbonaceous material, formed from compaction and induration of variously altered plant remains similar to those in peat. Most coal is fossil

peat. Peat is an unconsolidated deposit of plant remains from a water-saturated environment such as a bog or mire; structures of the vegetal matter can be seen, and, when dried, peat burns freely.

3.11.2 Coalmining

The depth, thickness, and configuration of the coal seams determine the mode of extraction. Shallow, flat coal deposits are mined by surface processes, which are generally less costly (per ton of coal) than underground mines of similar capacity. Strip mining is one of the most economical surface processes. Here removal of overburden and coal extraction proceed in parallel strips along the face of the coal deposit, with the spoil being deposited behind the operation in the previously mined areas. In open pit mining, thick seams (tens of meters) are mined by traditional mining techniques. Underground mining is used for deep seams. Underground mining methods vary according to the site conditions, but all involve the removal of seams followed by more or less controlled subsidence of the overlying strata. Coal seams usually contain an explosive gas, methane.

3.11.3 Stages of Mining

The operational life of a mine and the mineral exploitation from a mine progresses through about five stages:

Prospecting: prospecting is the first stage in the utilization of a mineral deposit, is the search for ores or other valuable minerals (coal or nonmetallics). Because mineral deposits may be located either at or below the surface of the earth, both direct and indirect prospecting techniques are employed.

Exploration: Exploration is the second stage in the life of a mine. Once the deposit is assured, this is done to assess the size, shape, location and economic value of the deposit. Exploration determines as accurately as possible the size and value of a mineral deposit, utilizing techniques similar to but more refined than those used in prospecting. The line of demarcation between prospecting and exploration is not sharp. Exploration generally shifts to surface and subsurface locations, using a variety of measurements to obtain a more positive picture of the extent and grade of the ore body.

Development: Development, i.e., third stage, is the work of preparing access to the deposit so that the coal can be extracted. During this stage, the work of opening a mineral deposit for exploitation is performed. With it begins the actual mining of the deposit, now called the ore. Access to the deposit must be gained either (1) by stripping the overburden, which is the soil and/or rock covering the deposit, to expose the near-surface ore for mining or (2) by excavating openings from the surface to access more deeply buried deposits to prepare for underground mining. During excavation/ development of mine, wooden pit to props regularly fixed to make mine, sage and stable. Wooden pit props have length of 6 to 8 ft and girth varies from 18- 24 inches small wooden pieces of 2ft length are also used during new cutting of mines insides.

Reclamation: Reclamation is the final stage in the operation of most mines. It is the process of closing a mine and recontouring, revegetating, and restoring the water and land values. The best time to begin the reclamation process of a mine is before the first excavations are initiated. In other words, mine should be planned so that the reclamation process is considered and the overall cost of mining plus reclamation is minimized. The new philosophy in the mining industry is

sustainability, that is, meeting of economic and environmental needs of the present while enhancing the ability of future generations to meet their own needs.

3.11.4 Classification

Depending on the content of volatiles, coal is classified into Lignite, Sub-bituminous coal, Bituminous coal and Anthracite.

3.11.5 Tools for Mining Operations

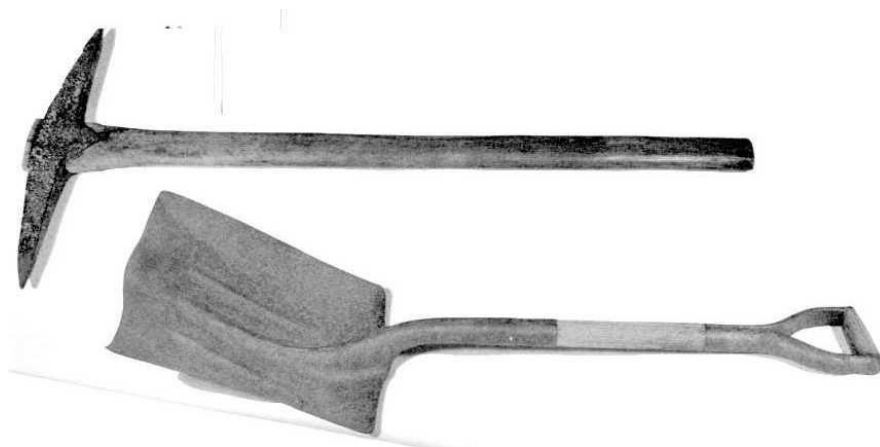
Various tools, instruments and equipment are used for mining, breaking, picking, loading and transportation of the collected coal. These will include from small size handtools. Except the small handtools, the proponent will get all machinery and vehicles on rent from the market (if required).

Handtools: The small handtools will include the following items:

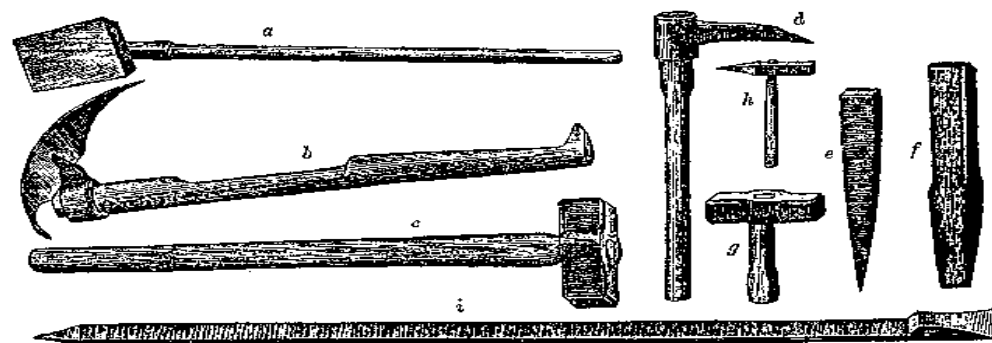
- ✓ Spade
- ✓ Mallet
- ✓ Pick Axe
- ✓ Crow Bar
- ✓ Rammer
- ✓ Wedge
- ✓ Rake
- ✓ Hammer

- ✓ Windlass
- ✓ Basket
- ✓ Bucket
- ✓ Wheel Barrow
- ✓ Donkey Bags

Handtools for Coalmining



Hand tools for Coalmining

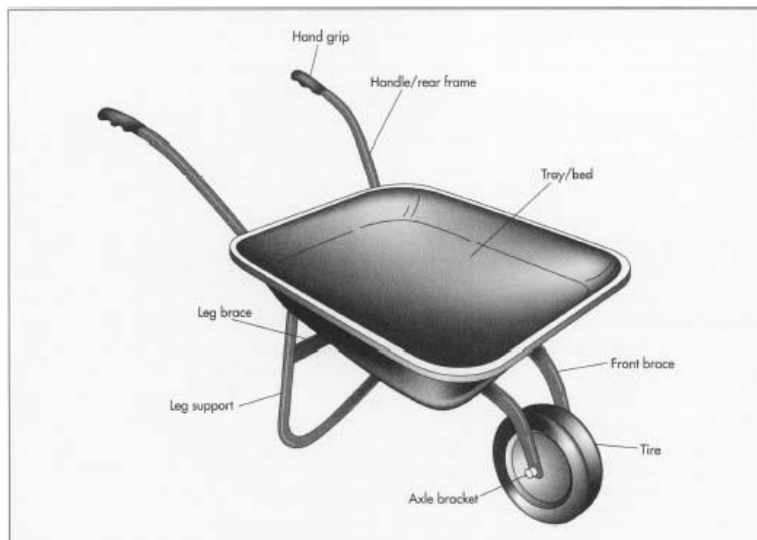


Hand tools for Coalmining (Pick Axe)



Some of the Handtools for Coalmining





Complementary Tools: The complementary tools will include the following items

- ✓ Chain Pulley Block
- ✓ Hand Barrow
- ✓ Weighing Scale

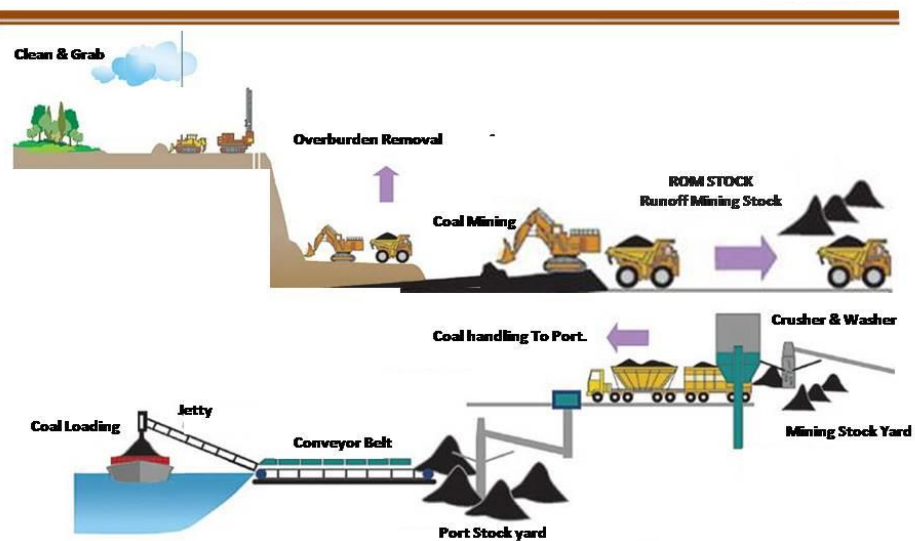


A Typical Chain Pulley Block



Some Other Coalmining Implements/Tools

Mining Flow Chart



Steps of Coalmining (Process Flow)

3.11.6 Summary of the Steps Involved

Table 2.1 presents a tabulated summary of the steps involved (process flow) of coal mining, picking, collection, loading and transportation to destination site, as depicted in Pic above.

Table 3.1: Summary of the Steps Involved in Coalmining (Process Flow)

Step	Activity	Description
1.	Taking over & Fencing of Coalmine Site	The coalmine site is fenced to demarcate and distinguish the area of operation and activity. This can be done by grouting pre-cast cement pillars in the ground and running barbed wire around them

2.	Stripping & Excavation	The surface soil is stripped and excavated to make a trench way to reach to the coal seam down
3.	Construction of Trench	The trench for bringing out coal is constructed by reinforcing sidewalls and roof pillars, domes and other weight bearing structures. A rail track for pulling our coal and electrical wiring is done during this stage

4.	Drilling & Excavation of Coal	Coal is frilled, hammered and broken off the rock. The coal so obtained is collected in a bucket, which is then emptied in the rail track trolley, The coal filled trolley is pulled out and emptied for the next round
5.	Loading of coal on carriage vehicle	Loader trucks, dumper trucks, tractor trolley etc. are used for transporting the coal from the mining site to the destination point

Average output

Daily coal extraction is 18 – 20 tons per day. On an average one truck carries 8 tons of coal which is sold at the average rate of 20,000 pkr per ton.

Pit props sizes

Wooden pit props have length of 6 to 8 ft and girth from 18 - 24 inches small wooden pieces of 2ft length are also used during new cutting of mines insides (working face). Mostly eucalyptus (working face) wood is being used for the purpose.

3.11.7 Discussion & Analysis

Arrangements have been put in place for handling any incident of fire the standalone fire extinguisher have been placed at key points at site. The firefighting system is always kept in ready-to-use state

The mining followed by transportation of the mined out coal is being done in conformity with the conditions of the lease grant, applicable standards and guidelines, as notified by Government in that respect and in line with international codes and standards for such like mining and allied operations. The basic design features of the mine are as under:

- The mined out coal is transported on dumpers, loader trucks and carriage trailers etc.
- There is a receiving/delivery ramp for off-loading the incoming commodities, and up-loading of the mined out coal on carriage vehicles for dispatch to various destinations
- There is a network of standalone foam extinguishers to combat dry fire in case of an accidental fire
- The site is accessible easily via an existing road, which runs on the north side of the site and is the principal approach road to the mine site
- As per the field survey, there is not any large size human settlement within 0.5 km radius of the site
- M/s ESTS Lahore is providing consultancy and advisory services with respect to the Environmental aspects of the activity including the EIA Report.

- The Mines & Minerals Department has asked the lessee/proponent to submit an Environmental Impact Assessment (EIA) report to the EPA Punjab, as required under Section 12 of the Punjab Environmental Protection Act 1997 (amended 2012) and the rules and regulations framed thereunder.

As per findings of the EIA, there will not be any serious negative impact. However, if any, found at a later stage, they will be all mitigable. The transient impacts of the implementation phase as have been identified in the EIA Report are all reversible and can be made good by implementing the mitigation measures and the environmental monitoring program as given in this EIA Report. To conclude, the environmental and social impacts of the project, are countered by the availability of coal for diverse end-users. This will give impetus to the dependent industry and promotion of country's economy including provision of job and employment opportunities in the country. In nutshell, the impacts of the project are beneficial for the environment, economy and the community. Precautionary measures for the workers are very important about their working inside mine and all steps to be taken to secure human life.

The findings of the EIA further show that the operations for mining for extraction of coal for its usage by host of consumers, are of immense advantage and benefit for the community and the environment. The EIA Report also shows that there are not any exhaustive exploitation and consequential depletion of the local natural resources. The project will therefore bring-in positive and healthy improvements in the socio-economic environment of the area. The project benefits thousands of the people, locally and distantly.

The source of water supply, both during setting-up the machinery and the subsequent mining operations, if needed, is the groundwater obtained from the

existing water sources near the site. The depth of water table at the site is approx. 95-135 feet. The groundwater, although a little brackish, is suitable for the intended purposes.

3.12 BENEFITS LIKELY TO ACCRUE FROM THE PROJECT

The major benefits likely to accrue from the project have been enumerated in the sections above. These include not only the business prospects, social uplifting of the area but also availability of coal in the country. The majority of the qualitative benefits are realized as a result of accomplishment of the underlying objectives of the project.

All regulation about human life safety are to be strictly implemented by the proponent.

The most significant positive impact of the project is the availability of the adequate stocks of coal for end-users and concerned industry of the country. It is a fuel of choice of the brick kilns in the country. Therefore, it is in high demand all over the country. The mining of coal from the approved mine will not cause any environmental pollution. Some of the significant quantitative benefits likely to accrue from the project can be enumerated as hereunder:

- The project indicators depict a positive cost to benefit ratio (CBR) showing that the project is feasible and is likely to bring forth economical and socio-cultural benefits in its wake
- There is an all-time availability of coal for end consumers of the commodity
- The cumulative monetized benefits from the project are in thousands of rupees per annum

- The project is likely to create more than 25 new job opportunities

The above-mentioned socioeconomic and environmental benefits of the project will far outweigh the potentially negative or the adverse impacts of the project, if any. Given the present state of affairs regarding demand and supply of coal in the country, setting-up of the project is of great benefit for the people, area and the environment for all times to come.

Contrarily, there are beneficial impacts on the local environment. The mining operations will not generate any pollutants, wastes or emissions. Some other positive and significant socioeconomic benefits of the project are the opportunities of employment, training and skill development both for the professionals and for the general cadre personnel who would be employed or whose services would be hired in connection with setting-up and operation of the project. Another social benefit of the project are the income prospects for large number of persons (traders, shopkeepers, suppliers, vendors, service providers, mechanics, artisans etc.) who would be providing goods and services during setting up and subsequently during operation of the project.

3.13 RESTORATION & REHABILITATION PLAN

The restoration or rehabilitation plans is required, mainly because of the following reasons:

- Project side is located along undulating mountain liable to erosion and other seasonal effects
- The project, being a coal mining activity, has been setup on coalmine which will require restoration.

- The site is situated away from any human settlement, villages and towns but according to location, it is a watershed area. Needs anti erosion works.
- There will not be any cutting or removal of trees or plantation as none exist on the site but the area need more plantation
- Aggressive tree plantation and development of greenbelts and grassy lawns will be taken up for improving environmental ambience.

CHAPTER – 4

SOCIAL BASELINE

4.1 SOCIAL AND CULTURAL ENVIRONMENT

4.1.1 Administrative Setting

Khushab got the status of district in 1982. At the start, the district was divided into two tehsils, Khushab, Noorpur Thal. Later on Quaidabad was given the status of Tehsil in March 2007 and Naushera (Vadi e Soon) became 4th Tehsil of District Khushab in March 2013. In local bodies delimitation 2000 (before to the creation of the Tehsil Quaidabad and Naushehra), it contained a total of fifty-one Union Councils. In 2015 delimitation of District Khushab, 48 rural union councils and 7 urban Municipal Committees have been created by the election Commission of Pakistan.

Moreover, the current administrative unit census of District Khushab is given as:

Administrative Units

Sr. No.	Administrative units	Number
1.	Tehsils	04
2.	Union Councils	48
3.	Mauzas	314
4.	Municipal Committees	07
5.	Town Committees	05

Tehsils, Sub-Tehsils and Main Towns

Sr. No	Tehsils	Sub-Tehsils	Main Towns
1.	Khushab	Noshera	Hadali
2.	Nurpur		Mitha Tawana
3.	Quaidabad		Naushera
4.			Quaidabad

4.1.2 Settlement Pattern

The settlement pattern of the Project area and its vicinity is all rural. No urban settlement exists in the close vicinity of the Project site. This was one of the major reasons to choose the Project site in this location that it is far away from urban developments.

4.2 DEMOGRAPHIC CHARACTERISTICS OF THE POPULATION IN THE STUDY AREA

An effort was made to collect the socio-economic information through structured questionnaires relating to the demographic features of the population resided in the study area. The demographic features include the information on ethnicity/tribes, size of households, gender composition, and literacy status of the population in the project area.

4.2.1 Family Size

Khushab has a population of 102,793 making it the 38th biggest city in Punjab. It operates on the IST time zone, which means that it follows the same time zone as Lahore.

Khushab District is an important district located in Punjab, Pakistan. Covering an area of 6,511 square kilometers. The district consists of 3 Tehsils, 1 Sub Tehsil and four main towns.

The last census in Pakistan was carried out in 1998. Though the data of this census is quite old now, there are many authentic estimations of the current population of the area. The present population of the two tehsils is given in table.

	Khushab	
	1998	Dec-13
Urban	202,000	253,000
Rural	349,000	438,000
Total	551,000	691,000

Gender	Population	Percentage (%)
Male	451439	49.84%
Female	454272	50.15 %
Total population	905711 persons	

Population census 1998

4.2.2 Education Status

According to Pakistan District Education Ranking, a report released by Alif Ailaan, Khushab is ranked 42 nationally with an education score of 65.42 and learning score of 65.82.

The readiness score of Khushab is 62.33. The infrastructure score of the district is 88.11, which indicates that the schools in Khushab have adequate facilities

4.2.3 Nature of Occupation

In the study area, the major occupations include business (shops, stores etc.), service (government, private), drivers, labour (skilled & unskilled) etc. The socioeconomic baseline survey results summarized in **Table 4.3** reveal that on overall basis in the study area, 4.41 percent operates business (general stores, shops etc); 10 percent are labourers,

etc. 3.86 percent are Govt servants and 14.60 percent are in private service and rest of them are in other professional as tabulated below:

Table 4.3: Percentage of Occupations of Sample Population

Occupation	Percentage
Govt. Servant	3.86
Private	14.60
Shop	3.58
Driver	3.31
Laborer	10.74
Student	9.92
House Maid	9.09
House Wife	32.51
Jobless	8.82
Old / Retired	2.75
Business man	0.83

4.2.4 Household Expenditure

The annual expenditure and pattern of expenditure provides an indication for assessing the standard of living of a household. The expenditure on food items includes cereals, pulses, flour, sugar, cooking oil/ghee, milk etc., while the non-food items consist of expenditure

on education, medical treatment (if any), clothes etc., electricity and gas etc. In this respect, survey results are depicted in **Table 4.4**.

Table 4.4: Average Annual Food and Non-Food Expenditure per Family

Item	Annual Expenditure		Occasional Expenses last year	Average Annual Bills			Avg. Annual Expenditure on Health Rs	Avg. Exp Per family (Rs.)
	Food	Non Food		Electricity	Gas	Communication		
Sample Population	42050	14500	49770	4147	4674	398	3181	6083

4.2.5 Housing Conditions

Housing conditions are also one of the indicators for the assessment of living standard/ household well-being. It was observed during the field survey that 85.0 percent of the sample respondents had their own houses under a status of simple ownership outside the project corridor.

As far as the housing conditions are concerned, it was assessed during the field survey that 4.0 percent are katcha, 32.4 percent katcha+pacca and 69.6 percent are pacca houses in the project area.

Households

Sample Size And Allocation (Households)				
	Households			
	Major City	Other Urban	Rural	Total
Punjab	10464	21360	59456	91280
Khushab District	0	360	768	1128
Tehsil				
Khushab	0	276	400	676
Noorpur Thal	0	84	368	452

4.2.6 Extent of Credit Utilization

Generally, the credit is obtained to supplement the income to meet routine and some occasional expenditure of the household including investment, social needs and other unforeseen situations. Credit is obtained from formal (banks/institutions) and informal sources (friends, relatives, land owners etc.). Mostly people do not like to get credits from the government saying that the mark up rate is very high.

4.2.7 Physical Infrastructure and basic Amenities

Generally, in the study area, drinking water is available to the population through hand pumps, electric motors or shallow wells. It was observed that on the whole, majority of the population has access to drinking water and most of them has facility of electricity. Rest of the amenities is tabulated below:

Housing Units

Sr. No.	Housing Units	Number	Percentage (%)
1.	Pacca Housing Units	100165	68.99%
2.	Housing Units having Electricity	84298	58.06 %
3.	Housing Units having piped water	30357	20.91 %
4.	Housing units using gas or cooking	3755	2.58%
5.	Total Housing Units	145187	

4.2.8 Gender Analysis and Issues

Overall about one-half (51.45 percent) of the total population are women. Women are participating to alleviate poverty and enhance economic growth and human well-being of the families. Women participation relating to the income generation/development activities and decision-making remained commendable with respect to the different development projects/ program:

It can be concluded that along the project corridor the women are heavily involved in several households and income generation activities. Some of the major activities are as below:

- Agricultural/Farming Activities - Wheat harvesting, rice transplanting, harvesting and threshing, and vegetables picking.
- Livestock rearing - Collection of fodder, grazing, washing buffaloes, processing the milk products.
- Poultry - Cleaning cot, supervise hatching, feeding & health care

- Other Activities - washing clothes, fetching water, cooking, child caring, cleaning and repairs of household items, participation in social obligations/gathering etc.

Thus keeping in view the above discussion regarding women development in the project area, their role should not be underestimated. Furthermore, the women activists after providing necessary training and capacity building can facilitate the rural women/ women-farmers in the following activities:

- Interaction/coordination & understanding amongst the women
- Social /community mobilization, training & capacity building of women
- Fund raising for the community development
- Educating to other women to make the best use of available resources
- Enhance the household savings and investment on some development works in the area.
- There is a need to address gender-related issues at all levels of the project design, implementation and operation.

4.3 PROJECT AFFECTED PERSONS

There is no Project Affected Person.

4.4 CULTURAL, RELIGIOUS AND OTHER STRUCTURES

No cultural structures are located inside the project area. No graveyard was located within the Project site.

4.5 INDIGENOUS AND WOMEN HEADED HOUSEHOLDS

During the social field survey of the project, efforts were made to identify the indigenous and women headed families along the Project corridor. Similarly no women headed household was identified in the Project area.

4.6 HISTORICAL AND ARCHEOLOGICAL SITES

No site of historical and archeological importance was observed within the Project as well as study area.

Although the notable places of Khushab are as follow:

The **Soon valley Sakasir** is one of the most beautiful areas of the district.

There are three beautiful lakes (**Ochali, Khabbaki and Sodhi Jay Wali**) which are Ramsar sites (international) Route of Mitigation birds and a beautiful garden, **Kanhatti Garden** near Khabbaki village, located here in the Soon valley area is the largest forest in Khushab district. **Pail-Piran** a gate way to Soon Valley represents a scenic view as you enter the valley via Kalar Kahar from Islamabad-Lahore MotorWay. On your left on the hill top you see shrine of **Hazrat pir Khawja Noori**, descendent of Hazrat Baha ud din Zakkariyya of Multan (a saint descendent of Habbari Arab rulers of Sindh). Few leading personalities of Pail Piran include **Late Late Pir Nowbahar Shah**, Late Pir Kalu Shah, Late Pir Walayat Shah (Dr. Wali Pir).

Katha Saghral - is semi-hilly and mineral area. Dozens of minerals including coal and salt are being mined in the surrounding area of this village.

Sakasir - is the highest *mountain in the Salt Range area in Pothohar in Pakistan. It is 1522 metre / 4946 feet high. It is situated in Khushab District but it can be seen from adjoining districts of Mianwali and Chakwal.*

The Thal Dessert

The Thal desert is a dry desert with scarce vegetation — mostly thorny bushes — over a breadth of 70 miles (110 km) and is situated between the Indus river and the Jhelum river. In Thal the whole land is arid and depends upon the weather condition, but now with the project of greater thal canal the most part of the desert will be irrigated. Gram is the main crop. People are hardworking. Noorpur thal and Rangpur Baghoor are main towns of this tehsil. Mari Shah Sakhira is the one of the biggest towns of Thal desert. Noor Pur Thal has ten Union councils having degree college for men and as well as for women. Thal desert is basically is a triangle between the districts of Khushab, Bhakkar, Mianwali, Jhang, Leyiha and Muzzafargarh. Thal has very hot days and pleasant nights.

The Soon Valley

The Soon Valley is the cultural hub of Awan tribe. The heirline of the Awan tribe reaches a common ancestor Qutab Shah who supposedly lived here, so the valley holds a special meaning to the tribe. One of the villages of the soon valley namely Pail-Piran is inhabited by the descendants of Bahauddin Zakkarya Multani, and are Hashmite Sadats (Syeds), whose ancestor Pir Khawja Noori son of Pir Ali Qatal made many people of region embrace Islam. Pirs of Pail-Piran are closely related to Pirs of Bhera Sharif (Sargodha), In Chakwal District Pir da Khara, Sarkal, Titral, Wahula, Watli, Karooli, In Abotabad District Malmula, Plasi, Arwari, Thath Pir Karam Shah. Few leading personalities of Pail-Piran included Pir Nowbahar Shah, Dr. Pir Walayat Shah (Dr. Wali pir). Pir Bahadar Shah (Zaildar), Pir Kalu Shah, Pir Qadir Bakhash one of biggest land lord of area, Pir Sattar Shah, Pir Walayat Shah, Pir Siddique Shah Nambardar, Pir Bashir Ahmad Shah, and lately the sons and grandsons of Dr. Wali Pir namely: Syed Sajid Hussain Shah, Dr. Syed Wajid H. Pirzada, Pirzada Majid Hussain Shah and Pirzada Zahid Hussain Shah (Zaidi Pir), Pirzada Aitizaz Walayat Shah (pirzada-aitizaz-walayathshah.blogspot.com), Pirzada Danial Walayat Shah, Pirzada Sheharyar Walayat Shah, Pir Zakriya Walayat shah. Mazar of Pir Khawja Noori is located in Pail-piran. The Soon Valley is important as

a hill station after Murree in the province of Punjab. The valley has beautiful lakes and gardens.

CHAPTER – 5

ENVIRONMENTAL BASELINE

5.1 GENERAL

This section describes the baseline conditions, which cover the existing physical, ecological, and socio-economic environment of the Project Area. Information on these aspects has been derived from the desk study of available data, field visits to the project area as well as information obtained through visits to the Government departments and other agencies.

Information regarding physical environment is collected within project area as well as study area. While in-case of biological and social environment, efforts were made to collect the information in 0.5 km around the project area and even upto 1 km in-case of any direct or indirect impacts was envisaged.

5.2 PHYSICAL ENVIRONMENT

5.2.1 Geology

Khushab District is a rural district located in Punjab, It is located 32.30 latitude and 72.35 longitude and it is situated at elevation 186 meters above sea level Pakistan. According to the 1998 census, the population was 905,711 with 24.76% living in urban areas. The district consists of 3 tehsils: Khushab, Nurpur, and Quaidabad, as well as a sub-tehsil Noshehra. Khushab is home to the Heavy Water and Natural Uranium Research Reactor a critical part of the Pakistan's Special Weapons Program, which has come under much heated scrutiny.

Khushab is located on Sargodha- Mainwali- Bannu Road and along branch railway line connecting main railway line running from Karachi to Peshawar therefore its importance is rapidly increasing. According to master plan Khushab city consists of 16 blocks, a grain

market, an industrial area, gardens and schools. It is an important industrial city and a number of industrial concerns are operating here. There are various cotton ginning factories, textile mills, ice factories and cold storages. The city serves as a central place for its surroundings providing important markets for about all sorts of necessary items required for daily life. There is also a General Post Office, Telephone Exchange and a General Bus Stand from where the road vehicles ply towards various cities and towns.

5.2.2 Land Use

Khushab consists of agricultural lowland plains, lakes, and hills. Parts of the Thal desert touch the district of Jhelum which runs alongside it making it fertile for agriculture. The district is rich in natural resources (salt and coal). Most people are associated with farming and agriculture. One third of the district is hilly and is dominated by Awans and some minor tribes. Since where there is no agriculture in the area, this part of Khushab district has been favoured by governments since British times as being fertile ground for armed services recruitment - a majority of the population from this area goes into the armed forces. The other two parts are irrigated lands between Khushab and Quaiadabad and the desert area of Tehsil Noorpur Thal. This desert area is the beginning of large Thal desert that continues into India's Rajasthan. In the 1980s the district was classified as a tax relief zone for new industries. This led to the establishment of many industries including cement, sugar, and textiles. But this exist only in the Headquarter (Jauharabad) so the benefits are getting the Elite ones. Masses have still a very hard life.

5.2.3 Water Resources

The major water resources in the project area include the surface as well as groundwater as described in detail below.

i) Surface Water

The major surface water source in the project area is Jhelum River along with the large nallahs coming from hill torrents and discharging into Jhelum River. The other surface

water sources are the stagnant water ponds in the nearby villages and few other ponds of rainwater storage used for livestock consumption. Rainwater storage pond in Wara Phapra is being utilized for livestock consumptions. Water along Khushab Kethe Road and along DD khan Road is saltish.

ii) Ground Water

The major groundwater sources in the project area are tube wells, hand pumps and electric suction pumps for extracting ground water. Water table is high. Hand pumps and electric suction pumps are used for drinking and other household purposes, where ground water is not brackish. Tube wells are being used for agricultural purposes. In addition to that two natural springs i.e. one in Baghanwala and other in Rawal are also being used by local people for drinking, cooking, bathing and other purposes.

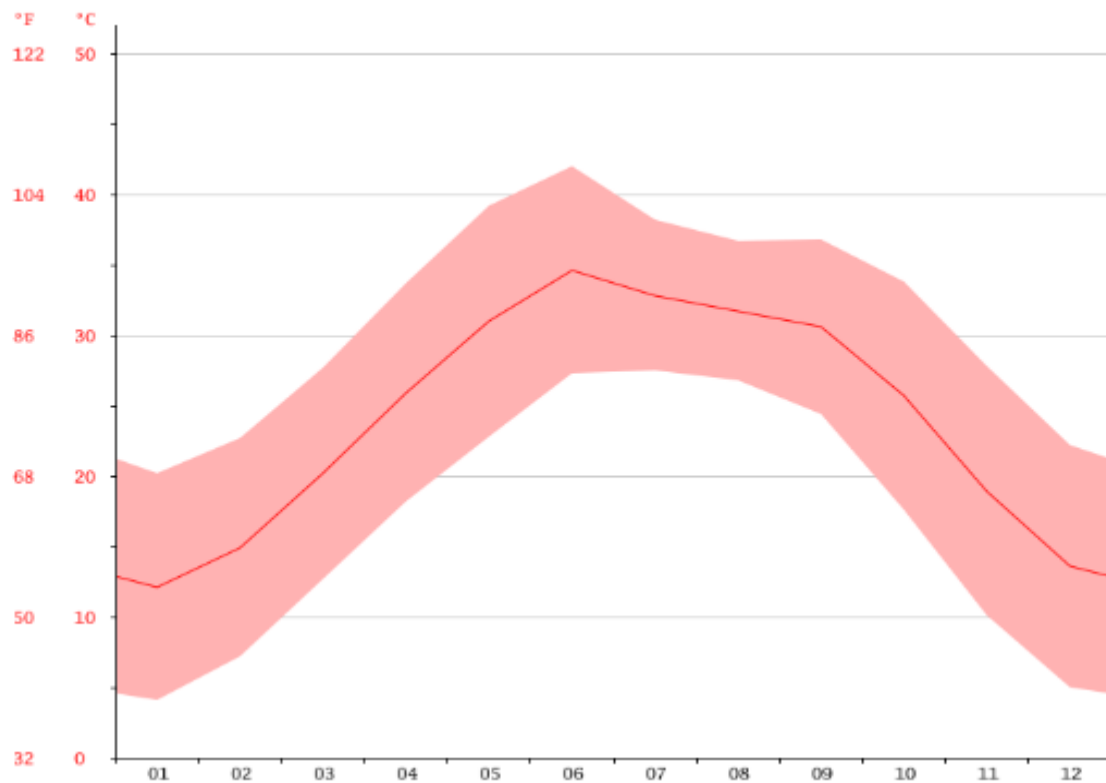
5.2.4 Climate

i) Temperature

The average temperature in Khushab is 24.3 °C. Precipitation averages 400 mm. With an average of 34.6 °C, June is the warmest month. The lowest average temperatures in the year occur in January, when it is around 12.1 °C. The variation in temperatures throughout the year is 22.5 °C.

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT
 MINING FOR EXTRACTION OF COAL OVER 1005.13 ACRES NEAR DHOK CHHAB DISTRICT KHUSHAB
 LEASE FROM MINE & MINERAL DEPARTMENT ML-KHB-COAL(05)

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	12.1	14.9	20.2	25.9	31	34.6	32.8	31.7	30.6	25.7	18.9	13.6
Min. Temperature (°C)	4.1	7.2	12.7	18.2	22.8	27.3	27.5	26.8	24.4	17.6	10.1	5
Max. Temperature (°C)	20.2	22.7	27.7	33.7	39.2	42	38.2	36.7	36.8	33.8	27.8	22.2
Avg. Temperature (°F)	53.8	58.8	68.4	78.6	87.8	94.3	91.0	89.1	87.1	78.3	66.0	56.5
Min. Temperature (°F)	39.4	45.0	54.9	64.8	73.0	81.1	81.5	80.2	75.9	63.7	50.2	41.0
Max. Temperature (°F)	68.4	72.9	81.9	92.7	102.6	107.6	100.8	98.1	98.2	92.8	82.0	72.0
Precipitation / Rainfall (mm)	19	23	36	24	24	20	100	100	28	9	5	12



ii) Wind

The wind direction in winter months is north-west and in summer south-east with average yearly speed varying from 9km/h to 12km/h

iii) Rainfall

There is very little rainfall throughout the year. The precipitation varies 95 mm between the driest month and the wettest month

Broadly, there are four well marked seasons in Pakistan. These are:

1. Cold season (December to March)
2. Hot season (April to June)
3. Monsoon season (July to September)
4. Post-Monsoon season (October and November)

5.2.5 Ambient Air Quality and Noise Level

Information on ambient air quality in rural areas is totally missing. This is mainly because air pollution is primarily a hazard for urban areas where the increasing number of industries and vehicles is increasingly concentrating the pollutants in air and also prevents them from being dispersed. As far as rural areas are concerned the air quality has not been a problem, except near sources of noxious and large emissions, such as industries. Therefore, no attention has been given in that direction.

5.3 BIOLOGICAL RESOURCES

5.3.1 General

Khushab is situated between the cities of Sargodha and Mianwali, near river Jhelum. The district is headquartered at Jauharabad (founded 1953, pop. 39,477).

Khushab is one of the old and most important cities especially from a defensive (atomic) point of view.

Khushab owns mountains, deserts, luxuriant green harvesting land, lakes and river. Khushab is also rich in natural resources (salt & coal) etc. The district is full of natural beauty containing Jhelum River, Fields, Mountains (Skaisar) and Thal desert. Its main towns included Quaida-bad, Jauhara-bad, Mitha Tiwana and Nowshera. Jauharabad (atomic city) is beautiful city for residence having wide roads and streets. Nearby cities include Sargodha, Mianwali, Bhakher, Jhelum and Jhang.

Khabikki Lake is a salt water lake in the southern Salt Range area in Pakistan. This lake is formed due to the absence of drainage in the range. Earlier its water was brackish. Now the water is sweet and a Chinese breed of fish is introduced in it. The lake is one kilometre wide and two kilometres long. Khabikki is also the name of a neighbouring village. Boats are also available and there is a rest house beside the lake. A hill gently ascended on the right side of the lake. The lake and the green area around provide a good scenery.

Uchhali Lake is just below the Sakaser Mountain, it is a salt water lake in the southern Salt Range area in Pakistan. This lake is formed due to the absence of drainage in the range. Due to its brackish water the lake is lifeless. But it offers picturesque scenery.

Sakaser (1522 metre / 4946 feet), the highest mountain in the Salt Range, looms over the lake. Sakaser is very important air defense mountain having a height of 5000 feet above sea level and very good environment.

5.3.2 Tropical Thorn Forest

Most of this region has been cleared for cultivation. Remnants of the original flora are almost vanished for need of fuel wood, grazing, timber, and felling by charcoal burners. The Project area falls in this vegetation zone. About 20% of the project area has still original flora existing over it.

5.3.3 Flora

The soil is alluvial with sandy textured sand dunes covering 50 to 60 percent of the area.

Trees

Jand	Prosopis cineraria
Frash	Tamarix aphylla
Van	Salvadora oleoides
Mesquite	Prosopis juliflora

Shrub

Dhaman	Cenchrus ciliaris
Karir	Capparis aphylla
Phog	Calligonum polygonoides

Grass

Chhimber	Eleusine flagellifera
Malai	Panicum antidotale
Lumb	Aristida depressa
Gorkha	Elionurus hirsutus
Khwai	Cymbopogon jwarancusa

5.3.4 Fauna

Variety of the wild animals are found in different tracts of the area and are of considerable importance. The Ravine deer or Chinkara (Indian gazelle) generally called Hiran also occurs. The Jackal is occasionally seen and constantly heard in all parts of the tract. The blue rock pigeon is common. Domestic camels are also abundant in the nearby area. The

grey partridge (tittar) is fairly common everywhere but black partridge is found very rarely.

5.3.5 National Parks, Reserved Forest Wild Life Sanctuaries

In the Project Area or in its close vicinity or even upto 10 km from Project site, no national park, reserved forest and wild sanctuaries were observed.

5.3.6 Migratory Birds

As no major water body exist in close vicinity of the Project Area, so no migratory birds were observed in the area.

5.3.7 Endangered Species

No floral and faunal endangered species were observed in the Project area.

CHAPTER 6

ENVIRONMENTAL MANAGEMENT & MONITORING PROGRAM

6.1 Institutional Capacity

This section describes the Environmental, Social and Risk Management Plan (ESRMP) for ensuring smooth environmental and social management of the project at all stages of activities and dealing with an emergency as and when it may occur. The section also contains a set of environmental guidelines for avoiding and or preventing the adverse environmental impacts of the project. Besides, institutional setup for implementing the ESRMP, management of hazards and emergencies, importance of the compliance-monitoring program has also been discussed.

The ESRMP is considered as the core area of an environmental examination study. It focuses on environmental protection through minimization of the impending risks and the likelihood of occurrence of hazards. The ESRMP aims to ensure that adverse consequences of an emergency are addressed appropriately at all stages of disaster management from prevention to rehabilitation and resettlement of the affected individuals. Wherever possible and applicable, the ESRMP provides for avoiding environmental risks and, in case they are unavoidable, then identification of the most direct and the best possible measures for reducing the extent of damage to persons and property. Additionally, ESRMP designates the special risk areas and proposes stringent measures for hazard avoidance at these high risk and sensitive areas. In nutshell, the objectives of the ESRMP would be as under:

- To provide an early warning system for the potential or actual risks
- To provide a systematic and implementable mechanism for risk characterization and risk mitigation
- To test effectiveness of the risk handling mechanism and hence improve upon the weaker areas
- To ensure that operational activities are carried out in sound and secure manner by avoiding the probability of risks occurrence

Safety measures, including appropriate design solutions, onsite handling of hazardous materials during installation of machinery and resolution of social conflicts during operational phase of the project represent some major components of the ESRMP. The ESRMP also aims to ensure that the quality of the life values as well cultural and religious sensitivities are fully preserved all through various stages of the project to avoid social severances and conflicts. Lastly, the ESRMP has been framed in line with the national legislative framework, environmental standards and regulations to ensure environmental compatibility of the project.

The lessee/proponent shall setup an Environmental Safety and Health (ESH) Unit for timely appreciation, identification, and reporting of the environmental issues relating to the project activities and for taking necessary preventive and corrective measures. The ESH will be permanent setup and will exist during the operation phase as well but with a little changed composition and mandate.

6.2 Training Schedule

The prime objective of the trainings and capacity building programs will be to ensure long-term environmental sustenance of the project's operations and activities and to keep the ESH Manager and the project management abreast of the emerging issues, troubleshooting strategies, and modern techniques of environmental management and handling emergencies.

It is recommended to hold at least one training or practice drill session into environmental issues every six months all during the operational life of the project. The training programs must cater for managing the on-ground environmental problems and the strategies for implementing the suggested environmental mitigation measures.

An external environmental consultancy of eminence and repute may be involved in making these training sessions and workshops meaningful.

6.3 Mitigation and Environment Management Plan

EMP is a framework for the implementation and execution of mitigation measures and alternatives. Ideally EMP should cover all phases of project development i.e. Preconstruction, Operation of mine and Decommissioning of the mine. It is a documented plan containing details of impacts, recommended mitigation and monitoring measures etc. and legal document based on which the performance is monitored. Some salient features of mitigation plans will include the following aspects.

6.3.1 Topsoil Management: The best practices for topsoil management is to scrap the topsoil prior to drilling and blasting, Scraped topsoil should be used immediately for plantation/agriculture.

6.3.2 Overburden Management: If an external overburden dump is unavoidable, then it should be stabilized with biological reclamation.

This would ensure that the overburden and inter burden generated is used for backfilling the exhausted pit, instead of being dumped elsewhere. Till a pit is exhausted, the overburden should be compacted and stacked in specified locations in low lying, non-mineralized zones within the lease area.

Vegetation should be planted over the dump slopes as early as possible.

The height and slope of the overburden dumps should be maintained to prevent slope failure.

6.3.3 Planned subsidence by considering surface structures and human lives, as in the case of long-wall mining. Preparation of a subsidence management plan and its approval by the regulatory agency. The plan should ensure the following:

- Simultaneous stowing of the de-coaled area.
- Compensation to and rehabilitation of the affected people.
- Fencing of the subsidence zone during active mining operation to prevent unintended entry into the affected area.
- Reclaiming the subsided area by afforestation.
- Regular monitoring and inspection of subsidence area to detect any subsidence and taking the necessary steps.
- Preparing a subsidence monitoring program that covers the impact of subsidence on surface and groundwater (quality and quantity) and its management

6.3.4 Management of Water Pollution: Use of mine seepage water (after treatment) for different purposes, Construction of gabion wall, garland drain,

siltation pond, wherever appropriate and coal stockpiles, overburden and topsoil should be selectively placed in a stable area which is less prone to erosion.

6.3.5 Mitigation Measures for Air Pollution: fixed and mobile water spraying on the haulage roads. Asphaltting of the road junction meeting public roads. Covering of the trucks carrying ore with tarpaulin. Wheel wash system. 9 inch free board for all the trucks. Green belt around mining area as physical barrier.

6.3.6 Mitigation of Noise and Vibration: Use of closed and advanced blasting technology like shock tube technology Conducting blast only during day time, use of hydraulic drills and provision of sound insulated chambers for workers deployed on machines producing higher levels of noise like bulldozers, drills etc. Enclosing crusher units in covered buildings to minimize sound propagation. Providing silencers or enclosures for noise generating machines such DG sets, compressors etc. Creating a green belt around potential noise prone area and provision of protective devices like earmuffs/earplugs to workers, who are exposed to high level of noise and reducing the exposure time of workers by practicing worker rotation.

6.3.7 Mine Closure Plan: A good mine closure plan should include the following:

- A detailed final closure plan to create productive and sustainable land use
- A plan to protect the health and safety of the surrounding habitat, and
- A plan to eliminate/contain all possible sources of pollution post-mining

The plan must be accepted by mine owners, regulating agencies, and local communities. **Mitigation of Occupational Health and Safety Issues:**

Table 6.1: Chart of Mitigation Measures

Sr.	Activity	Mitigation Measure
1.	Coal Seam Drilling	Driller to be equipped with closed cabin to reduce noise and dust ▪ The operators and other workers be provided masks, helmets, gloves and earplugs ▪ Safety zone: Buffer zone to be maintained between the local habitation and the mine lease in the form of a green belt
2.	Workers Health Surveillance	▪ Health survey programs for workers and local community ▪ Regular training and awareness of employees to meet health and safety objectives
4.	Mine Fires	▪ Try to extinguish the new fires and try to isolate existing fires ▪ Take a scientific approach to mining practices and give due consideration to fire prevention plans ▪ Monitoring with new scientific techniques ▪ Underground mining explosion managed by goal planning, ventilation, and methane gas monitoring

5.	Dust Collection	▪ Efficiency based Low, Moderate & High Dust Capturing Herbs, Shrubs and Trees
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6.4 Equipment Maintenance

All the machinery and equipment, as installed at the site, is being kept clean, tidy, tuned-up and up-to-date as per the instructions and the operating manuals of their respective manufacturers. The ESH Unit will verify the daily monitoring checklists of the upkeep and maintenance schedules.

6.5 Environmental Budget

Funds will be required for efficient performance of the ESH Unit. Apart from expenses on maintenance, payment of utilities, salaries of the staff, external compliance monitoring by an environmental firm will also require allocation of money. It is, therefore, recommended that the project complex should have suitable environmental budget.

6.6 Summary of Impacts & Mitigations

The project, being the mining activity, is one of the many such like activities already operational in the mining sites in the country. The demand of coal is increasing with every passing day and therefore its equitable availability across the country is all the more essential.

The availability of coal is essential for various dependent sectors of economy and businesses.

Therefore, round the time availability of coal is all the more required to satisfy the consumer demand. The setting-up of coal mining facilities near coalmines in the country will help to solve this problem effectively.

As mentioned under Executive Summary, the majority of the potentially negative environmental impacts, being of low rating, are manageable through good management and housekeeping practices. Implementation of the proposed mitigation measures and compliance of the environmental laws of the country will further ensure their attenuation to the desired level. In this particular case, implementation of the recommended environmental mitigation measures and the management guidelines, as given in the relevant chapters of the EIAR, are expected to bring down the negative environmental impacts of the project within the fold of acceptability.

As far as mitigation of the environmental impacts of the operation phase is concerned, their actual magnitude cannot be determined in advance at this very early and premature stage of concept planning of the project unit. Therefore, based on the tentative assessment of the likely impacts, only some tentative mitigation measures have been suggested to address the likely impacts of the operation phase. These suggested measures will be reviewed for their efficacy, once the project goes into full operation.

It is imperative that the impacts of such projects on the environment should be well evaluated and addressed in the planning, construction and operation of these projects. It needs to be ensured that construction of such like projects does not affect the environment adversely by bringing about unfavorable land use changes, large-scale exploitation of natural resources, and irreversible pollution

of the air, water, and soil environments from emissions, effluents, solid wastes and other contaminants originating from such projects.

Last but not the least, implementation of the mitigation measures should not be taken to undermine the importance of research and development (R&D) which is the keystone for finding better measures and technologies for addressing the environmental issues and concerns. It is, therefore, recommended that the lessee/proponent may review the process operations continuously to make them compatible with the applicable environmental quality standards. This will help to improve environmental profile of the project plant and will improve its socioenvironmental outlook.

CHAPTER – 7

STAKEHOLDERS CONSULTATION

7.1 Objectives and Rationale

The primary objective of the stakeholders' consultations was to learn and know the apprehensions, concerns, and opinions of the key stakeholders over environmental implications of the project. The consultation also served as a source of first-hand information about expectations of the community and beneficiaries of the project.

7.2 Identification of the Relevant Stakeholders

The consultation process began with identification of the most pertinent stakeholders. Table give are the various categories of the stakeholders and the nature of their stakes into the project pertaining both to construction and operation stages of the project:

Table: Stakeholders of the Project and Stakes (Construction Phase)

Proponent	
Funding	Funds to be provided in time
Sponsoring	Schedule timeline is to be followed keeping to view seasonal difficulties
Implementation	Bottlenecks are to be removed
	Payments to be made in time
Regulatory Authorities like EPA Mines & Minerals Department	Regularly to be in contact and implement bylaws effectively

Beneficiary	To get maximum benefit due to timely completion of the project
Service providers	To be ready to provide tools and implementations etc. as and when required. Delay in provision can cause huge lose.
Community development	Community projects like dispensaries, schools, village approach road and cold and fresh water tanks etc be provided.

Stakeholders of the Project (Operation Phase)

Proponent Funding/ Sponsoring / Sponsoring / Operating Agency

- To produce satisfactory results.
- Project operates in successful manner.
- Bottle necks are removed

Regulatory authorities like EPA / TMA

Regulations / bye laws are followed strictly

Beneficiaries

- Services and facilities be provided, safety factors is kept in view.
- Do not pollute environment
- Payments are made in amine
- Privacy and routine life of local community is not upset.

7.3 Consultation Methodology

Onsite consultations were held with representatives of the various categories of the stakeholders as were available during field visits of the sites. **Annex** is a list of the

persons consulted and interviewed. Additionally, wherever found feasible, general public in the vicinity were also consulted to know their views and concerns over the project activities. The majority of these consultations were either one to one meetings or small and focused group discussions. See **Annexure 6**

7.4 Issues Discussed

The points listed below are some of the issues discussed during the consultations:

- Constructions in accordance with applicable codes, rules, and regulations
- Constructions commensurate to usage after completion
- Contractors complying with the environmental requirements
- Concerns apprehensions, and views of the community and the stakeholders over the project design, construction and operational aspects about local norms and rural life.
- Likely adverse impacts of the project on environment i.e., physical, biological, and social components?
- Possible remedies for the concerns and apprehensions
- Any particular and specific personal or site related concern.
- Steps to ensure long-term sustainability of the project

7.5 Outcome of the Consultations

The neighbourhood communities did not express any specific or significant concerns. Interestingly, different stakeholders had different perceptions and different concerns about the project. Some of the concerns and apprehensions relating to various aspects of the project are reproduced below:

7.5.1 Design Aspects

- The design aspects need to take into account the relevant byelaws, and governmental policies.

7.5.2 Construction Aspects

- Delays in construction of the project might have to face bad weather.
- Delays in payments to the contractors, sub-contractors, suppliers and the labour be avoided.
- Interferences by the local regulatory agencies and the Local Government are also likely to cause delays in completion.
- Disorderly and haphazard placement of construction materials can have nuisance for the labour and other persons.
- Flying off of coal dust and its fallout deposition on exposed surfaces may require frequent dusting.

7.5.3 Operation Aspects

- There could be disruptions and discontinuations in the supply of the machinery and equipment and other materials for timely completion of the project
- There could be non-payment or delayed payment of wages to the temporary employees.
- There could be unsatisfactory cleanliness of the premises due to administrative and supervisory lapses.

7.6 Measures to Address the Concerns

Table below presents a summary of the concerns and apprehensions of the various stakeholders to the project and the plausible measures to address them:

Table: Summary of Stakeholders' Concerns alongwith Remedial Measures

Concerned sectors

Environment Protection Agency

Concerns

- Environmental and functional compatibility of the project
- An institutional setup for addressing the issues and concerns
- No or minimal delays at various milestones

Remedial measures

EIA, EMP and the Environmental Guidelines will ensure efficient working

Concerned sectors

Local Government authorities

Concerns

The project carries on smoothly without creation of any serious impediments

Remedial measures

Concerned authorities to be regularly in contract for smooth working

Concerned sectors

Proponent

Concerns

Wages are paid in time and no deductions are made therefrom on any count

Remedial measures

Proponent to ensure timely actions

Concerned sectors

Proponent

Concerns

- Delays in construction and completion of the project
- Delays in clearing of the running bills/ payments
- Poor coordination

Remedial measures

Proponent to ensure management issues at proper time

Concerned sectors

Proponent

Concerns

- Non-fulfillment of promises by the project authorities

- Disruptions in the supply of essentialities like office stationery, diesel for generators, and ink for printers
- Unsatisfactory cleanliness of the premises
- Lack of appropriate working space for the employees

Lack of safe drinking water facility

Remedial measures

All promises and dues to be attended timely so that there is no discontentment among workers.

Proper arrangements for records and stores be ensured

Concerned sectors

Proponent

Concerns

- Noise pollution
- Dust and air pollution
- Disorderly placement of construction materials
- Environmental compatibility of the project
- Neighbours are not displaced or their business are not affected
- Timely completion of the project

Preference in provision of jobs to locals

Remedial Measures

Jobs to local community / local persons be preferred.

No displacement of works on petty issues

Neighboring community interests be strictly honored

CHAPTER – 8

SITE RESTORATION AND REHABILITATION PLAN

8.1 Introduction

Rehabilitation and restoration are now used very commonly in connection of developmental activities that somehow effect the physical environment. It is now commonly applied in relation to ecosystems, forests etc. The laws and regulations are being framed to ensure rehabilitation and restoration of the disturbances caused to the environment.

For purposes of this chapter, ecosystem (or ecological) restoration is defined as an intentional activity that initiates or accelerates the recovery of a degraded, damaged, or destroyed ecosystem (both floral and faunal organisms) with respect to its health, integrity, services, and sustainability.

In an ecosystem, "restoration" means the process of recovering an ecosystem that has been damaged, degraded, or destroyed maybe because of a natural phenomenon (e.g., soil erosion) or human interference. Restoration of an ecosystem is an attempt to return it to its previous position. On the other hand, "rehabilitation" means the reparation of ecosystem processes, services, and productivity. In architectural terms, "restoration" is a process or act of depicting the characters and features of a property as it appeared at a particular period.

8.2 Rehabilitation Plan

Rehabilitation plans provide site-specific guidance and direction on the management of an area that is retained for environmental purposes. This may sometimes be necessary to protect and enhance areas with significant ecological

values and to demonstrate compliance with the applicable laws, statutes, codes and regulatory framework.

Rehabilitation plan should be prepared by a suitably qualified ecologist (with tertiary qualifications including ecology, natural resource management, environmental management or environmental science) who has experience in natural area restoration.

The effectiveness of a rehabilitation plan is dependent on implementation and maintenance being undertaken by suitably qualified and experienced ecological restoration and management contractors. At a minimum, contractors undertaking rehabilitation works should employ operational field staff who have qualifications and experience in ecological restoration.

Project drawings should show existing vegetation and natural features to be retained and protected (e.g. wetlands, waterways, drainage features and specific habitat values) as well as existing and future planned site elements (e.g. infrastructure, boundaries, roads, fencing, drainage lines and contours).

Maintenance and Monitoring

The rehabilitation plan should include clear and concise maintenance practices, schedules and responsibilities to ensure the area is properly maintained over the establishment phase and into the longer term. Methods for monitoring, reporting and record keeping should also be outlined.

8.3 Submitting a Rehabilitation Plan

The regulatory authority e.g., EPA may require a rehabilitation plan to be submitted as part of an IEE/EIA application, during IEE/EIA review process or as a condition of environmental approval.

8.4 Restoration of Coal Shafts

Coalmine shafts are the trenches that have been excavated to reach to a coal seam. The variable size, shape and nature of coalmine shafts require very specific -recommendations. However, the following general conditions shall apply.

- Before extraction commences, licenses and permits should be checked and limits of disturbance and/or clearing must be clearly marked out before.
- All run-on surface water must be intercepted and diverted around the area to be excavated. As a concurrent operation, all available topsoil must be removed and stockpiled as low, flat windrows around the top and sides of the area to be developed having run-on surface water management system.
- At the completion of extraction, the shafts must be made stable and safe. This usually requires the sides of the tunnel to be reshaped with gentle safe grades (e.g. 1:6 grade). All disturbed areas associated with shafts may be re-topsoiled (if appropriate) as part of the restoration plan in case of surface mining.

Stockpile areas and construction campsites should be developed in a well planned manner. Limits of disturbance and/or clearing must be clearly marked out on the site using posts or flagging tape before any ground disturbing activity takes place. All run-on surface water must be intercepted and diverted around the site. Windrows or rills of topsoil graded off the site can be formed up to make an effective temporary diversion bank. If required, a rill can be formed below the site using subsoil material, in conjunction with a sump or stacked rock containment structure, to restrict sediment and/or contaminant movement off-site. The vehicle wash-down areas, if any, should be constructed and bound as a separate area to ensure and contaminants are contained and removed at the close of the site. Decommissioning of the site requires all stockpiled material to be removed. Since

the area would generally be compacted, the area must then be contour ripped to a minimum depth of 250 mm and retopsoiled.

8.5 Restoration of Sidetracks

Sidetracks can create a much greater impact than the actual construction/operation site itself. Justification for sidetracks should be assessed during the planning phase of the project as part of the environmental impact and discussed with designers to minimize potential disturbance. If sidetracks are justified, limits of disturbance must be clearly marked out on the site before any ground disturbing activity takes place. Once again, all run-on surface water must be intercepted and diverted around or through the site. Rehabilitation of sidetracks requires removal of all temporary cross drainage structures from watercourses, together with the removal and disposal of fill materials used for temporary approaches, abutments, crossings or embankments. All disturbed or denuded areas must be contour ripped to a minimum depth of 250 mm, retopsoiled (if appropriate) in conjunction with the restoration plan.

8.6 Restoration Steps

Briefly step an as below:-

- Legal restraints of restoration
- Funding limit
- Stakeholders concerns
- Species
- Ecology
- Weather
- Physical environmental
- Bulldozers/ Hydraulic shovels be used

- Erosion effect

8.7 Activity / Site Specific Restoration & Rehabilitation Plan

Table 8.1 presents a detailed description of the activity/site specific restoration and rehabilitation plan for a coalmine.

Activities Likely Impact the Site & Restoration & Rehabilitation Measures

Sr.	Activity	Potentiality of Physical	Nature of Impact	Restoration & Rehabilitation Measures	Responsibility to
1.	Site surveys and demarcation of the coal source area/block	Likelihood of interaction with the local ecosystem	No Impact	• Not any specific restoration and rehabilitation measures are required as there will be hardly any physical change	• Site Incharge
2.	Taking over of site by the Lessee from Mines Deptt.	Likelihood of interaction with the local ecosystem	No Impact	• Not any specific restoration and rehabilitation measures are required as there will be hardly any physical change in the site, area and other features except that the proponent should be well aware of features of the local ecosystem, if any, and keep it preserved	• Site Incharge

3.	Setting-up of the site camp office for managing, coordinating and supervising.	Likelihood of interaction with the local ecosystem	No Impact	• Not any specific restoration and rehabilitation measures are required as there will be hardly any physical change in the site	• Site Incharge
4.	Drilling, breaking, gathering & collecting of coal from the Coalmine through ordinary and conventional means i.e., manual picking of coal pieces followed by heaping etc	Likelihood of damage of shaft walls and development of black spots on the ground Surface underneath the coal heap / pile	Momentary impact from Coalmining and coal heaping	• Damage to coalmine walls, ground surface from heaping of coal stock will be restored back before handing the site back to Mines & Minerals Deptt.	• Site Incharge
	-do-				• Site Incharge

Sr.	Activity	Potentiality of Physical	Nature of Impact	Restoration & Rehabilitation Measures	Responsibility to Implement
	-do-	Likelihood of damage to local flora, biota and alike, if any biota is present at the site from coalmining activities	No Impact, as mining of coal will not affect any local flora or biota simply for the reason that the site is a coalmine	• There is no likelihood of damage to wildlife as none will be existing in the area except some (e.g., rat, mice, squirrel etc.)	• Site Incharge
7.	Transportation of mined out Coal loaded on tractor trolleys, carriage trucks and other carrying vehicles by road from the minesite to the nearby destination	Likelihood of damage to local flora, biota and alike	Only some minor impact in case of over-run of the roadside plantation and biota by the types of the carriage vehicle	• The damage to any roadside plantation will be duly compensated by planting new sapling	• Site Incharge • Proponent

	-do-	Likelihood of accidental damage of the roadside infrastructure, electricity poles, telephone poles etc.	Temporary damage to physical infrastructure which is amenable to repair	The damage to any roadside structure, installation or utility supply lines, if caused by or attributable to a carrying vehicle, will be duly compensated by repairing the damaged entities	• Site Incharge
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CHAPTER – 9

FINDINGS AND CONCLUSIONS

9.1 Findings

Findings and results of this Environmental Impact Assessment EIA study show that mining for extraction of coal and its transportation will not have any significant adverse environmental impact unless properly taken care.

The Environmental Impact Assessment (EIA) study and security of the likely operations relating to mining shows that there will not be any major adverse or negative impacts on the physical as well as the biological environment.

The transitory and insignificant impact relating to flying off particulate dust and noise, during both installation of the mining tools & equipment and actual mining of the coal from the source (coalmine) have not much eventual consequences. As per findings of the EIA Report, there will not be any major impact of the mining and the allied activities, whatsoever.

However, if any impacts surfaces up at a later stage, it will be mitigated appropriately. The transient impacts of the mining operations, as have been identified in the EIA study, can be reversed and can be made good by implementing the mitigation measures and the environmental monitoring program. As a fact, the environmental and social impacts of the mining operations are countered by the more positive impact of round the clock availability of coal for various end-users and the dependent industry. The environmentally compatible mining, extraction and transportation for consumers, end-users and the dependent industry are of immense advantage and benefit for the community.

EIA study also shows that there will not be any exhaustive exploitation and consequential depletion of the local natural resources from any of the project activities. Hence no adverse environmental impacts.

In view of the calculated scope and magnitude of the project activities, the local resources will remain conserved and available for sustainable future development. The project will therefore bring-in positive and healthy improvements in the socio-economic environment of the area. As a result of economic trickle down, the operations will benefit thousands of people, locally and distantly.

The high-end positive impacts outweigh all low-end negative impacts of the project, thereby making the project an environment friendly and sustainable.

9.2 Conclusion

Results of the EIA study show that mining, quarrying & extraction of coal and its transportation will not have any significant adverse environmental impact.

The EIA study also shows that there will not be any exhaustive exploitation and consequential depletion of the local natural resources from any of the project activities. In view of the calculated scope and magnitude of the project activities, the local resources will remain conserved and available for sustainable future development.

The project will therefore bring-in positive and healthy improvements in the socio-economic environment of the area. The transitory and insignificant impacts relating to blow-up dust and noise, during both installation of the mining tools and equipment and actual mining from the coal mine are all negligible. There are not of major significance and are controllable by adopting mitigation measures.

However, if any impacts surface up at a later stage, these will be mitigated appropriately. Even after a comprehensive and in-depth examination of the parametric and the non-parametric aspects of the likely environmental impacts of the mining and the other allied operations, no major negative impact is anticipated.

The transient impacts of the mining operations, as identified in the EIA report are reversible and can be made good by properly implementing the mitigation measures and monitoring program

To conclude,

- The environmental and social impacts of the mining operations are countered by the more positive impacts and above all it will provide jobs to the poor local population living in rain fed areas having very low monthly income.
- Mining Labour is to be taken care so that no mishap occurs. New Digging be made safer. Life is very important. Poor Labour is to be given all legal benefit.
- Medical facilities must be provided at site for these coal mining areas
- Mining should be done in a scientific manner and all tools and equipment's including pit props may be regularly checked by Mines and Minerals Department / Environmental Protection Agency to avoid any mishap.
- Punjab mines and mineral department rules and regulations issued from time to time are to be strictly followed
- Regular fortnightly medical checkup of the labour may be carried out
- Oxygen supply is to be ensured in the mine
- Safety of the labour is to be ensured by proper digging, giving wooden (pit props) support and maintaining stability of the mine.

CHAPTER – 10

SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

10.1 Environmental Impact & their Mitigations

This section / chapter describes the aspects of potential environmental impacts and their mitigation measures of mining operation phase of the project on the physical, biological, social aspects of the environment.

Unlike the large-scale developmental projects, this project, because of its extremely small size, scale and spread, is likely not to produce any significant or even insignificant impacts on the local physical, biological and social environment within or out the project's zone of environmental influence. The mining components have been designed and will plan in such a manner so as to ensure minimum disturbance to the environment. The possible impacts on the baseline environment profile and social impacts (positive & negative; visible & invisible; concrete & absolute; and reversible & irreversible) have been examined together and reported.

The environmental impacts of the project are likely to relate mainly to flying-off of particulate matter from mining for extraction of the coal.

The generation and disposal of the striped surface crust, unspent materials, debris and solid wastes, may be associated with some other insignificant and transitory impacts on the environment. The majority of the impacts concerning

setting-up of the mining tools are temporary and transitory in nature, e.g., generation noise from truck / vehicles for transportation operations.

As against the negative impacts, there are number of positive impacts of the project. These would be availability of jobs for both skilled and unskilled personnel particularly for local community, income prospects for the persons involved in carriage and transport of materials and goods for the project and above all easy availability of coal for the end-users. Because of these benefits, the positive impacts of the project will outweigh the potentially negative impacts.

10.2 Assessment Methodology

The EIA Report is based on the standard impact assessment methodology as prescribed in EPA 1997 and IEE / EIA Guidelines 2000. In accordance with the said methodology, comparative analysis, both of the negative and the positive impacts has been carried out with respect to the already existing baseline conditions.

The Modified Impact Assessment Matrices (**Tables 10.1 & 10.2**) have been used for identification, screening and characterization of the unmitigated as well as the residual impacts on the physical, biological and social aspects using a numerical scale from (-2) to 0 to (+2) respectively. The value (-2) denotes high adverse impacts, (-1) low adverse impacts, 0 insignificant impacts, (+2) high beneficial impacts, (+1) low beneficial impacts, and N denotes nil impacts. This method of scaling up of the magnitude of the impacts helps in easy appreciation of the nature, quantum and effect of the project's impacts.

10.3 Mitigation Strategy

The mitigation measures, as presented in this document, are intended to prevent and reduce the foreseeable impacts of the project activities during both installation of mining tools, equipment's and the subsequent operation phase. The mitigation strategy for the adverse impacts is based on the following factors:

- Avoiding a particular impact altogether particularly considering it.
- Minimizing the impact by limiting the magnitude of the action.
- Rectifying the impacts by repairing, rehabilitating or restoring the environment
- Reducing or eliminating the impacts by preserving.
- Improving landscape of the site to improve aesthetics.

10.4 Likely Environmental Impacts of Coalmining

Coal is a combustible black or brownish-black sedimentary rock, formed as rock strata called coal seams. Coal is mostly carbon with variable amounts of other elements; chiefly hydrogen, sulfur, oxygen, and nitrogen. Coal is formed if dead plant matter decays into peat and over millions of years the heat and pressure of deep burial converts the peat into coal.

Coal produces a variety of pollutants during electricity generation and releases numerous toxic pollutants into the air, water and land. The environmental impacts of coal mining are complex and depend on the mining method and its location with respect to the place of utilization.

Environmental impacts for coal mining range from mining subsidence, changes in ground water regimes and mining hydrology. Mining activities also give rise to the visual effects on the environment surrounding the mine including the release of methane into the atmosphere, the release of contaminated water and the generation of solid waste products.

Coal mining has significant impact on land use, some of the land related impact are: Loss of biodiversity, loss of livelihood or economic loss due to displacement and encroachment of agricultural land and Impact on water resource (in term of water availability and quality).

10.5 POTENTIAL ENVIRONMENTAL IMPACTS DURING DESIGN & LOCATION

The discussion following hereinafter relates to impacts of the project's design and planning phase on various important environmental parameters.

As per information provided by the lessee/proponent, design and planning stage is not relevant to this project as project is only extraction of coal from mine.

Activity

(N/A)

Likely Impacts

(N/A)

Time of Occurrence

(N/A)

Duration of Impact

(N/A)

Frequency

(N/A)

Probability

(N/A)

Occurrence

(N/A)

Category of Impact

(N/A)

Area of Effect

(N/A)

Exposed Persons

(N/A)

Mitigation Measure (EMP) Design & Planning

(Not Relevant)

10.6 POTENTIAL ENVIRONMENTAL IMPACTS DURING CONSTRUCTION PHASE

The discussion following hereinafter relates to impacts of the implementation phase of the project on various important environmental parameters.

10.6.1 Parametric Impacts of Construction Phase

The subsections following hereinafter present a discussion on various parametric impacts of the project's construction phase.

(a) Soils and Lands

Impacts on the soil quality will be minimum as no excavations for making the tunnel/ boring/ blasting is required only excavation of coal from main tools (manually) is done at site. However, there is no likelihood of such an occurrence in the case.

Activity

Stripping of surface crust and excavation for making mine shaft.

Likely impacts

Flying off of particulate fugitive dust and its dry fall out in the vicinity

Time of occurrence

Start of stripping and digging and so long as the activity continues

Duration

During continuation of the activity

Frequency

Reasonable

Category

Minor, Local, Insignificant, Temporary, without any permanent Impacts

Area of Effect

Max. Up to 30 Feet from stripping or digging Point

Effect on person

Diggers and Vicinity Persons within zone of effect

Mitigation

Sprinkling of site during stripping and digging. No one should be present in the dust zone during digging

(b) Surface Water Quality

As mentioned earlier under Chapter 2, there are not any significant surface water channels in the zone of environmental influence of the minesite.

Mine construction

Activity

Mine construction

Likely Impacts

surface water channel near mine site

Time of Occurrence

NA

Duration of Impact

NA

Improbable Frequency of Probability Of Occurrence

Improbable

Category of Impact

NA

Area of Effect

NA

Exposed Persons

NA

Mitigation Measure (EMP)

NA

(c) Groundwater Abstraction and Quality

The freshwater requirements for other needs, if any, are being met from the existing water sources of the area under permission of the concerned.

Breaching of groundwater can affect the local availability of water. High risk to alter the water quality of areas e.g. low pH, TDS and heavy metal concentration increase in total solids.

Not any significant quantity of water was required during installation and setting-up. The approx. water requirement during this phase was 100 gallons per day. The obtaining of water from the nearby source is likely not to compete with water resources of the area.

During operational phase, the water requirement will be reduced. It will be required for normal routine human needs of the project staff and the drivers coming with carriage trucks for loading of the coal.

There is less population or human settlement near the site. Therefore, obtaining of water during the temporary machinery installation and setting-up phase of the project will not affect the community water supplies in any manner, whatsoever.

Mine construction

Activity

Mine construction

Likely Impacts

Usage of water to get settle the flying off particulate dust

Time of Occurrence

Start of mine construction and so long as the activity continues

Duration of Impact

During continuation of the activity

Improbable Frequency of Probability of Occurrence

Reasonable

Category of Impact

Minor, Local, Insignificant, Temporary, Without any permanent Impacts

Area of Effect

Feeding area of aquifer

Exposed Persons

Neighbor community if any

Mitigation Measure (EMP)

Ensure water conservation by using as minimal quantities of water as possible

Water Consumption By Site Worker

Activity

Water consumption by site worker

Likely Impacts

Usage of water to workers

Time of Occurrence

Start of mine construction and so long as the activity continues

Duration of Impact

During continuation of the activity

Improbable Frequency of Probability of Occurrence

Reasonable

Category of Impact

Minor, Local, Insignificant, Temporary, Without any permanent Impacts

Area of Effect

Feeding area of aquifer

Exposed Persons

Neighbor community if any

Mitigation Measure (EMP)

Ensure water conservation by using as minimal quantities of water as possible

(d) Wastewaters and Effluents

The mine construction works will not produce any wastewaters, whatsoever

Mine construction

Activity

Mine construction

Likely Impacts

NA

No wastewater generation from mine construction activities

Time of Occurrence

NA

Duration of Impact

NA

Improbable Frequency of Probability of Occurrence

NA

Category of Impact

NA

Area of Effect

NA

Exposed Persons

NA

Mitigation Measure (EMP)

NA

Generation Of Sanitation & Other Wastewater From Water Use By Site Workers

Activity

Generation of sanitation & other wastewater from water use by site workers

Likely Impacts

Waste Water Generation

Time of Occurrence

Start of construction

Duration of Impact

Construction period

Improbable Frequency of Probability of Occurrence

Frequent

Category of Impact

Minor, Local, Insignificant, Temporary without any permanent Impacts

Area of Effect

Waste water generation point and around

Exposed Persons

Site workers

Mitigation Measure (EMP)

Construction septic tanks for waste water treatment and disposal

(e) Air Quality

The air impact is mainly in the form of fugitive dust. Most mining operations, such as drilling, blasting, vehicular movement on haul roads, collection, transportation and handling of coal, screening, sizing and segregation and storage etc. generate dust. For example, a coal stack of 50,000 tonne can generate 250 tonne of fugitive dust even if assuming loss of only 0.5 per cent as fugitive dust. However, it is not applicable in this case.

Mine Construction

Activity

Mine construction

Likely Impacts

Flying off Of Particulate dust during construction activities

Time of Occurrence

Start and during construction span

Duration of Impact

Construction span

Improbable Frequency of Probability of Occurrence

Reasonable

Category of Impact

Minor, Local, Insignificant, Temporary, without any permanent Impacts

Area of Effect

Max. up to 30 feet from activity point

Exposed Persons

Site workers, vicinity persons within effect zone

Mitigation Measure (EMP)

Sprinkling of site during stripping and digging

No one should be present in the dust zone during digging.

Likely Impacts

Dry fallouts of flown off dust on nearby land, vegetation and vehicle etc

Time of Occurrence

Star of stripping and digging and so long as the activity continues

Duration of Impact

During construction of activity

Improbable Frequency of Probability of Occurrence

Reasonable

Category of Impact

Minor, Local, Insignificant, Temporary, Without any permanent Impacts

Area of Effect

Max. up to 30 feet from stripping or digging point

Exposed Persons

Diggers and vicinity persons with in zone of effect

Mitigation Measure (EMP)

Sprinkling of site during stripping and digging

No one should be present in the dust zone during digging.

Likely Impacts

Dry fallouts of flown off dust on nearby land, vegetation and vehicle etc

Time of Occurrence

Star of stripping and digging and so long as the activity continues

Duration of Impact

During construction of activity

Improbable Frequency of Probability of Occurrence

Reasonable

Category of Impact

Minor, Local, Insignificant, Temporary, without any permanent Impacts

Area of Effect

Max. up to 30 feet from stripping or digging point

Exposed Persons

Diggers and vicinity persons with in zone of effect

Mitigation Measure (EMP)

Sprinkling of site during stripping and digging

No one should be present in the dust zone during digging.

(f) Noise and Vibrations

Owing to non-cumulative property of sound and vibrations, the impacts are reversible and of significance only during continuation of the noisy activities. Cumulative effect of mining activities may produce considerable noise from activities like drilling, crushing and movement of vehicles.

Mine Construction

Activity

Mine construction

Likely Impacts

Noise and vibration

Time of Occurrence

Start of construction

Duration of Impact

All during Construction phase

Improbable Frequency of Probability of Occurrence

Infrequent, irregular

Category of Impact

Minor, Local, Insignificant, Temporary, Without any permanent Impacts

Area of Effect

Max. up to 30 feet from activity point

Exposed Persons

Mine workers, vicinity persons within noise zone

Mitigation Measure (EMP)

Use PPEs, earplugs etc.

Usage Of Machinery And Tool

Activity

Usage of machinery and tool

Likely Impacts

Noise and vibration

Time of Occurrence

Start of construction

Duration of Impact

All during Construction phase

Improbable Frequency of Probability of Occurrence

Infrequent, irregular

Category of Impact

Minor, Local, Insignificant, Temporary, Without any permanent Impacts

Area of Effect

Max. up to 30 feet from activity point

Exposed Persons

Mine workers, vicinity persons within noise zone

Mitigation Measure (EMP)

Use PPEs, earplugs etc.

Keep all machinery tuned up & in good working condition

(g) Land Use Change

The minesite is a vacant land and available for the project immediately. Therefore, there will not be any land use changes, whatsoever from mining operations.

Mine construction

Activity

Mine construction

Likely Impacts

Likelihood of adverse land use change (only if there is such a change)

Time of Occurrence

Start of mine construction

Duration of Impact

All during Construction phase

Improbable Frequency of Probability of Occurrence

Improbable, unlikely

Category of Impact

Permanent (only if there is a adverse land use change)

Area of Effect

Mine zone as leased by mines and mineral dept.

Exposed Persons

Mine workers

Mitigation Measure (EMP)

NA, likelihood any use change post cl reclaim -in case of change

(h) Solid Waste

There will not be the generation of any such solid wastes during operation of the project. Only generation of food based kitchen waste from meal making activities by the site labour will not be of any significance or relevance. Poor storage of solid waste can lead to run-off.

Mine Construction

Activity

Mine construction

Likely Impacts

Not any solid waste generation

Time of Occurrence

NA

Duration of Impact

NA

Improbable Frequency of Probability of Occurrence

Improbable, unlikely

Category of Impact

NA

Area of Effect

NA

Exposed Persons

NA

Mitigation Measure (EMP)

NA (no likelihood of any solid waste generation)

Food Stuff Consumption Activities And Generation Of Kitchen Trash

Activity

Food stuff consumption activities and generation of kitchen Trash

Likely Impacts

Littering of site, putrefaction and foul smell, ugly sightedness, breeding of vectors, rodent, flies etc.

Time of Occurrence

Start of mine construction

Duration of Impact

Project life

Improbable Frequency of Probability of Occurrence

Frequent, daily

Category of Impact

Minor, Local, Insignificant, Temporary, without any permanent Impacts

Area of Effect

Max. up to 4 feet from disposal point

Exposed Persons

Mine worker, other staff etc.

Mitigation Measure (EMP)

Segregate organic and inorganic waste. Reuse or recycle inorganic waste in burial pit
sprinkle burial pit with lime powder.

(i) Access, Health, Wellbeing and Worksite Safety

The environmental and social impacts pertaining to rights of access, health, community wellbeing and worksite safety will relate to the setting-up as well as to the operational phase of the project.

A poorly planned mining activities can be troublesome for the workers and the neighbouring communities.

Haphazardly placed materials and debris on or near the site can cause impedance of movement, risks of personal injury and inconvenience for the neighbours. Non-observance of the worksite safety instructions and non-use of safety gadgets during installation operations can increase vulnerability of the exposed persons to adverse health and personal safety impacts.

Mine Construction

Activity

Mine construction

Likely impacts

Positive socio economic impacts. Source of livelihood for number of persons

Time of occurrence

Start of construction

Duration

Project life

Frequency

Frequent, continuous, project life

Category

+ve, Lifelong, Permanent, Beneficial

Area of Effect

Very wide

Effectuated person

Numerous

Mitigation

NA (+ve Economic Activity)

Likely impacts

Likelihood of Accidental Personal Injury

Time of occurrence

Time of accident

Duration

Project life

Frequency

Frequent, continuous, project life

Category

Maybe Temporary or Permanent. May be Significant or Insignificant. Maybe Minor or Major. Maybe Reversible or Irreversible

Area of Effect

Activity Spot & Around

Effected person

Site Workers, Staff, Labourers

Mitigation

Use PPEs, Put on Safety Measures, Display Safety Instructions, Warning Boards, Keep First Aid Box ready and handy,

(j) Cutting and Removal Trees and Crops

Mining works will not involve cutting and removal of any trees, whatsoever

Mine Construction

Activity

Mine construction

Likely impact

NA. No tree cutting involved

Time of occurrence

NA

Duration

NA

Frequency

Improbable Unlikely

Category

NA

Area of Effect

NA

Effected person

NA

Mitigation

NA

Likely impacts

NA. No crop removal involved

Time of occurrence

NA

Duration / Frequency

NA / Improbable Unlikely

Category

NA

Area of Effect

NA

Effected person

NA

Mitigation

NA

10.7 POTENTIAL ENVIRONMENTAL IMPACTS DURING OPERATION PHASE

The discussion following hereinafter relates to some foreseeable impacts of the project's operation phase on various important environmental parameters as well as of the non-parametric aspects.

As a general rule, the potentiality of the negative impacts of a project is likely to increase with the number of persons (workers) present at the site. Higher the number of the persons present, higher will be the amount of the wastes, effluents and air emissions generated. Thus, volumetric increases of consumption of resources and the resultant generation of effluents and emissions will be directly proportional to the number of the project users.

10.7.1 Parametric Impacts of the Operation (Usage) Phase

The subsections following hereinafter present a discussion on the parametric impacts of the project's operation phase.

(a) Soils and Lands

Operation of the project will not have any significant interventions with the land and soils at all. Impacts on the soil quality will not have any major impact as no excavations / tunnel boring / blasting is required.

Mining Operation

Activity

Mining operation

Likely Impacts

Flying off of particulate fugitive dust and its dry fall out in the vicinity

Time of Occurrence

Start of mining operations

Duration of Impact

Life of mining operations

Improbable Frequency of Probability of Occurrence

Reasonable

Category of Impact

Minor, local, insignificant, temporary, without any permanent impacts

Area of Effect

Max. up to 30 feet from stopping or digging point

Exposed Persons

Diggers and vicinity persons with in zone of effect

Mitigation Measure (EMP)

Sprinkling of site duration stripping and digging. No one should present the dust zone during digging

Likely Impacts

Dry fallout of flown off dust (shale) on nearby land, vegetation and vehicles etc.

Time of Occurrence

Start of stripping and digging and so long as the activity continues.

Duration of Impact

During continuation of activity

Improbable Frequency of Probability of Occurrence

Reasonable

Category of Impact

Minor, local, insignificant, temporary, without any permanent impacts

Area of Effect

Max. up to 30 feet from stopping or digging point

Exposed Persons

Diggers and vicinity persons with in zone of effect

Mitigation Measure (EMP)

Sprinkling of site duration and digging. No should present the dust zone during digging

(b) Surface Water Quality

The mining for coal extraction operations will not have any interaction with the nearby surface waters. There are no noticeable surface water channels in the area, except small lean torrents, which will not be affected in any manner. The local geographical gradient also does not suggest any likelihood of effects on the surface water from any of the mining activities. Therefore, no chances of pollution of the local surface waters from mining operations.

Mining Operation

Activity

Mining operation

Likely impacts

NA. No surface water channel near minesite

Time of occurrence

NA

Duration

NA

Frequency

Improbable

Category

NA

Area of Effect

NA

Effected person

NA

Mitigation

NA

(c) Groundwater Abstraction and Quality

The mining & extraction of coal will neither involve nor require usage or consumption of groundwater for any of the mining operations. Therefore, there will not be any impacts on the groundwater quality or availability during the mining and even the post-mining operations.

Breaching of groundwater can affect the local availability of water. High risk to alter the water quality of areas e.g. low pH, increase in total solids, TDS and heavy metal concentration.

No significant quantity of water will be required during coalmining as water requirement was approximately 40 gallons per day. This requirement was met from the existing nearest source in the area. Which will not compete with water resources of the area. There is no population or human settlement near the site.

Generally, the routine mining activities, do not cause groundwater contamination. The groundwater quality is likely to be affected only if wastewater (from any source) somehow succeeds in reaching to the groundwater aquifer. Through groundwater borehole. As no boreholes were constructed under the project, therefore, there is no probability of contamination of groundwater from mining activities.

Mining Operations

Activity

Mining operations

Likely Impacts

Usage of water to get settle the flying off particulate dust

Time of Occurrence

Start of mining operations and their continuation

Duration of Impact

During continuation of mining operation

Frequency Probability Occurrence

Reasonable

Category of Impact

Minor Local Temporary

Area of Effect

Feeding area of aquifer

Exposed Persons

Local people or neighbor

Mitigation Measure (EMP)

Ensure water conservation by using as minimal quantities of water as possible

Activity

Water consumption by site workers

Likely Impacts

Usage of water by workers

Time of Occurrence

Start of mining operations and continuation

Duration of Impact

During continuation of mining operation

Frequency Probability Occurrence

Reasonable

Category of Impact

Minor Local Temporary

Area of Effect

Feeding area of aquifer

Exposed Persons

Local people or neighbor

Mitigation Measure (EMP)

Ensure water conservation by using as minimal quantities of water as possible

(d) Wastewaters and Effluents

Because of its very nature, the mining activities will not generate any type of effluents all during its operational life. Hence, no generation of wastewaters is expected and therefore no resultant impacts.

Mining Operations

Activity

Mining operation

Likely impacts

Usage of water to get settle the flying off particulate dust

Time of occurrence

Start of mining operations and their continuation

Duration

During continuation of mining operations

Frequency

Reasonable

Category

Minor,

Local, Insignificant, Temporary, without any permanent Impacts

Area of Effect

Feeding area of aquifer

Effectuated person

Neighbour community if any

Mitigation

Ensure

Water conservation by using as minimal quantities of water as possible

Water Consumption By Site Workers

Activity

Water consumption by site workers

Likely impacts

Usage of water by workers

Time of occurrence

Start of mine construction and so long as the activity continues

Duration

During continuation of the activity

Frequency

Reasonable

Category

Minor,

Local, Insignificant, Temporary, Without any permanent Impacts

Area of Effect

Feeding area of aquifer

Effectuated person

Neighbour community if any

Mitigation

Ensure

(e) Air Quality

The air impact is mainly in the form of fugitive dust. Most mining operations are such as drilling, blasting, vehicular movement on haul roads, collection, transportation and handling of coal, screening, sizing and segregation and storage etc. generate dust.

The mining for extraction of coal might be associated with transient flying-off of fine particulate matter during mining and excavation operations. The impacts of the flown-off particulate matter, if any, will remain highly localized and within short vicinity of the site only and will not be of any significance at all.

Activity

Mining operation

Likely impacts

Airborne suspension of flown off particulate dust

Time of occurrence

Start and continuation of mining operations

Duration

Project life

Frequency

Reasonable

Category of Impact

Minor, local, temporary

Area of Effect

Activity Spot & Around mines

Effectuated person

Site Workers, Staff, Labourers, neighbouring community

Mitigation

Sprinkling of water during mining and after.

No one should be present in that area when digging

Use PPEs, Put on Safety Measures, Display Safety Instruction Warning Boards. Keep First Aid Box Ready and handy.

10.7.2 Non-Parametric Impacts of the Operation Phase

The subsections following hereinafter present a discussion on the non-parametric impacts of the project's operation (mining of coal) phase.

Activity

Mining operation

Likely impacts

Noise and vibration

Time of occurrence

Start and continuation of mining operations

Duration

All along Project life

Frequency

Irregular

Category of Impact

Minor, local, temporary

Area of Effect

Activity Spot & Around mines

Effectuated person

Site Workers, Staff, Labourers, neighbouring community

Mitigation

Use PPEs, ear plugs etc., Put on Safety Measures

Activity

Usage of tools

Likely impacts

Noise and vibration

Time of occurrence

Start and continuation of mining operations

Duration

During mining

Frequency

Infrequent

Category of Impact

Minor, local, temporary

Area of Effect

Activity Spot & Around mines

Effected person

Site Workers, Staff, Labourers, neighbouring community

Mitigation

Use PPEs, ear plugs etc., Put on Safety Measures. Keep all tools / machinery in good working conditions.

(a) Electricity Usage

No machinery will run on the electricity connection. The project will have its own dedicated electric transformer / power supply / generator (if required).

(b) Water Usage

The mining for extraction of the coal from its source i.e., coalmine, do not require any freshwater. However, freshwater is required to meet needs of the project staff relating to drinking, washing, sanitation and other miscellaneous requirements.

As has been mentioned under Section 1, the strength of the operational staff will hardly exceed 10 persons at any one time. If it is assumed that all 10 persons are always present and the average per capita consumption for all and various needs is 20 litres per person per day or sometimes 30liters,

This much water usage is just normal and without any bearing on the local environment.

Moreover, the minesite is located away from any congested human settlements. There is no population or human dwelling nearby the site. Therefore, pumping out of the groundwater for various project needs do not affect the community water supplies. Similarly, the water used for utility purposes does not have any bearing on the community water resources

Activity

Mining operation

Likely impacts

Usage of water during sprinkling

Time of occurrence

Start of mining operations

Duration

Start of Project life

Frequency

Less portable

Category of Impact

Minor, local, temporary

Area of Effect

Near and around water sources

Effected person

Neighbouring community water users

Mitigation

Use of water as minimum quantity as possible

Water Consumption By Site Workers

Activity

Water consumption by site workers

Likely impacts

Workers using water

Time of occurrence

Start of mining operations

Duration

During lease period

Frequency

Frequent

Category of Impact

Minor, local, temporary

Area of Effect

Near water source

Effected person

Neighbouring community / water users

Mitigation

Use of water as minimum quantity as possible

(c) Solid Waste

There is not any solid waste generation during operation phase of the project, except some very small quantities of municipal wastes, "which may be containing wrappings, papers, eatables, food residues, paper, glass, empty cans, tin bottles, food packaging, peelings, PET bottles, plastics, wood chippings.

Such types of the municipal wastes contain relatively higher amounts of inorganics on comparative weight basis'. The organic constituents of these wastes tend to putrefy early and therefore may give rise to foul smells particularly during hot days when temperature is high'. Practically, no solid waste is being generated except the food remains, garbage, and trash from the office, cafeteria, drivers'. This will be collected separately on daily basis.

Mine Operation

Activity

Mine Operation

Likely Impacts

Not any solid waste generation

Time of Occurrence

NA

Duration of Impact

NA

Improbable Frequency of Probability of Occurrence

Improbable, unlikely

Category of Impact

NA

Area of Effect

NA

Exposed Persons

NA

Mitigation Measure (EMP)

NA (no likelihood of solid waste generation)

Food Stuff Consumption Activities And Generation Of Kitchen Trash

Activity

Food stuff consumption activities and generation of kitchen Trash

Likely Impacts

Littering of site putrefaction and foul smell, ugly sightedness, breeding of vectors, rodent, flies etc.

Time of Occurrence

Start of mine construction

Duration of Impact

Project life

Improbable Frequency of Probability of Occurrence

Frequent, daily

Category of Impact

Minor, Local, Insignificant, Temporary, without any permanent Impacts

Area of Effect

Max. up to 10 feet from disposal point

Exposed Persons

Mine worker, other staff etc.

Mitigation Measure (EMP)

Segregate organic and inorganic waste.

Reuse or recycle inorganic waste

(d) Noise & Vibrations

There will not be the generation of any undesirable noise and vibrations during operation phase of the project i.e. mining activities. Generally, the noise and vibrations are of relevance to operational activities only if their levels exceed the prescribed limits. The noise levels higher than a threshold can produce psychological and social impacts of distracted attention and irritation for workers. However, owing to non-cumulative property of sound and vibrations, the impacts are reversible and of significance only during continuation of the noisy activities. Cumulative effect of mining activities may produce considerable noise from activities like drilling, crushing and noise from vehicles of vehicles.

(e) Access to Health, Wellbeing and Worksite Safety

The environmental and social impacts pertaining to rights of access to health, community wellbeing and worksite safety will relate to the setting-up as well as to the design phase of the project.

A poorly planned mining can be troublesome for the users and the neighbouring communities. Haphazardly placed materials and debris on or near the site can cause

impedance of movement, risks of personal workers injury and inconvenience for the neighbours. Nonobservance of the worksite safety instructions and non-use of safety gadgets during installation operations can increase vulnerability of the exposed persons to adverse health and workers safety impacts.

Occupational health & safety for workers:

The workers in mine have high risk of the occupational diseases like coal workers Pneumoconiosis, due to inhalation of coal dust. Pneumoconiosis can cause severe lung problems and lung cancer, dust allergy and asthma, noise hazard such as temporary or permanent hearing loss, headache and high blood pressure.

Socioeconomic: Coal mining can affect communities at multiple levels. During mine's opening-Displacement, Loss of livelihood. During mine's operation-pollution impact (air, water, noise, vibration), Health impact.

Internal Mine fires:

An issue for not only the workers but also the people living in adjoining area is a major problem.

Activity

Mining operation

Likely impacts

Positive socio economic impacts. Source of livelihood for number of persons

Time of occurrence

Start of operation

Duration

Project life

Frequency

Frequent, Continuous, Project life

Category

+ve, Lifelong, Permanent, Beneficial

Area of Effect

Diffused

Effectuated person

Numerous

Mitigation

NA (+ve Activity)

Likely impacts

Likelihood of Accidental Personal Injury

Time of occurrence

Time of accident

Duration

Project life

Frequency

Infrequent, Incidental, Probable

Category

May be temporary or permanent, significant or Insignificant, minor or Major, and
Reversible or Irreversible

Area of Effect

Activity Spot & Around

Effectuated person

Site Workers, Staff, Labourers

Mitigation

Use PPEs, Put on Safety Measures, Display Safety Instruction Warning Boards, with SOPs. Keep First Aid Box Ready and handy.

(f) Cutting and Removal Trees and Crops

Mining operations will not involve any cutting and removal of any trees, whatsoever

Mine construction

Activity

Mine construction

Likely Impacts

NA no tree cutting involved

Time of Occurrence

NA

Duration of Impact

NA

Improbable Frequency of Probability of Occurrence

Improbable, unlikely

Category of Impact

NA

Area of Effect

NA

Exposed Persons

NA

Mitigation Measure (EMP)

NA

Likely Impacts

NA. No Crop removal involved

Time of Occurrence

NA

Duration of Impact

NA

Improbable Frequency of Probability of Occurrence

Improbable, unlikely

Category of Impact

NA

Area of Effect

N/A

Exposed Persons

N /A

Mitigation Measure (EMP)

NA

(g) Other Mining Activities

The project is designed for environmentally compatible mining for extraction of coal from its source i.e., coalmine. Some of these activities (e.g., loading of coal on carriage trucks) may result in flying off of fine coal particulate that might stay for some time in the local environment. However, owing to the fact

that there is not any human population in the vicinity site, there are not any impacts on the land use status of the site. The mined out coal is dispatched to the desired destinations through loader trucks, dumper trucks and carriage trailers. Essential equipment for weighing, loading and unloading of the mined out coal has been setup. For the provision of first aid, an emergency management system is in place.

- **Likely Impacts**

As already discussed above under various topics

- **Activities Likely to Produce the Impacts**

As already discussed above under various headings

- **Mitigation Measures**

As already discussed above under various heads and subheading

(h) Extraction Operations

The mining for extraction are being done in strict accordance with the conditions of lease by Mines and Mineral Department, the best practices and under the supervision of the experienced supervisors. Arrangements have been put in place for handling any incidence of fire. Fire extinguishers have been placed at key points at site. This firefighting system is being kept always in a ready-to-use state.

- **Likely Impacts**

- As already discussed above under various sections

- **Activities Likely to Produce the Impacts**

- As already discussed above under various heading

- **Mitigation Measures**

- As already discussed above under various heads and subheads

(i) Transportation of Coal

The extracted coal is transported in the carriage trucks, dumpers and other suitable haulage vehicles to the desired destinations. The loading is through a properly designed loading and unloading mechanism with the help of workers.

- **Likely Impacts**

As already discussed above under various sections

- **Activities Likely to Produce the Impacts**

As already discussed above under various heads and subheads

- **Mitigation Measures**

As already discussed above under various headings

10.8 Environmental Impacts of Surface Mining

Surface coal mining operations require large areas of land to be temporarily disturbed creating a number of environmental challenges, including soil erosion, dust, noise, water pollution, and impacts on local biodiversity.

Dust levels can be controlled by spraying water on shingle roads, stockpiles and trolleys.

Noise can also be controlled through the careful selection of carriage vehicles and their maintenance and sound enclosures around machinery. Foliage planted in these buffer zones can reduce emitted noise levels while minimising the visual disturbance of mining operations on local neighbourhood.

10.9 Environmental Impacts of Underground Mining

In underground mines, the surface disturbance is less obvious, but the extent of possible subsidence can be very large. Methane generation and release can also be a problem under certain geological conditions. If groundwater systems are disturbed, the possibility of serious pollution from highly saline or highly acidic water exists. Impacts may continue long after mining ceases.

10.10 Environmental Impacts during Coal Transportation

Trucks, rail, ports and barges which are used to transport coal, may all affect air and water quality, in addition to the environmental health impacts from blowing coal dust and air pollution coming from the vehicles themselves. The environmental impact of coal transportation is moderate

Noise from jack hammering and dust from unloading coal trucks can also cause environmental problems.

10.11 Likelihood of Effects on Ecosystem

Coalmining can cause extensive degradation to natural ecosystems such as forests and can scar the landscape irreparably. Damage to humans, animals and plants,

occurs due to habitat destruction and environmental contamination disrupting ecosystems and endanger human health. Steps are taken in modern mining operations such as good planning and environmental management minimise the impact of mining on the environment and help to protect biodiversity. Clean coal technologies have been developed and are widely used to limit particulate emissions, waste from coal production, NO_x, SO_x and CO₂, limiting the negative effects of coal production and its use. Improvements in the efficiency of coal combustion for coal-fired power generation have already achieved significant reductions in CO₂ emissions.

10.12 Summary of Environmental Issues of Coalmining

The potential environmental effects due to coalmining and coal utilization can be summarised as follows:

- Dust, noise and vibration during extraction, loading and transportation of coal during mining
- Taking care of health and safety of workers.
- Mining operations rendering land unfit for other uses
- Release of major conventional air pollutants during coal combustion process (particulate matter, NO_x, SO₂, Hg and other toxic substances, CO₂ and CH₄)

10.13 Environmental Enhancement Measures

Aggressive tree plantation, development of grassy plots, lawns and greenbelts (when and where possible) as the prime measure for enhancing and improving the environmental ambience and aesthetics of the project premises

Table 10.1: Environmental and Social Impact Matrix (Unmitigated Impacts)

Environmental	Physical				Biologic	Social and Socioeconomic																		
Project Activities	Soil Erosion / Contamination	Surface Water Quality	Groundwater Quality	Air Quality	Natural Vegetation	Natural Fauna	Access and Easement	Noise and Vibrations	Agriculture / Farming	Livestock Grazing	safety and Hazards	Public infrastructure	esthetic Value	Wetlands Eco-system	Health and Wellbeing	Education / Learning	Gender Issues	Employment / Income	Community Empowerment	Price of Land	Community Participation	Archaeological Heritage	Cultural Issues	Impact on occupants
Site Selection	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	+1	+1	+1	0	N	N	N
Master	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	0	N	N	N
Construction	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	+2	+1	+1	+1	N	N	N
Operation	N	N	N	N	N	N	N	N	N	N	N	N	N	N	+2	+2	+1	+2	0	+1	+1	N	0	N

Key: 2= High Negative Impact, -1 = Low Negative Impact, 0= Insignificant / Negligible Impact, +1= Low Positive Impact, +2= High Positive Impact, N= No Impact

Table 10.2: Environmental and Social Impact Matrix (Mitigated & Residual Impacts)

Environmental	Physical				Biological		Social and Socioeconomic																	
Project Activities	Soil Erosion / Contamination	Surface Water Quality	Groundwater Quality	Air Quality	Natural Vegetation	Fauna	Access and Easement	Noise and Vibrations	Agriculture / Farming	Livestock Grazing	Safety and Hazards	Public Infrastructure	Aesthetic Value	Wetlands Eco-system	Health and Wellbeing	Education / Learning	Gender Grievance	Employment / Income	Community Empowerment	Price of Land	Community Participation	Archaeological Heritage	Cultural Issues	Impact on occupants
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	+1	+1	+1	0	N	N	N
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	+1	N	+1	0	N	N	N
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	+2	+1	+1	+1	N	N	N
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	+2	+2	+1	+2	+1	+1	+1	N	0

Key: 2= High Negative Impact, -1 = Low Negative Impact, 0= Insignificant / Negligible Impact, +1= Low Positive Impact, +2= High Positive Impact, N= No Impact

