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Sapphire Power Generation Ltd.

The Registrar
National Electric Power Regulatory Authority ("NEPRA")
NEPRA Tower, Attaturk Avenue (East)
Sector G-5/1, Islamabad.

Dated: May 05, 2021
Ref: SPGL/NEPRA/001

Subject: **Application for Modification in Generation License of Sapphire Power Generation Limited**

Dear Sir,

Sapphire Power Generation Limited (the "Company") was granted the Generation License No. IPG:/002/SGC 2001 on August 27, 2001 (the "Generation License") by NEPRA, under section 15 of Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 and subsequently approved Modification-I, II & III dated July 02, 2008, July 13, 2015 and November 28, 2016 respectively pursuant to Regulation 10(11) of the NEPRA Licensing (Application and Modification Procedure) Regulations, 1999.

That in accordance with Regulation 10 of the NEPRA Licensing (Application, Modification, Extension and Cancellation) Procedure Regulations, 2021, Application of Licensee Proposed Modification in the Generation License is being submitted.

I hereby certify that the documents-in-support attached with this application are prepared and submitted in conformity with the provisions of the National Electric Power Regulatory Authority Licensing (Application, Modification, Extension and Cancellation) Procedure Regulations, 2021, and undertake to abide by the terms and provisions of the above-said regulations. I further undertake and confirm that the information provided in the attached documents-in-support is true and correct to the best of my knowledge and no material omission has been made.

A Pay order in sum of Rs /- 690,000/- (Six Hundred and Ninety Thousand Only) net of Tax [as per new regulations schedule II], license application fee calculated in accordance with Schedule-II to the National Electric Power Regulatory Authority Licensing (Application, Modification, Extension and Cancellation) Procedure Regulations, 2021, is attached herewith.

The Application is filed in triplicate with all annexures appended with each set.

Yours sincerely,

For and on behalf of Sapphire Electric Company Limited

SAPPHIRE POWER GENERATION LTD.

Faisal Zia Siddiqui
Business Head Energy Projects

SAPPHIRE POWER GENERATION LIMITED
201, Cotton Exchange Bldg., I.I.Chundrigar Road, Karachi
Pakistan. Tel : (92 021) 32410930, Fax: (92 021) 32416705
E-mail : contact@sapphiretextiles.com.pk
7-A/K, Main Boulevard, Gulberg-II, Lahore – Pakistan.
Tel : (92 042) 35750410 – 11, UAN : (92 042) 111-000-100
Fax : (92 042) 35713753, E-mail: info@sapphire.com.pk

EXTRACT OF RESOLUTION PASSED BY THE BOARD OF DIRECTORS OF SAPPHIRE POWER GENERATION LIMITED IN ITS MEETING HELD ON APRIL 13, 2021. AT OFFICE OF THE COMPANY SITUATED AT 7-A/K, MAIN BOULEVARD, GULBERG-II, LAHORE.

RESOLVED that a License Proposed Modification Application (the "LPM Application") may be instituted in respect of the Generation License issued by NEPRA No. IPGL/002/SGC/2001 dated August 27, 2001 and subsequent modification dated July 02, 2008, July 13, 2015 and November 28, 2016 respectively on behalf of Sapphire Power Generation Limited (the "Company") with the National Electric Power Regulatory Authority ("NEPRA"), in respect of the Company's power project.

RESOLVED FURTHER that Mr. Faisal Zia Siddiqui the Business Head Energy Projects of the Company bearing CNIC No. 34101-2489463-7, is hereby authorized to sign the LPM Application, and any documentation ancillary thereto, pay all filing fees, and provide any information required by NEPRA in respect of the Project, and do all acts and things necessary for the processing, completion and finalization of the LPM Application.

CERTIFIED TRUE COPY

SECRETARY

SAPPHIRE POWER GENERATION LTD.

AJ513886

100 Rupees

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CHAUDHARY ASHRAF ADVOCATE
OATH COMMISSIONER Lahore

AFFIDAVIT

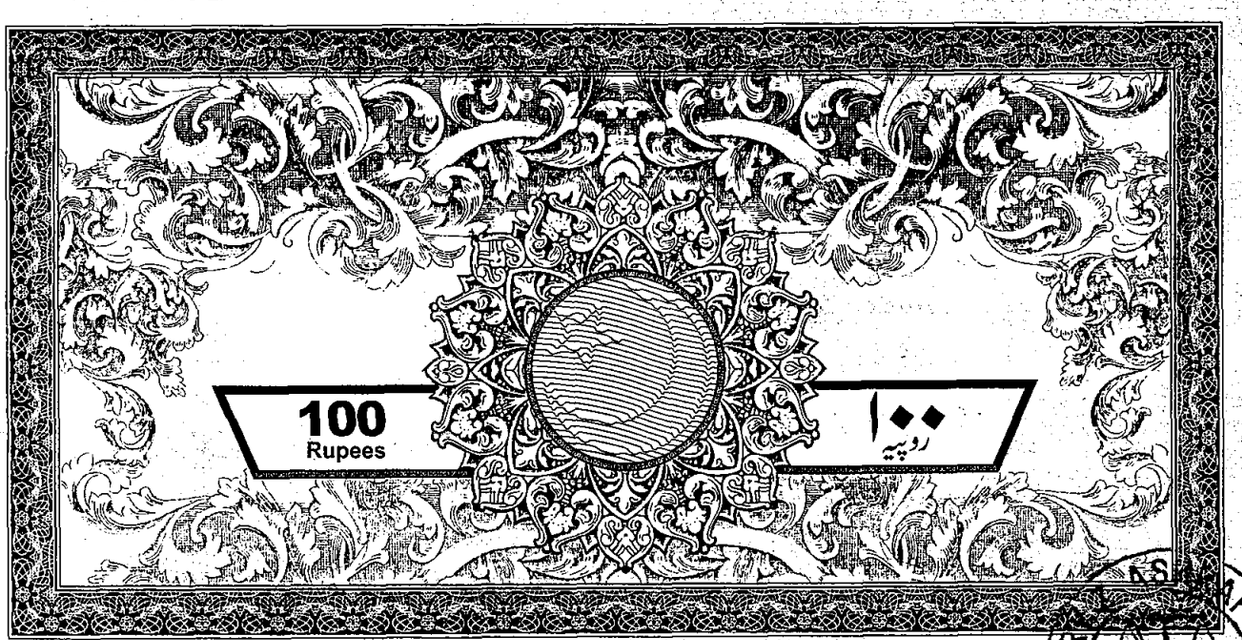
I, Faisal Zia Siddiqui, CNIC No. 34101-2489463-7, Business Head Energy Projects, Sapphire Power Generation Limited-, hereby solemnly affirm and declare on oath that the contents of the accompanying application of Sapphire Power Generation Limited for the modification of its Generation License No. 002/SGC/2001 dated May 05, 2021 and subsequent modifications, including all attached documents-in-support are true and correct to the best of my knowledge and belief and that nothing has been concealed.

Deponent

Name: Faisal Zia Siddiqui
Date: May 5, 2021

ATTESTED
Chaudhary Z. Ashraf Advocate
Oath Commissioner Lahore

F089492



CHAUDHARY Z. ASHRAF ADVOCATE
OATH COMMISSIONER Lahore

AFFIDAVIT

I, Faisal Zia Siddiqui, CNIC No. 34101-2489463-7, Business Head Energy Projects, Sapphire Power Generation, being the authorized representative through the Board Resolution, hereby solemnly affirm and declare that this Company has not been issued any other License other than the Generation License No. 002/SGC/2001

Deponent

Name: Faisal Zia Siddiqui

Date: May 5, 2021

ATTESTED
Chaudhary Z. Ashraf Advocate
Oath Commissioner Lahore

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Sapphire Power Generation Ltd.

The Registrar
National Electric Power Regulatory Authority ("NEPRA")
NEPRA Tower, Attaturk Avenue (East)
Sector G-5/1, Islamabad.

Subject: **Authorization Statement**

Sapphire Power Generation Limited (the "Company") has been granted the Generation License No. IPG:/002/SGC 2001 on August 27, 2001 (the "Generation License") by NEPRA, under section 15 of Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 and subsequently approved Modification-I, II & III dated July 02, 2008, July 13, 2015 and November 28, 2016 respectively pursuant to Regulation 10(11) of the NEPRA Licensing (Application and Modification Procedure) Regulations, 1999.

No license application of the Company has been refused by NEPRA.

For and on behalf of Sapphire Electric Company Limited

Faisal Zia Siddiqui
Business Head Energy Projects

SAPPHIRE POWER GENERATION LTD.

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Sapphire Power Generation Ltd.

LICENSEE PROPOSED MODIFICATION APPLICATION

1. Background

Sapphire Power Generation Limited {the "Company") was incorporated in Pakistan on September 15, 1993 as a Public company limited by shares under the Companies Ordinance, 1984 (Replead with enactment of the Companies Act 2017 on May 30, 2017). The Registered Office of the Company is Situated at 201, Cotton Exchange Building, I.I Chundrigar Road, Karachi. The Company was granted the Generation License No. IPGL/002/SGC 2001 on August 27, 2001 (the "Generation License') by NEPRA, under Section 15 of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 ("NEPRA Act"), for its power project (the "Project") and subsequent modifications (issued on July 02, 2008 on July 13, 2015 and November 28, 2016) pursuant to Regulation 10 (11) of the NEPRA Licensing (Application and Modification Procedure) Regulation 1999.

The Company have two Generation facilities with total capacity of 56.80 MW (I) Power Plant-1 Located at 1- Km Warburton Road Feroze Wattwan District Sheikhpura having Gross Capacity of 52.2 MW and (II) Power Plant II, Gross capacity of 4.60 MW Located at 64 Km Multan Road, Jamalabad Jumber Khurd, District Kasur.

Plants	Plant Size (MW)	Type of Technology	Number of Units	Unit Size (MW)
Plant 1	25.6	Diesel Engine	4	6.4
	21.2	Diesel Engine	4	5.3
	5.4	Gas Engine	2	2.7
Plant 2	4.6	Diesel Engine	2	2.3
Total	56.80			

Further to above the Company have 9 Bulk Power Consumers (BPCs) under a Second Tier Supply approved by the Authority as stipulated in Section 21 & 22 of NEPRA ACT and Rule 7 of the NEPRA licensing (Generation) Rules 2000.

2. License Proposed Modification

Regulation 10 of the NEPRA Licensing (Application, Modification, Extension and Cancellation) Procedure Regulations, 2021 states that:

"A licensee may, at any time during the term of a license, communicate to the Authority a Licensee Proposed Modification setting out the -

a. *type or category of license proposed to be modified;*
b. *the text of the proposed modification;*
c. *reasons in support of the modification; and*
d. *the impact, if any, of the proposed modification on tariff, quality of service or fulfillment of license obligations."*

2.1 Type or Category of License

The type or category of license remains the same. New generation facility is based on coal as fuel.

2.1 Text of Proposed Modification

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Sapphire Power Generation Ltd.

A. Addition of Generation Facility

Installation of 34 MW coal fired power plant located at Bilot village, Dera Ismail Khan, Khyber Pakhtunkhwa. The power plant will supply electricity to Bulk Power Consumer i.e. cement manufacturing plant "Premier Cement Limited" , project of sapphire group.

Gross Installed Capacity	34 MW
De-rated Capacity	34 MW
Auxiliary Consumption	3.45 MW
Net Capacity	30.55 MW

BPC "Premier Cement Limited" to be added.

B. Discontinuation of Generation Facilities

The Company have following proposed modification for reduction in existing capacity of Generation facilities of Sapphire Power Generation Limited. Total Capacity of 31.2 MW is to discontinue. From Plant 1, Unit of 21.2 MW (4 * 5.3) and Plant 2 4.6 MW (2*2.3)

Plants	Size (MW)	Type of Technology	Number of Units	Unit Size (MW)	Unit Make and Model	Date of Commissioning	Status
Plant 1	25.6	Diesel Engine	4	6.4	Wartsila 18 V32 NL	2015	Active
	21.2	Diesel Engine	4	5.3	Niigata/16V32 CLX	3 Engine 1995 & I Engine 1998	Capacity to be Reduced
	5.4	Gas Engine	2	2.7	GE Jenbacher JGS/620GS	2008	Capacity to be Reduced
Plant 2	4.6	Diesel Engine	2	2.3	Niigata 6L/34HX	1996	Capacity to be Reduced

Further to above the BPCs reduced their load and start purchasing electricity from the distribution Companies.

	Consumer	Existing Capcity (KW)	Proposed Capacity (KW)	Load Factor
Plant 1	Reliance Cotton Spinning Mills	4800	2,400	Variable
	Sapphire Textile Mills -5	7500	3,800	do
	Sapphire Fibers Ltd -3	6500	3,400	do
	Ali Akbar Spinning Mills	1300	600	do
	Sapphire Textile Mills-6	7500	3,800	do
	Diamond Fabrics Ltd	10000	5,200	do
	Sapphire Fibers Ltd - Knitting	600	300	do

	Consumer	Existing Capcity (KW)	Capacity (KW)	Load Factor
Plant 2	Sapphire Textile Mills - 4	2000	-	Variable
	Sapphire Fibers Ltd - Knitting	2500	-	do

SAPPHIRE POWER GENERATION LTD.

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2.2 Reason in Support of Modification

A. Addition of Generation Facility

In order to discharge its contractual obligations under the bilateral agreements with the companies the Company is required to obtain and maintain a generation license from NEPRA, The Sapphire Group going to start its Cement Project "**Premier Cement Limited**" for which Company adding to Generation Facility the 34 MW Coal Fired Power Plant which is envisioned to meet power requirement of Premier Cement Limited (8,500 tpd capacity), a milestone project located near Bilot village, Dera Ismail Khan, in the province of KP. The Project would provide affordable uninterrupted power supply to cement manufacturing plant. The power plant will supply cheaper electricity to the cement plant thus reducing the overall cost.

B. Discontinuation of Generation Facility

The Company discontinue the production from current HSD generation facility of plant as these were not compatible with the LESCO unit rate due to the increase in fuel cost. Further, Company also not able to generate through its Gas Engines due to shortage of gas supplies under the Government policy. Hence company by reducing its Capacity by 31.1 MW against Authority approval dated November 28, 2016

2.3 The Impact, if any, of the proposed modification on Tariff, Quality of Service or Fulfillment of License Obligations

2.3.1 Impact on Tariff

It is pertinent to mention that the proposed amendments do not impact the tariff in any manner rather it will enable the Company to generate and supply the cheap electricity through coal to its bulk power consumers. Tariff between SPGL and its BPC(s) is a Bi-lateral arrangement without affecting the third party.

2.3.2 Impact on Services and Performance

The Company certify that the quality of service and performance of the company under the license shall not be affected on acceptance by NEPRA of this LPM. The Company undertake to abide all obligations under the license.

3. Prayer

In light of the submissions set out herein and the information attached (together with the Annexures), the Application for Modification in Generation License is submitted for NEPRA's approval of the proposed modifications in the Generation License.

The Company hereby requests NEPRA to approve the proposed modification in the Generation License as such modification would allow the Company to proceed further with the development of the Project.

Appendices:

Appendix-I: Draft Schedule I
Appendix-II: Draft Schedule-II

SAPPHIRE POWER GENERATION LTD.

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Sapphire Power Generation Ltd.

For and on behalf of Sapphire Electric Company Limited

SAPPHIRE POWER GENERATION LTD.

Faisal Zia Siddiqui
Business Head Energy Project

Modification to Schedule -1 of the Licence No. 002/SGV/2001

The Modification made to Schedule -1 of the Original Licence No. 002/SGC/2001 is as follow

A) **Plant Configuration**

The Proposed and pervious details about the plant configuration given at the item 5a,5b, 5c,5d, 5e and 5f for the Plant are hereby replaced in its entirety with the following.

	5a	5b	5c	5d		5e	5f
Plants	Plant Size (MW)	Type of Technology	Number of Units	Unit Size (MW)	Unit Make and Model	Date of Commissioning	Status
Plant 1	25.6	Diesel Engine	4	6.4	Wartsila 18 V32 NL	2015	Active
	21.2	Diesel Engine	4	5.3	Niigata/16V32 CLX	3 Engine 1995 & I Engine 1998	Capacity to be Reduced
	5.4	Gas Engine	2	2.7	GE Jenbacher JGS/620GS	2008	Capacity to be Reduced
Plant 2	4.6	Diesel Engine	2	2.3	Niigata 6L/34HX	1996	Capacity to be Reduced
Plant 3	34	Pulverized Coal based power plant	1	34	Sinoma Energy Conservation Ltd/ Shanghai Triumph Energy Conservation Engineering Co. Ltd.	To be Commissioned	To be Commissioned

B) FUEL DETAILS

		Diesel engines	Coal Plant / Plant 3
6a	Fuel Type	HFO	Imported Coal
6b	Fuel (Imported/indigenous)	imported /indigenous	Imported
6c	Fuel suppliers	Shell/PSO/Total Parco/Other OMC	Imported from Malysia,South Africa and Other Countries.
6d	Supply Arrangement	Road /Tankers	Through Sea/Trucks/Trains
6e	No of Tanks	2	Nil
6f	Storage Capacity/Tank	2000 Metric Tons	Nil
6g	Gross Storage	2000 Metric tons	Nil

C) **PLANT CAPACITY**

The detail of Plant capacity given at Item 9, 10 for the Plants are hereby replaced in its entirety with following

		Plant 1 (MW)	Plant 2 (MW)	Plant 3 (MW)		Total	Remarks
9	Installed Capacity	25.6	0	34		59.6	Plant 3 to be commissioned
10	Derated Capacity	20.5	0	34		54.5	Plant 3 to be commissioned

D) ANCILLARY SERVICE

The information about Spinning Reserve given at the Item 13b for plants are hereby replaced in its entirety with following:-

		Plant 1 (MW)	Plant 2 (MW)	Plant 3 (MW)		Total	Remarks
13.b	Spinning Reserve Service	-	-	-		-	Plant 3 to be commissioned

SAPPHIRE POWER GENERATION LTD.

E) **PROJECT COST**

The detail of the equity and debt against the Project Cost given at Item 14 a, 14 b, and 14 c are hereby replaced in its entirety with the Following:-

		%	Plant III Amount in USD (Million)
14 a	Financed Through Equity	100%	27.2
	Plant and Equipment		24.48
	Civil Cost		2.72
14 c	Total Project Cost		27.2

F) AUXILIARY CONSUMPTION

The detail given at item 15 g for the plants are hereby replaced in its entirety with the following

		Plant 1 (MW)	Plant 2 (MW)	Plant 3 (MW)	Total	
15g	Auxiliary Consumption	0.82	0	3.4	4.22	Plant 3 to be commissioned

PART A

The Networks Facts given at Item b and c of Part A of the Schedule 1 are hereby replaced in its entirety with the following

		Plant 1		Plant 3
B	Length of Each Feeder (KM)	Feeder 1	175 Meters	Plant will be located in the vicinity of Premier Cement Limited
		Feeder 2	300 Meters	
		Feeder 4	3600 Meters	
		Feeder 5	2050 Meters	
		Feeder 6	440 Meters	
			4150 Meters	
		Feeder 9	120 Meters	

		Plant 1			Plant 3
		Feeders	Consumer	Length (Meters)	Consumer (Premier Cement)
C	Length of Each Feeder to each Consumer	Feeder 1	Reliance Cotton Spinning Mills	175	Plant will be located in the vicinity of Premier Cement Limited
		Feeder 2	Sapphire Textile Mills -5	300	
		Feeder 4	Sapphire Fibers Ltd -3	3600	
		Feeder 5	Ali Akbar Spinning Mills	2050	
		Feeder 6	Sapphire Textile Mills-6	440	
			Diamond Fabrics Ltd	4150	
		Feeder 9	Sapphire Fibers Ltd - Knitting	120	

PART -B

		Plant 1		Plant -3		Total
A	No. of Consumer	7		1		8
B	Location of Consumer (Distance and/or identity of premises)	1	Reliance Cotton Spinning Mills, 1 KM Warburton road, Feroze Wattoan Sheikhupura		Adjacent to Premier Cement Limited site (in Bilot village in Dera Ismail Khan district in the province of KP)	
		2	Sapphire Textile Mills-5 5.1 KM Warburton road, Feroze Wattoan, Sheikhupura			
		3	Sapphire Fibers Ltd -3 26 KM Faisalabad Road Sheikhupura			
		4	Ali Akbar Spinning Mills , 22 KM Faisalabad road, Sheikhupura			
		5	Sapphire Textile Mills-6, 1.5 km Warburton Road , Feroze Wattoan, Sheikhupura			
		6	Diamond Fabrics Ltd, 26 KM Faisalabad Road Sheikhupura			
		7	Sapphire Fibers Ltd - Knitting, 1 Km Warburton Road, Feroze Wattoan, Sheikhupura			

SAPPHIRE POWER GENERATION LTD.

		Plant 1			Plant 2		
		Consumer	Capacity (KW)	Load Factor	Consumer	Capacity (KW)	Load Factor
C	Contracted Capcity and Load Factor for Consumer	Reliance Cotton Spinning Mills	2,400	Variable	Premier Cement Limited	34,000	Variable
		Sapphire Textile Mills -5	3,800	do			
		Sapphire Fibers Ltd -3	3,400	do			
		Ali Akbar Spinning Mills	600	do			
		Sapphire Textile Mills-6	3,800	do			
		Diamond Fabrics Ltd	5,200	do			
		Sapphire Fibers Ltd - Knitting	300	do			

D. Specify Whether

		Consumer	Associate Undertaking of SPP	% age ownership equity
i)	The Consumer is an Associate undertaking of the SPP- if Yes, specify percentage ownership of equity	Reliance Cotton Spinning Mills	Yes	3.46%
		Sapphire Textile Mills -5	do	26.43%
		Sapphire Fibers Ltd -3	do	17.63%
		Ali Akbar Spinning Mills	No	do
		Sapphire Textile Mills-6	do	26.43%
		Diamond Fabrics Ltd	do	20.28%
		Sapphire Fibers Ltd -Knitting	do	17.63%
		Premier Cement Limited	No	do

		Consumer	Common Directorship (Yes/No)
ii)	There are Common Directorship	Reliance Cotton Spinning Mills	Yes
		Sapphire Textile Mills -5	Yes
		Sapphire Fibers Ltd -3	Yes
		Ali Akbar Spinning Mills	No
		Sapphire Textile Mills-6	Yes
		Diamond Fabrics Ltd	Yes
		Sapphire Fibers Ltd -Knitting	Yes
		Premier Cement Limited	Yes

		Consumer	Common Directorship (Yes/No)
iii)	Either can Exercise influence or control over the others	Reliance Cotton Spinning Mills	No
		Sapphire Textile Mills -5	do
		Sapphire Fibers Ltd -3	do
		Ali Akbar Spinning Mills	do
		Sapphire Textile Mills-6	do
		Diamond Fabrics Ltd	do
		Sapphire Fibers Ltd -Knitting	do
		Premier Cement Limited	do

Nature of Contractual Relationship

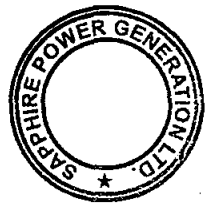
		Consumer	Common Directorship (Yes/No)
i)	Relationship between each consumer and SPP	Reliance Cotton Spinning Mills	Firm Supply of electricity to consumer as and when required
		Sapphire Textile Mills -5	do
		Sapphire Fibres Ltd -3	do
		Ali Akbar Spinning Mills	do
		Sapphire Textile Mills-6	do
		Diamond Fabrics Ltd	do
		Sapphire Fibres Ltd -Knitting	do
		Premier Cement Limited	do

		Consumer	Relation with host Disco
ii)	Consumer and Host DISCO	Reliance Cotton Spinning Mills	Yes
		Sapphire Textile Mills -5	Yes
		Sapphire Fibres Ltd -3	Yes
		Ali Akbar Spinning Mills	Yes
		Sapphire Textile Mills-6	Yes
		Diamond Fabrics Ltd	Yes
		Sapphire Fibres Ltd -Knitting	Yes
		Premier Cement Limited	No

Modification to Schedule -II of the Licence No. 002/SGC/2001

The Schedule II of the Licence No. 002/SGC/2001 is hereby replaced in its entirety with the Following

	Plant-1	Plant III	Total
	(MW)	(MW)	(MW)
Gross Installed Capacity	25.6	34	59.6
De-rated Capacity	20.5	34	54.5
Auxillary Consumption	0.82	3.45	4.27
Net Capacity of the Plant	19.68	30.55	50.23



GENERATION FACILITY DETAILS

34 MW COAL POWER PLANT

1. **The Applicant**

Company Name:	M/S Sapphire Power Generation Limited
Contact Details:	Faisal Zia Siddiqui
	7-AK, Main boulevard Gulberg-II, Lahore, Pakistan
	fzsiddiqui@secl.pk
Project:	34MW Coal Power Plant located at Bilot Village, Dera Ismail Khan

2. **Salient Features of Project**

The Generation Facility of 34 MW Captive Power Plant is based on imported Coal having one generating unit.

Installed Capacity:	34 MW
Auxiliary Consumption:	10.14%
Net Capacity:	30.55 MW
Boiler:	120 TPH PC Boiler
Potential Buyer:	Premier Cement Limited

3. **Proposed Investment**

The total Project Cost is USD 24 Million. The project cost would be financed by 100% equity. The Letter of Support for equity injection from Sapphire Fibers (shareholder in Sapphire Power Generation Limited) is provided with the Application.

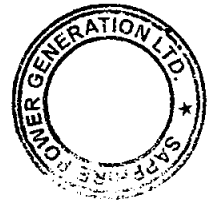
4. **Project Schedule and Expected Life**

The project will be developed as a Captive Power Plant. The project would take around 18 months to complete. Economic life of the plant is 30 years.

5. **Social and Environmental Impact of the Project**

The Environmental Study of the Project has been conducted by the renowned Consultant that has been submitted to Environmental Protection Agency and expected to be approved shortly.

The consultants reported that project has no major adverse impacts, and all impacts could easily be mitigated.



TECHNICAL INFORMATION AS PER REGULATIONS

1. Location

The project is located within the boundaries of Cement Plant, at Bilout Village, Dera Ismail Khan, Khyber Pakhtunkhwa.

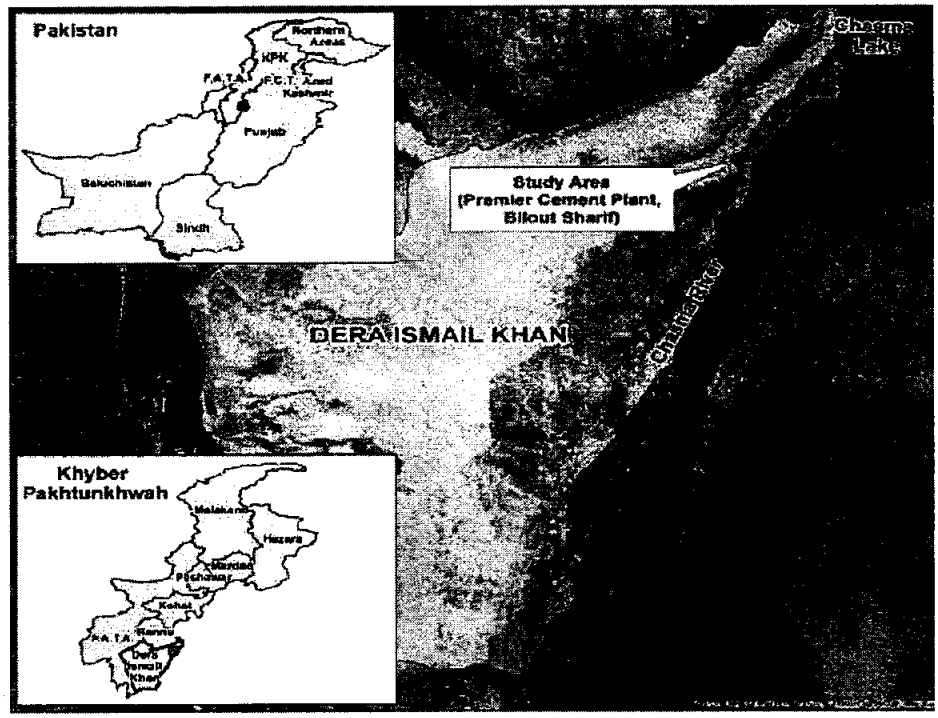
Coordinates of Power Plant and Cement Factor are provided below:

CFPP Co-Ordinates:

Latitude	32.245913°	Longitude	71.146877°
Latitude	32.246969°	Longitude	71.146770°
Latitude	32.247487°	Longitude	71.150367°
Latitude	32.246693°	Longitude	71.150622°

Cement Plant Co-ordinates:

Latitude	32.239999°	Longitude	71.143075°
Latitude	32.245987°	Longitude	71.142086°
Latitude	32.248897°	Longitude	71.155771°
Latitude	32.242922°	Longitude	71.156811°



2. Plant Type

The plant would be Pulverized Coal Fired Power Plant using imported coal for power generation.

3. Capacity & Efficiencies

Installed capacity (34 MW), auxiliary consumption (3.45 MW), Net capacity (30.55 MW)

Designed Efficiency of Plant : 34%

Gross Efficiency of Plant at mean site conditions : 31.25%

Net Efficiency of Plant at mean site conditions : 28.5%

SAPPHIRE POWER GENERATION LTD.

4. Fuel

Imported Coal would be used as primary fuel. Coal with calorific value of minimum 6,000 Kcal would be imported primarily from South Africa via ship and transported to site through roads network through trucks.

5. Emission Values

The emission values will be maintained as per SEQS / NEQS.

Emission of SOx, NOx, CO and PM would be controlled through Pollution Control Equipment. Their levels would be measured in Stacks, Boiler and generator. Monitoring frequency would be quarterly to ensure these are within NEQS. If all redundant pollution control systems fail, the plant would be shutdown immediately until resolution of problem.

Top layer of coal piles would be kept moist while coal dust would be regularly monitored.

6. Cooling Water Source

Underground water.

7. Interconnection

The integration will be as follows:

- Integration of 6.3kV output of the coal plant with the centralized distribution switchgear.

8. ESSA

The Detailed environment and social impact assessment study has been conducted by a renowned environmental consultant.

- The IEE study has been conducted in-line with the EPA – KPK requirement
- The study after consultation with all stakeholders was submitted to EPA-KPK
- The proposed projects falls under Category B (Energy) of Schedule I
- The IEE study has been approved by KPK-EPA in March, 2021.

9. Safety Plans

- Fire detection and alarm system and evacuation system
- Emergency lighting
- Security surveillance through the power plant
- Access control system for physical and software access
- Central security control room

10. Plant Characteristics: generation voltage, frequency, power factor

Rated Gross Power	: 34 MW
Net Power	: 30.55 MW
Self-Consumption	: 3.45 MW (10.14%)
Allowable Frequency range	: 48 Hz – 52 Hz (±4%)
Rated Voltage	: 6.3 kV
Rated Power Factor	: 0.8
Rated Speed	: 3000 rpm

SAPPHIRE POWER GENERATION LTD.

Rated Efficiency	: 97.6%
Rated Current	: 3437 A
Short Circuit level of Electrical Equipment (Medium Voltage – 6.3kV)	50 KA / 3sec
Ramp up Time from Cold start	: 06 hours
Degradation	: 10 %

11. Control, metering, instrumentation and protection

The metering, instrumentation, control and protection will be installed that comply with the prudent electrical practices for captive generation facilities.

12. Training and development

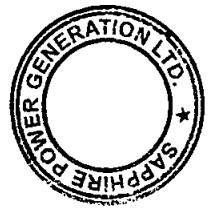
The Training and development and will be provided to the employees, workers. Training has been made part of the environmental report.

13. Project Consumers

Premier Cement Limited, (Project of Sapphire Group) will be the main consumer of the electricity.

Enclosed Documents:

1. Feasibility Study
2. Interconnection Arrangement
3. Environmental Study Report



Appendix I

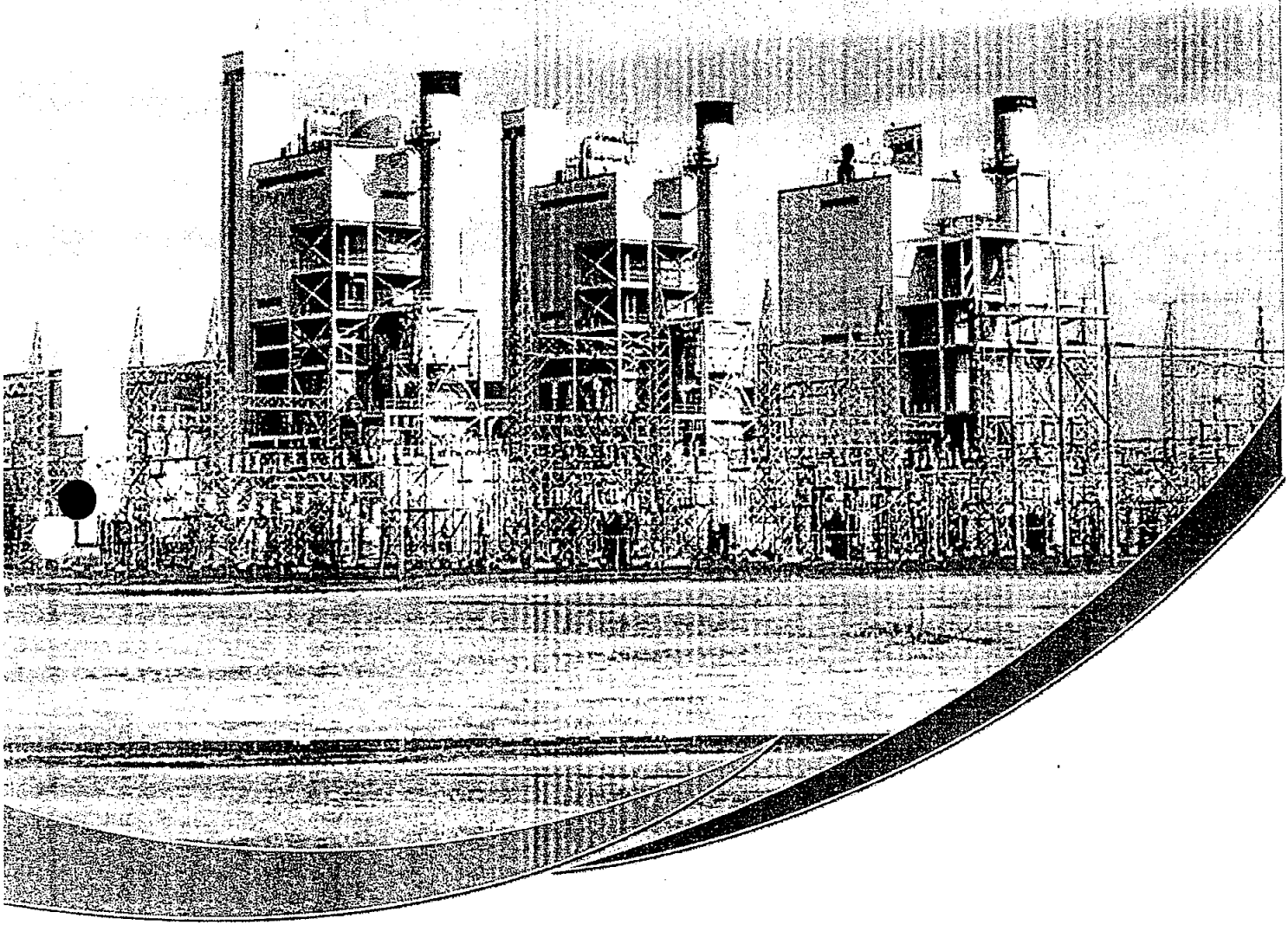
Environment Study Report

Sapphire

Premier Cement, Sapphire Group

INITIAL ENVIRONMENTAL EXAMINATION (IEE)

50MW Petroleum Coke/Coal Based and 40MW Tri-Fuel Engines Power Plant



GEMS

Global Environmental Management Services (Pvt) Ltd.

2nd Floor, Aiwan-e-Sanat, ST-4/2, Sector 23, Korangi Industrial Area, Karachi

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CHAPTER 8: ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

ES

EXECUTIVE SUMMARY

OVERVIEW

Project Title	Initial Environmental Examination of IEE of "50MW Petroleum Coke/Coal Based and 40 MW Tri-Fuel Engines Power
Location	Billout, Khyber Pakhtunkhwa, Chashma road
Project Proponent	Premier Cement, Sapphire Group.
Project Consultant	Global Environmental Management Services (Pvt) Ltd.(GEMS)

This report discusses the Initial Environmental Examination of proposed 50 MW Petroleum Coke/Coal Based Power Plant titled as "Premier Cement" a subsidiary of Sapphire Fibers Ltd. The report also analyzes the environmental and social impacts associated with the Power Plant of the proposed project and its surroundings, suggest realistic, time bound and applicable mitigation measures to reduce and manage the identified environmental and social impacts to ensure project sustainability during the entire life cycle of the proposed project.

PROPONENT'S PROFILE AND INTRODUCTION

Sapphire Group with investments of $1 Billion is a Pakistani industrial conglomerate largely focused on the textile industry. Based in Lahore, it is a vertically integrated textile group, manufacturing cotton yarn, fabric, and finished garments. Its products are exported to over 35 destinations around the globe. The Group has also diversified into the power generation and dairy sectors. Sapphire Electric Company is operating a 234 MW combined cycle plant in Muridke. Sapphire Dairies Private Limited operates a large mechanized dairy farm based on 100 acres of land near Manga, Lahore, with a herd size of 3000 and targeting 10,000 milking cows (300,000 liters per day) by 2020.

After achieving all milestones in different sectors of the industry, Sapphire is now entering into the cement industry. Sapphire is set to install a green field cement plant with a capacity of 8500 tons/day clinker in Bilot, Khyber Pakhtunkhwa under the name of "**Premier Cement**". Bilot is a small, under developed village situated in a remote area, 45kms from the city of Dera Ismail Khan on the main D.I Khan - Chashma road. Bilot is situated next to the Right Bank Chashma Canal and lies on the border of Punjab and Khyber Pakhtunkhwa. Moreover, Mines have already been acquired by Premier Cement

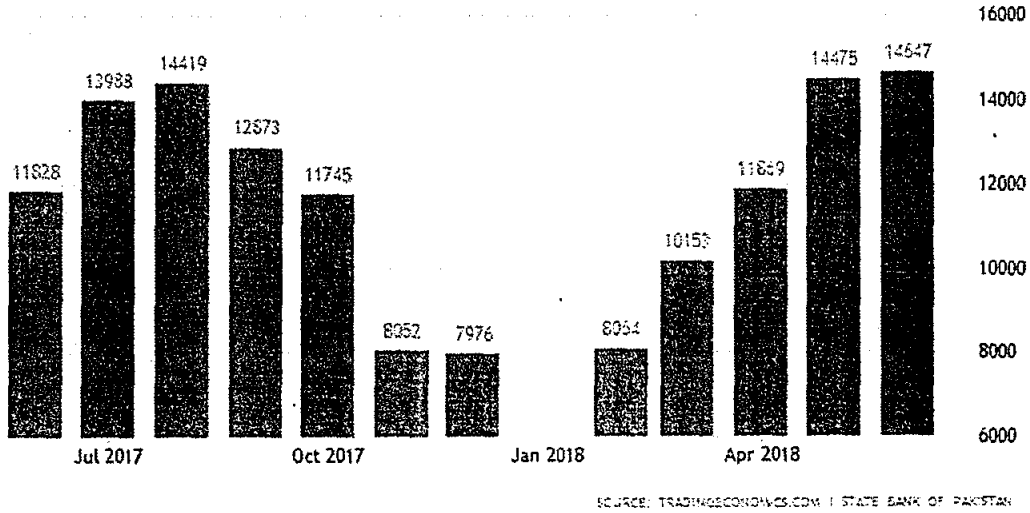
from the Government of Khyber Pakhtunkhwa and land for setting up Plant has also been acquired. This plant will be the only green field project announced in the country in 2017.

ENVIRONMENTAL CONSULTANT'S PROFILE AND INTRODUCTION

Global Environmental Management Services (Pvt.) Ltd. (GEMS) is an Environmental Consultancy which provides broad range of Environmental Solutions which are and not limited to Environmental Audits, Initial Environmental Examinations (IEE), Environmental and Social Impact Assessments (ESIA), Baseline studies and Training & Capacity building. GEMS is one of the few environmental firm having its own renowned ISO 17025 Certified Environmental Laboratory by the name of Global Environmental Laboratory (Pvt) Ltd.

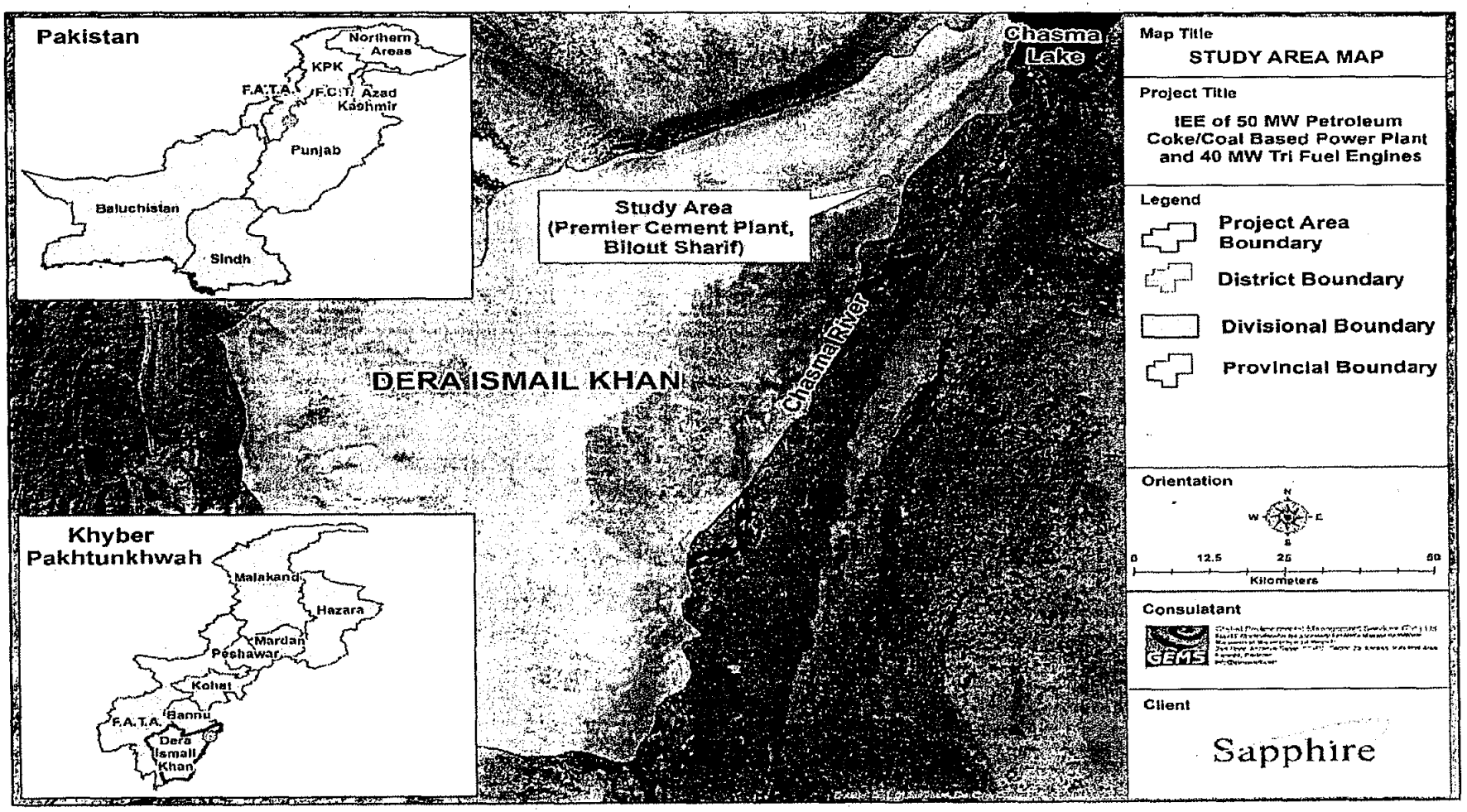
NEED AND IMPORTANCE OF THE PROJECT

Pakistan is among some countries which has a lot of potential to produce electricity. The country is geographically very rich in terms of various renewable resources which are low costing to produce electricity and at the same time more environment friendly. But still from last 15 years Pakistan has a series of bottlenecks in power sector and there is a shortfall because electricity demand is growing day by day and the resources to produce electricity are not used efficiently. At present Sapphire Group has initiated to install 50 MW Captive power plant to the existing location of Premier Cement at Bilout, Dera Ismail Khan to provide power to their cement/lime plants. Electricity Production in Pakistan increased to 14647 Gigawatt-hour in June from 14475 Gigawatt-hour in May of 2018. Electricity Production in Pakistan averaged 7986.80 Gigawatt-hour from 2003 until 2018, reaching an all-time high of 14647 Gigawatt-hour in June of 2018 and a record low of 4195 Gigawatt-hour in December of 2010. The below graph shows the detail demand and supply of electricity in Pakistan.



SOURCE: TRADINGECONOMICS.COM | STATE BANK OF PAKISTAN

Proposed Location Map of Power Plant



PROJECT DESCRIPTION

The proposed Power Plant project will require about 4 acre of land for construction/installation of 45 MW Coke/coal and 40 MW tri fuel engines having Boiler structure, Turbine, Generator, Control room building, Transformer yard, switch yard, coal/petroleum coke stock yard, ash pond and ash dyke, conveyor belt, greenbelts, roads, security post, FGD and ESP system, compressor house, fire station, laboratories, workshops, boundary wall.

LEGISLATIVE REQUIREMENT

The IEE of the proposed Project activity will be subjected to the pertinent legislative and regulatory requirements of the Government of KPK including State laws. Legislation presents a synopsis of environmental policies, legislation and other guidelines that have relevance to the proposed project.

The proposed project falls under the project **Category B "Energy"** of **Schedule I (IEE)** as per the guidelines issued by the PEPA under the Review of IEE and EIA Regulations, 2000. The 2000 Regulations were promulgated under PEPA 1997 were enforced on 15 June, 2000 PEPA ACT, 2014. According to these guidelines, project under this category require an IEE to be conducted at planning stage.

ENVIRONMENTAL AND SOCIOECONOMIC BASELINE:

The proposed project lies in the district Dera Ismail Khan, Khyber-Pakhtunkhwa Province, Pakistan. It is situated on the west bank of the Indus River, 200 miles (320 km) west of Lahore and 120 miles (190 km) northwest of Multan. District Dera Ismail Khan is a part of the Lower Indus basin and is composed of alluvial sediments derived from the Indus and its tributaries. Most of the area is a dry alluvial plain commonly referred to as "Daman". The only hills, within the district, are those of Khisore range which lies in the north– eastern part of the district. The climate of the district Dera Ismail Khan is dry and hot in summer season and mild in winter season. Temperature begins to rise in April and the months of May, June, July and August are extremely hot. The proposed project-site, may contribute to the gaseous emissions during constructional and operational phases, to assess the current conditions of the project site, air quality baseline parameters was monitored at this location continuously for 24 hours and the primary baseline data was compiled for baseline of the project surrounding.

Canal water and ground water was also collected and subjected to chemical analysis in the Global Environmental Lab (GEL) laboratory to examine the quality of surface water. The levels of air pollution within the project area was observed to be quite low and under the NEQS limits. One of the reasons for fresh air samples qualifying within the NEQS limits is less anthropogenic activity within close proximity of the project area.

The proposed project site is not located on any biologically sensitive area. As per data obtained from Wildlife departments located in Dera Ismail Khan, the proposed power Plant site does not have any sensitive species of Flora/Fauna. Based on information available in the EIA/IEE for projects in Dera Ismail Khan, and literature review, no threatened or endemic terrestrial plant species has been reported from the Study Area. In addition, their distribution is not limited to any specific site or

habitat type, and is widespread. None of the Faunal species has been reported from the Study Area as protected, threatened or included in the CITES appendices except the Indian Grey mongoose which is listed on CITES Appendix III by India.

In Dera Ismail Khan the major proportion of total population is self-employed, others are private employees and government employees. The major occupation in project area is agricultural farming, livestock rearing, small businesses and service in public and private sectors. Livestock breading is one of the main resource of livelihood of rural and urban population of the project area and serve as an important source of income, it is also a source of rural transport and draft power in agricultural farming. The proposed project is characterized by a very strong tribal bounds and very rich ethnic diversity and cultural heritage.

The people of the project area have adopted a mix lifestyle. Saraiki is the native language of Dera Ismail Khan, but Pashto and Hindko are also spoken fluently. Officially Urdu and English both are used. The area is the confluence of Pashtun and Balochi tribes. In Dera Ismail Khan, festivals are celebrated with full zeal and zest. Both EIDS are greeted with full religious fervor and people visit their relatives and neighbors after the 'Eid' prayers. 'Urs' of saints is also an important festival celebrated by people of the area.

ENVIRONMENTAL IMPACT AND MITIGATIONS

The mitigations for the impacts identified and monitoring requirements are summarized in the Environmental Management and Monitoring Plan (EMMP) for the proposed Power Plant.

Environmental Management Plan

Activities	Impact	Mitigation Safeguards	Monitoring Parameter	Monitoring Location	Monitoring Frequency	Monitoring Responsibility
Construction Phase						
Topography & Land-Use Patterns	Accidental spillage of oils, lubricants, paints and leachate discharge from concreate mixing may impact the soil as well as aquatic life. Soil erosion Micro topographical change	- Proper site leveling should be ensured. - The construction activities will be planned to minimize disturbances to soil as well as surface water quality of the proposed location. - Leachate of any material such as leachate from concrete mixing should be prevented from mixing to the soil and the water bodies. - Regular inspections will be carried out to detect leakages in construction vehicles, equipment. - Ensure that lubricants and oils will be stored properly, having impermeable floors to reduce the probability of leaching of these lubricants into the soil.	Surface topography	Project site	Monthly	Premier Cement /Contractor
Site Aesthetics	scattered waste may result leachates which will produce nuisance	- Construction material and solid waste should be stored at a separate designated storage area.	Housekeeping and waste management practices	Project site	Continuous	Premier Cement /Contractor

Activities	Impact	Mitigation Safeguards	Monitoring Parameter	Monitoring Location	Monitoring Frequency	Monitoring Responsibility
	and ground water contamination	- The dragged or excavated material should be reused in backfilling . - Construction waste and residue will be stored at a designated area till its final disposal. Residual waste from construction will not be allowed to be disposed at open land and outside the storage area. - Strictly prohibited to dump any type of waste at site or its surrounding during construction and as well in operational phase of the proposed project. - Proper site specific housekeeping is to be ensured during project activities of construction phase. - Proper site-specific housekeeping is to be ensured during operational activities.				
Ecology	Unorganized and un planned operation activities might resulted: - Ecological disturbance - Habitat loss	- Plantation and green belt should be developed in order to rehabilitate native plants. - Unnecessary cutting of tress should be restricted - The environment and natural beauty of hills should be preserved.	- Green area - Reptile habitat	Project site	As and When Required	Premier Cement /contractor

Activities	Impact	Mitigation Safeguards	Monitoring Parameter	Monitoring Location	Monitoring Frequency	Monitoring Responsibility
Air Quality	Impairment of ambient air quality from coal power plant emissions. Upper respiratory diseases and other health impacts due to air emissions and dust dispersion. Flue gas emission by generators machineries and vehicle on the Project site.	- Ensure use of standard, maintained and certified equipment and vehicles. - Dust abatement technique on unpaved, vegetated surfaces to minimize dust. - Air emission devices should be installed, training should be provided to workers periodically to reduce the dust emission and safe work. - Construction vehicles and machinery should be well maintained and tuned in order to control emission of CO2, SOX and NOX. - Toned certified standard and low emission transport and machinery will be preferred - All the dusty material should be sprayed with water prior to loading unloading and transfer to control. - Water sprinkling should be done where necessary to contain dust emission. - Dust respirator should be provided to workmen.	NOx SOx PM_{10} $PM_{2.5}$ CO	Project site	Quarterly	Premier Cement /Contractor

Activities	Impact	Mitigation Safeguards	Monitoring Parameter	Monitoring Location	Monitoring Frequency	Monitoring Responsibility
		- Covering of material during transportation. - Monitoring of gaseous emission of vehicles and ambient air should be done as per prescribed NEQS in law.				
Noise Levels	Un-tuned and noisy construction equipment along with construction activities like hammering, piling and plugging etc. may result in following impacts: - Headaches - Hearing problems - Hear loss - Accumulation of stress hormones - Hypertension	- Worker should be provided with proper PPE's i.e proper Ear plug or Ear muffs - Noise abating devices should be installed - Noise monitoring should be done as prescribe in EPA law. - Construction equipment/ machineries will be provided with suitable silencers. - Workers working at project site will be provided with ear muffs and ear plugs during working hours.	Noise levels	Project site	Quarterly	Premier Cement /Contractor
water Quality	Oil, lubricants and chemical spillage from construction equipment as well as	- Safe and hygienic drinking water should be provided to worker	pH Temperature Turbidity	Groundwater source	Quarterly	Premier Cement /Contractor

Activities	Impact	Mitigation Safeguards	Monitoring Parameter	Monitoring Location	Monitoring Frequency	Monitoring Responsibility
	solid waste disposal into open ground may result in ground water contamination.	- Ensure strict implementation of spill prevention and control plan in order to prevention ground water contamination.	Oil & Grease TDS TSS Sulphide Phenolic Compounds Total Metals	Surface water source Oil/Chemical storage and usage areas		
Health & Safety	Access of un-authorized and un-skilled personnel at project site might cause harm to themselves and others Lack of awareness among general laborers about safety may lead to accidents Un organized Construction works may increase risks and hazards that may lead to severe injuries	- Implementation of all the relevant health and safety guidelines such as, OSHA and other health and safety standards to be implemented according to project operation. - First aid facility should be provided at work site. - Emergency response plan should be developed and implemented. - Periodically training should be provided to worker regarding emergency response, emergency fire drill and first aid. - Proper safety sign and symbols should be placed	HSE inspections reports Risk assessment reports Record of PPEs Work permits Severe injuries and hazards Safe man hours	Project site	Monthly	Premier Cement /Contractor

Activities	Impact	Mitigation Safeguards	Monitoring Parameter	Monitoring Location	Monitoring Frequency	Monitoring Responsibility
		- Do not placed any flammable or hazardous substance with explosive material - Before any activity notice the worker by loudspeaker - SOPs must be developed for process with special consideration of health and safety protocols - Trained personnel will be appointed for the specific work - Unauthorized personnel will not be allowed to access the project site without permission and safety permits. - Appropriate PPEs must be used for technical work.				
Social Environment	Conflicts between laborers/project developers and nearby communities	- Address concerns of neighboring land users as per this report. - Conflict resolution by taking the relevant concerns of communities into confidence by addressing their grievance and concerns by proper mitigations - Maintain complaint register to record the complains of people and nearby people;	Complaint register and Grievance Redress Mechanism (GRM) Local Consultations records	Project site	As and when required	Premier Cement /Contractor

Activities	Impact	Mitigation Safeguards	Monitoring Parameter	Monitoring Location	Monitoring Frequency	Monitoring Responsibility
Traffic	Irregular movement of construction vehicles may result in incident and may affect the patients and their attendant	- Traffic management plan should be devised for safe transport movement in the project site; - Use alternate routes for traffic to minimize the traffic congestion;	- Traffic - Vehicle movement	Project site	Daily	Premier Cement /Contractor
Biological Environment	Cutting of trees may resulted ecological disturbance and habitat loss	- Transfer the trees which is need to be cut during construction better transfer to safe green place or compensate the cut tree by the ratio of 1:10 for mature and 1:5 for immature. - Ensure that no extra trees are cut or cleared during construction or mobilization of machineries. - Green belt should be provided and maintained	No. of trees	Project site	Monthly	Premier Cement /Contractor
Solid Waste Disposal	Inadequate disposal of solid waste may result in health hazards, may contaminate affect the ground water quality, air quality and resulted	- Hazardous waste must be disposed off by EPA certified contractor. - A waste management plan should be developed that contains a waste tracking mechanism from the originating location to the final waste reception location	Solid waste quantification and management reports Hazardous waste disposal quantity and EPA Certified	Project site	Quarterly	Premier Cement /Contractor

Activities	Impact	Mitigation Safeguards	Monitoring Parameter	Monitoring Location	Monitoring Frequency	Monitoring Responsibility
	unaesthetic.	- SWM policy should be developed and implemented in which enhance the recycling and reused efficiency. - Solid waste should be reused in leveling and restoration activity.	contractor's disposal certificate			
Air Quality – Power plant emissions	The air quality of an air shed can deteriorate rapidly if control measures fail or stop performing well	- All Pollution Control equipment should be regularly inspected and maintained; - If all redundant pollution control systems fail, plant should be immediately shut down until problem is resolved; - All air emissions including Coal dust should regularly be monitored and if any parameter exceeds; - Top layer of Coal piles should be kept moist;	Sox, NOx, CO, PM	Stacks, Boiler, generator	Quarterly	Premier Cement /Contractor
Water Quality	Waste water can adversely impact the marine ecosystem by several means which can have short term as well as long term effects;	All wastewater generated anywhere inside or due to any construction or operation activity shall be treated before disposal; The sludge generated as a result of ETP operation shall be disposed according to hazardous waste management plan;	Effluent flow, Temperature, pH, TSS, Oil and Grease	ETP	Quarterly	Premier Cement /Contractor

Environmental Monitoring Plan

Aspect	Location	Parameters to Monitor	Monitoring frequency	Responsibility
Emissions	Stacks, Generators, Boilers,	- SOx, NOx, CO and Particulates, Heavy Metals	Quarterly	Premier Cement
Ambient Air	All operational areas including the residential area in the power plant vicinity.	- PM10, PM2.5 and TSP, filter based low volume sampler, ambient, CO, Sox, NOx and Lead using active sampler.	Quarterly	Premier Cement
Wastewater	All effluent discharge points	- Temperature, pH, TSS, Oil and Grease, Effluent flow,	Quarterly	Premier Cement
Solid Waste	Project Area	- Solid waste quality, quantity and disposal methods / locations Visual checks to assess the situation.	Quarterly	Premier Cement
Fire & Safety	All operational areas	- Fire hazards & safety protocols	Continuous	Premier Cement
Noise	All operational areas	Noise intensity measurement dB(A)	Monthly	Premier Cement
Hazardous spill	All operational areas	Spill on Land	Continuous	Premier Cement
Traffic management	Entry exit routes, road- loading terminal area	Traffic Management Plan	Continuous	Premier Cement

CHAPTER 1

INTRODUCTION

1.1 OVERVIEW AND SCOPE:

Study Type	Initial Environmental Examination (IEE)
Study Title	IEE of 50MW Petroleum Coke/Coal based and 40 MW Tri-Fuel Engines Power Plant
Location	Bilout Sharif, Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan.
Project Proponent	Premier Cement, Sapphire Group.
Project Consultant	Global Environmental Management Services (Pvt.) Ltd. (GEMS)

This report discusses the Initial Environmental Examination of proposed 50 MW Petroleum Coke/Coal Based Power Plant titled as "Premier Cement" a subsidiary of Sapphire Fibers Ltd. The report also analyzes the environmental and social impacts associated with the Power Plant of the proposed project and its surroundings, suggest realistic, time bound and applicable mitigation measures to reduce and manage the identified environmental and social impacts to ensure project sustainability during the entire life cycle of the proposed project.

1.2 NEED ASSESSMENT:

Pakistan is in the midst of a severe energy crisis that largely stemmed from mismanagement of energy resources in the country. Weak regulatory and pricing mechanisms in the energy sector have led to huge disparities between demand and supply and remained a largely unresolved matter. Pakistan faces a significant challenge in revamping its network responsible for the supply of electricity, in order to this several projects of coal fired, solar power, hydropower and LNG based power plant are constructed to resolve the energy crisis problem.

Premier Cement Limited wishes to install 50MW Petroleum Coke/Coal fired captive unit for its cement /lime plant. The 40 MW Tri fuel HFO/Gas/Diesel engines shall be used as back-up energy source.

1.3 PROPONENT'S PROFILE:

Sapphire Group with investments of $1 Billion is a Pakistani industrial conglomerate largely focused on the textile industry. Based in Lahore, it is a vertically integrated textile group, manufacturing cotton yarn, fabric, and finished garments. Its products are exported to over 35

destinations around the globe. The Group has also diversified into the power generation and dairy sectors. Sapphire Electric Company is operating a 234 MW combined cycle plant in Muridke. Sapphire Dairies Private Limited operates a large mechanized dairy farm based on 100 acres of land near Manga, Lahore, with a herd size of 3000 and targeting 10,000 milking cows (300,000 liters per day) by 2020.

After achieving all milestones in different sectors of the industry, Sapphire is now entering into building materials including cement – based & concrete products and limestone aggregates. Sapphire is set to install a green field cement plant with a capacity of 8500 tons/day clinker in Bilot, Khyber Pakhtunkhwa under the name of "**Premier Cement**." Under the umbrella of Premier Cement Limited, Sapphire is also looking at the possibility of setting-up a 660 TPD Quicklime plan at Bilout. Bilot is a small, under developed village situated in a remote area, 45 kms from the city of Dera Ismail Khan on the main D.I Khan - Chashma road. Bilot is situated next to the Right Bank Chashma Canal and lies on the border of Punjab and Khyber Pakhtunkhwa. Mines have already been acquired by Premier Cement from the Government of Khyber Pakhtunkhwa and 600 acres of land for setting up Plant has also been acquired.

1.4 ENVIRONMENTAL CONSULTANT'S PROFILE:

Global Environmental Management Services (Pvt.) Ltd. (GEMS) is an Environmental Consultancy which provides broad range of Environmental Solutions including; Environmental Audits, Initial Environmental Examinations (IEE), Environmental Impact Assessments (EIA), Baseline studies and Training & Capacity building. GEMS is one of the few environmental firm having its own renowned ISO 17025 Certified Environmental Laboratory by the name of Global Environmental Laboratory (Pvt.) Ltd.

GEMS have several divisions at work which provides core quality services. They are as follows:

1.4.1 Consultancy Division:

GEMS offer the following services to various industries, government institutions and international development organizations:

- Environmental impact assessments
- Environmental audits and management plans
- Baseline studies and habitat mapping
- Capacity building and trainings
- Cleaner production for industries

1.4.2 Laboratory Division:

GEMS Laboratory, Global Environmental Lab (Pvt.) Ltd. is the leading source of environmental solutions. It is providing 24 hours sampling and monitoring services to various sectors including:

- Liquid Effluent Analysis

- Drinking Water Analysis
- Soil and Sludge Analysis
- Microbiological Analysis
- Gaseous Emissions and Particulate Matter Analysis
- Ambient Air Monitoring
- Noise Level Measurements
- Light Intensity Measurements
- Complete Monitoring as per NEQS and SEQS

1.4.3 Waste Management Division:

Waste Management Division has the following services:

- Incineration
- Bio-remediation
- Research and Division facility for disposal
- Waste minimization
- Waste recycling
- Integrated Waste Management

For over a decade GEMS have conducted EIAs/IEEs in an expanding range of Energy sector (oil and gas industry, power plants etc.), Manufacturing industries (e.g. pharmaceutical, mineral fertilizers, textile, paper, food processing, cement manufacturing etc.), Infrastructure projects (roads, highway's buildings etc.), ports and harbors, tourism, aquaculture and fisheries.

1.5 IEE STUDY TEAM:

GEMS professionals have experience in evaluating environmental and social work policies and its work horizon is extending throughout Pakistan and UAE. They are all qualified environmental and social scientists with complementary multi-disciplinary skills covering all major biomes of the environment. As a result GEMS is able to offer accurate, independent and appropriate services to its clients and to regulatory bodies.

The IEE study team profile for the proposed project has been attached as **Annexure I** of the report.

1.6 LEGISLATIVE REQUIREMENTS:

The IEE of the proposed Project will be subjected to the pertinent legislative and regulatory requirements of the Government of KPK including State laws. Legislation presents a synopsis of environmental policies, legislation and other guidelines that have relevance to the proposed project.

The proposed project falls under the project category of **Schedule I, Category B, (Energy)** as per Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2000 shall be referred. According to these guidelines, project under this category require an IEE to be conducted at planning stage.

1.7 PURPOSE OF STUDY:

The purpose of this IEE study is to evaluate the significant Environmental and Social aspects of the proposed project and identify requirements and standards that need to be complied specifically with KPK Regulations, 2014.

The specific objectives of this IEE are to:

1. Assess the existing environmental conditions in the proposed project area, including identification of environmentally sensitive areas and significant receptors;
2. Assess various project related activities to identify potential impacts on environment and social baseline settings and determine their significance;
3. Propose appropriate mitigation measures that can be incorporated into the project design, commissioning and operating phases to minimize damaging effects or lasting negative consequences identified by the environmental assessment;
4. Assess the proposed activities and ensure their compliance with the relevant environmental regulations of the province;
5. Prepare an IEE report for submission to the EPA-KPK in compliance with PEPA Review of IEE and EIA Regulations 2000.

1.8 SCOPE OF IEE:

For the IEE study, the scope of work is as under:

1. Description of physical, environmental, socio-economic and cultural setting and baseline conditions in the proposed project area;
2. Identification and prediction of proposed project impacts and their significance relating to the proposed project activities;
3. Identification and assessment of the applicability and effectiveness of mitigation measures to offset or minimize adverse impacts on environment.

1.9 APPROACH AND METHODOLOGY:

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

1.9.1 Scoping

The key activities of this phase included:

Project Data Compilation: A generic description of the proposed project (i.e. construction and operation), within the proposed project area relevant to environmental assessment, was compiled with the help of EPA-KPK Guidelines and proponent.

Literature Review: Secondary data and information related to weather, soil, water resources, coastal and marine ecology, and wildlife was reviewed and compiled.

Legislative Review: Information on relevant legislation, regulations, guidelines, and standards was reviewed and compiled.

Identification of Potential Impacts: The information collected in the previous steps was reviewed, and potential environmental issues were identified.

1.9.2 Baseline Studies

Following the scoping exercise, the proposed project area was surveyed to collect primary data. During the field visits, information was collected on ecologically important areas, ambient air quality, surface and groundwater resources, existing infrastructure, local communities and public services. The following specific studies were conducted as part of the IEE.

Ecological Baseline: Biological experts conducted an ecological baseline study, which consisted of a thorough literature review and field data collection. During the fieldwork, the faunal species of the area were documented. The diversity of avian, large and small mammals, and reptile species were determined. Information was collected on the species found in approximately 3 Km radius of the area.

Floral species of the area were also identified through fieldwork and literature review.

Physical Environment: Environmental Assessment Specialists conducted physical environmental study including, ambient air, noise, water sampling, surface water resources and the groundwater resources of the areas. Specialists also carried out the impact of proposed project on soil and water resources.

Socioeconomic Study: Sociologist conducted socioeconomic and cultural study in the proposed project area. The study team through participatory techniques collected data from the locals of the proposed project area as well as the local governing bodies. The profile included livelihood, culture, leadership, gender issues, spiritual and temporal leadership, demographic information based on field data and published sources, the existing use of land resources, community structure, direct & indirect employment & opportunities, distribution of income, goods and services, public health, local religious and cultural values, and local customs, aspirations, and attitudes.

1.9.3 Impact Assessment

The environmental, socioeconomic, cultural, gender and project information collected in previous phases were used to assess the potential impacts of the proposed activities. The issues studied included potential project impacts on:

- Ambient air quality;
- Ecology of the area, including flora and fauna;
- Local communities;
- Water quality.

Wherever possible and applicable, the report discusses the following aspects:

- The present baseline conditions;
- The change in environmental parameters likely to be affected by proposed project related activities;
- Identification of potential impacts;
- Likelihood and significance of potential impacts;
- Mitigation measures to reduce impacts to negligible level;
- Prediction of impacts, including all long-term and short-term, direct and indirect, and beneficial and adverse impacts;
- Evaluation of the importance or significance of impacts (The significance of each impact has been judged on the basis of available local, national, and international standards. Where such standards were not available, the best practices elsewhere has been referred to);
- Implementation of mitigation measures (i.e., environmental management);
- Determination of residual impacts;
- Identification of controls and monitoring of residual impacts.

1.9.4 Documentation

At the end of the assessment, a report is prepared according to the relevant guidelines of KPK Environmental Protection Agency. This report includes the findings of the assessment, proposed project impacts, and mitigation measures to be implemented during the execution of the proposed activities.

The standard report format is as follows:

- Executive Summary
- Introduction
- Project Description & impact areas
- Institutional, Legislation and Policy Framework

- Physical Environment
- Ecological Environment
- Socio-Economic and Cultural Environment
- Environmental Impacts and Mitigations Measures
- Environmental Management and Monitoring Plan
- Conclusion

CHAPTER

2

PROJECT DESCRIPTION

2.1 GENERAL OUTLINE AND SCOPE

This section presents a detailed project description related to the IEE of "50MW Petroleum Coke/Coal based and 40 MW tri-fuel engines power. The project developer is highly committed to the principles of the sustainable development by advocating for environmental security and better welfare of its citizens through the promotion of a sound and environment friendly operation activities. However for the sustainable development of project the detailed insight regarding the project description was established by reconnaissance survey, site visit, and detailed discussions between project proponent and GEMS to assess the anticipated impacts and recommended the mitigation measures and monitoring plan to reduce the impact.

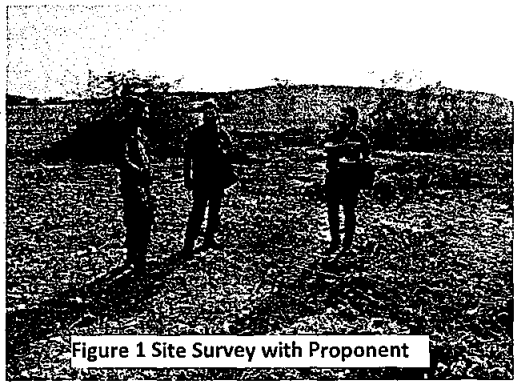
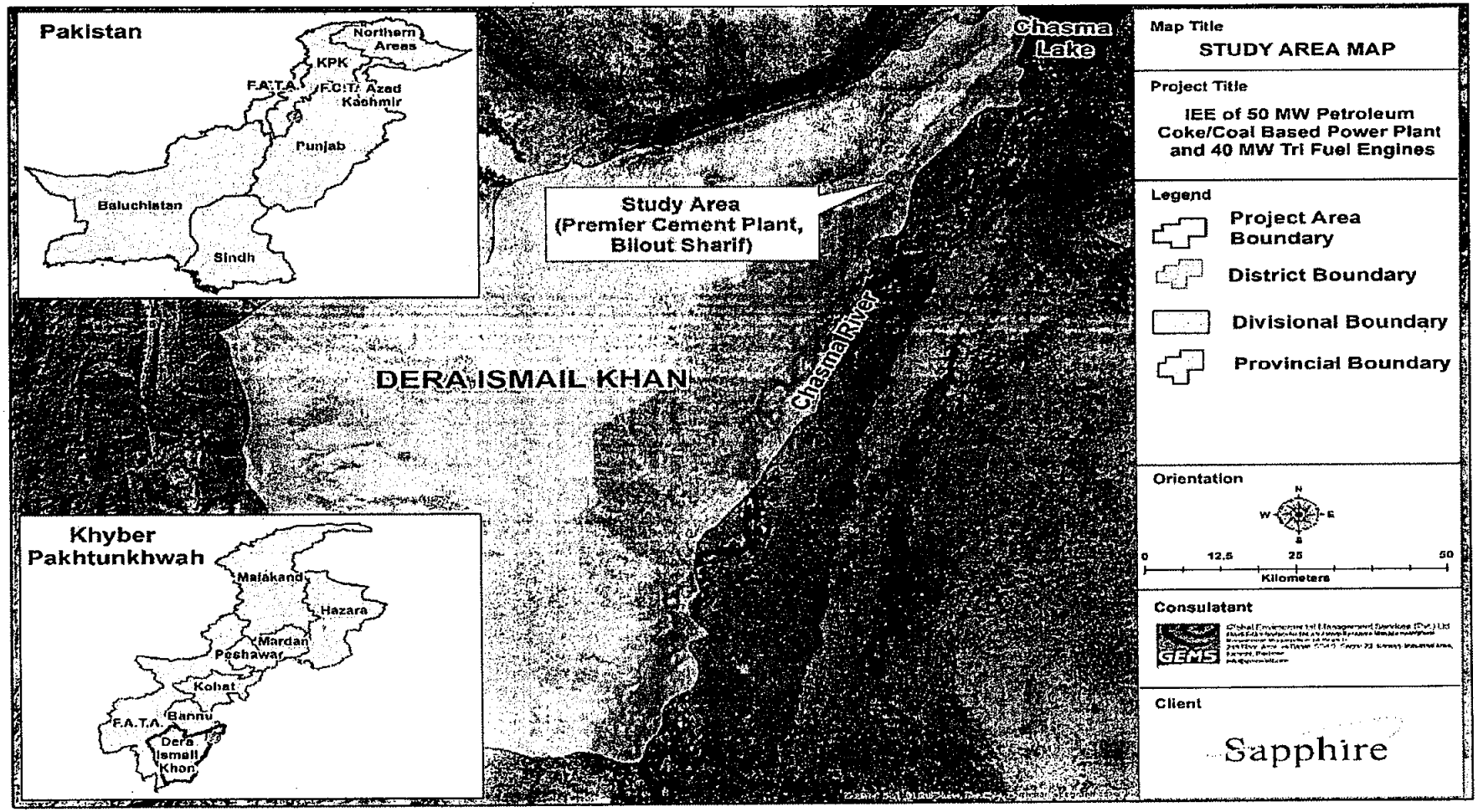


Figure 1 Site Survey with Proponent

2.2 PROPONENT ADDRESS & LOCATION MAP

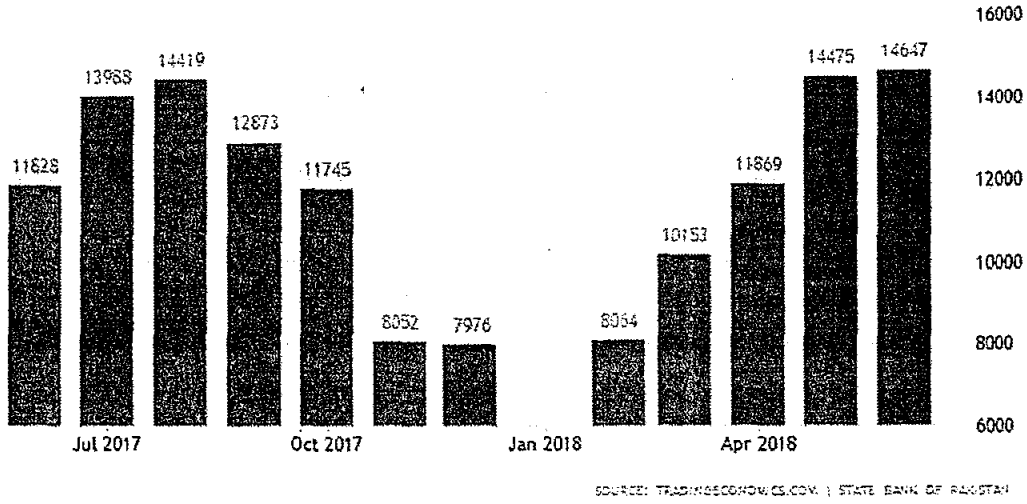
The proposed project will be located at Billout, Khyber Pakhtunkhwa situated in a remote area of district Dera Ismail Khan (DIK), Chashma Link road. Location map of the proposed project is presented as **Exhibit 2.1.**

Exhibit 2. 1: Project Location Map



2.3 NEED AND IMPORTANCE OF THE PROJECT

Pakistan is among some countries which has a lot of potential to produce electricity. The country is geographically very rich in terms of various renewable resources which are low costing to produce electricity and at the same time more environment friendly. But still from last 15 years Pakistan has a series of bottlenecks in power sector and there is a shortfall because electricity demand is growing day by day and the resources to produce electricity are not used efficiently. At present Sapphire Group has initiated to install 50 MW Captive power plant to the existing location of Premier Cement at Bilout, Dera Ismail Khan to provide power to their cement/lime plants. Electricity Production in Pakistan increased to 14647 Gigawatt-hour in June from 14475 Gigawatt-hour in May of 2018. Electricity Production in Pakistan averaged 7986.80 Gigawatt-hour from 2003 until 2018, reaching an all-time high of 14647 Gigawatt-hour in June of 2018 and a record low of 4195 Gigawatt-hour in December of 2010. The below graph shows the detail demand and supply of electricity in Pakistan.



SOURCE: TRADINGECONOMICS.COM | STATE BANK OF PAKISTAN

2.4 PROJECT COMPONENTS

The proposed project will require about 4 acre of land for construction/installation of Boiler structure, Turbine, Generator, Control room building, Transformer yard, switch yard, coal/petroleum coke stock yard, ash pond and ash dyke, conveyor belt, greenbelts, roads, security post, FGD and ESP system, compressor house, fire station, laboratories, workshops, boundary wall. The proposed project details are given in **Exhibit 2.2** below.

Exhibit 2. 2: Project Detail

50 MW Power Plant
Main Plant Area
Coal/Petroleum Coke Handling Plant along with conveying system

Raw Material Handling area
Miscellaneous Facilities
Land for green belt
40 MW Tri fuel Power Plant
Main Plant Area
Fuel storage area
Raw Material Handling area
Miscellaneous Facilities
Land for green belt

2.5 PROJECT ACTIVITIES AND SCHEDULE

Expected date of starting construction	June 2019
Expected date of completion of construction	July 2020

2.6 PROJECT DESCRIPTION

Based on the design, civil work shall be completed. Mechanical & Electrical Installation work shall be completed using suitable construction machinery. Power plant testing & commissioning shall be done as per the standards & codes. Power plant shall be operated as per the operation manual keeping in view the emission standards/ parameters. Activities of the project are classified as Pre-construction, Construction and operation phase activities and are detailed as below.

A) Pre-Construction Phase:

a) Selection of project site
b) Land acquisition & site establishment

B) Construction Phase

a) Civil construction and technological installation work
b) Post erection check & pre commissioning test
c) Monitoring of mitigation measures for Environmental impact of the plant
d) Commissioning test

e) Reliability test run

f) Commercial operation of the plant

g) Overall project management

h) Post construction

i) Commercial operation of the plant

j) Monitoring of EMP

k) Proper O & M of the plant for efficient running

2.6.1 Required Resource and Utility Demand

Resources required to develop the project include soil, construction material, manpower etc. The proposed project site is a low lying barren land already owned by Premier Cement Limited. Construction materials like cement, MS rod, brick etc. will be obtain from the local market or regional market of Dera Ismail Khan. Electricity demand during pre-construction and construction phases shall be met from the nearest public utility sub-station if available. Otherwise, diesel based power generator of adequate capacity shall be provided. Water for construction and drinking can be drawn from the ground water sources using Deep Tube wells. The project shall provide employment opportunity for unskilled, semi-skilled, and skilled categories of man power.

2.6.2 Technology and Process Description

Coal/Petroleum Coke is supplied to the coal/petroleum coke bin via coal/petroleum coke crushing plant. From the silos the crushed coal/petroleum coke is fed to the boiler by CFB boiler fuel feed system. For dust suppression water spray shall be used. The coal/petroleum coke handling system is controlled from the control handling control room.

The IEE of 50MW Petroleum Coke/Coal based and 40 MW tri-fuel engines power plant will have a CFB boiler fired ultra-super critical boiler with auxiliaries and ancillaries like feed water pump, FD Fans, coal/petroleum coke crusher etc., a steam turbines coupled with hydrogen cooled generators suitable for indoor installation. The power plant shall have FGD & ESP system to control the emissions compliant to NEQS. There will be 6300 KV GIS sub-station for incoming power. In addition to coal/petroleum coke, light diesel fuel oil will be used for start-up as well as flame stabilization and during low-load operation. The main Plant consists of three interconnected structures: (i) boiler structures, (ii) turbine building, and (iii) an integrated control and electrical building.

2.7 MAJOR INSTALLATION

Electricity is one of the most usable forms of energy and its sustainable availability is one of the major conditions for socio economic development of a country. Pakistan is one of the countries where electricity demand is more than its generation. Recent rapid industrialization and urbanization has increased the power demand to many fold. The special works such as concreting or commissioning

activities, it is necessary to work round the clock. Construction required the continuous use of a considerable number of machinery, including forklifts, excavators), trailers, compactors etc.

2.7.1 Fire Protection System

The protection of the plant against fire at coal/petroleum coke feeding plant fuel oil facilities main power plant, cable galleries, transformer and switchyard will be protected by combination of Hydrant system; High velocity spray system; apart from Portable and mobile fire extinguishers. Medium velocity water spray will be used for fire protection in the fuel handling plant. The type of firefighting system & location are indicated in brief:

2.7.2 Hydrant System

A network of piping will be spread out all through the plant area supplying pressurized water to Hydrant strategically located throughout the plant. The system will be kept under constant pressure by compensating the minor leakages through combination of pressurized hydro-pneumatic tanks and jockey-pump.

2.7.3 Utilities and Resource

2.7.3.1 Coal Requirement:-

Following are the details of coal requirement for the proposed Captive Power Plant:-

50 MW Coal Power Plant	
Bituminous Coal, **Petroleum Coke,**	- 153,000 Tons per year. - 70,000 Tons per year of 6-7% Sulphur Petroleum Coke and 44,000 Tons per year of 1-2% Sulphur Petroleum Coke.
Source	- Imported South Africa or Australia, - Imported from USA, Saudi and Turkey,
Fly Ash quantity	- 3.5 t/h; Bottom Ash quantity= 0.6 t/h; The Ash will be transported to Cement Mill after collected by Ash Bin. Fly Ash collected by the first stage ESP hopper will transport to boiler by air transporter.
Raw Material Usage During Construction And Operation Phase	
Cement	18000 ton

Other aggregates	126000 tons
Rebar	4500 tons
Electro Mechanical Equipment	8000 tons
40 MW tri fuel Power Engines	
HFO: -	**160 tons/ day on full load**

2.7.3.2 Water Requirement

The water consumption for the proposed 50 MW Captive unit power plant will be ground water through tube wells. During construction 0.3 cusecs of water will be required whereas, during Operational phase 1.5 cusecs of water will be required.

2.7.3.3 Power Requirement

The total power requirement of power is defined in this section.

Energy Requirement	
During Construction (diesel driven power generating sets)	1 MW
During Operation	6 MW

2.7.3.4 Manpower Requirement

The total manpower required at plant during operation stage will be 15 including O & M staff and Administrative personnel. Besides the same, the proponent will hire contractual labour and staff for several jobs in and around the plant. Major overhaul/maintenance works will be contracted out to equipment vendors and specialized agencies. Other ancillary services viz. canteen, housekeeping, township maintenance, security etc. would also be contracted out.

2.7.3.5 Transportation of Fuel for Plant Operation

The Coal/Petroleum Coke will be delivered via trucks to the covered coal/petroleum coke yard having 15 days capacity of about 8000 tons. The coal/petroleum coke is transferred to the live coal/petroleum coke storage pile. A sampling system shall be provided.

2.8 ASH UTILIZATION

The dry ash is taken to buffer hoppers for its onward transportation in dry form to storage silo near plant boundary for utilization. The residual ash can be used in Brick manufacturing, clinker industries, cement industries, compaction purposes etc. At initial stage, the generated ash will be used in and for development of the project area.

Many Cement plants exist in the vicinity, hence, 100% fly ash utilization might be considered. Hundred percent bottom ash utilization might also been considered. Ash may be utilized for the following purposes:

- Concrete production, as a substitute ingredient for Portland cement and sand;
- Embankments and other structural fills (usually for road construction);
- Grout and Flowable fill production;
- Waste stabilization and solidification;
- Cement clinkers production - (as a substitute ingredient for clay);
- Mine reclamation;
- Stabilization of soft soils;
- Road sub-base construction;
- As aggregate substitute material (e.g. for brick production);
- Mineral filler in asphaltic concrete;
- Agricultural uses: soil amendment, fertilizer, cattle feeders, soil stabilization in stock feed yards, and agricultural stakes;
- Loose application on rivers to melt ice;
- Loose application on roads and parking lots for ice control;

2.9 WASTE MANAGEMENT

In a power plant the wastes are of two types. Solid waste and liquid wastes. During construction phase the solid wastes are mainly the construction wastes like concrete pieces, small cut pieces of MS bars/rods, empty cement bags, empty cartons, garbage etc. and waste from worker's camps, human wastes, kitchen wastes etc. 200 tons of steel waste will be generated during construction whereas, 30 cubic meter of liquid waste will be generated per hour. Human wastes will be managed by constructing sanitary latrines which will be finally demolished and refilled. Construction wastes and kitchen wastes will be disposed-off in covered Plastic containers kept at designated place which will be periodically collected by local authority for final disposal. Metal pieces, empty cartons and paper bags will be initially kept at some designated place and finally sold to the re-cycling companies. In short all kind of solid wastes to be generated will be disposed off on site maintaining DoE's standard. The liquid waste generated in the same period is mainly water from bore holes, non- consumptive construction water, and waste water from worker's camps. Construction site waste water will be collected in a pool and

will be reused in construction activities. Liquid waste from worker's camps will be drained to a soak pond/ soak pits. Boiler Blow down water shall be collected in tanks and shall be recycled for cooling of machines. Liquid Waste Material shall be disposed within the site area for recycle/ Solid (steel) sold to scrape material dealers.

During operation phase ash particle will be the major solid waste to be generated from the power plant. The dry ash is taken to buffer hoppers for its onward transportation in dry form to storage silo. The ash can be used in Brick manufacturing, clinker industries, cement industries, compaction purposes, etc. There will be also scope for ash export. A blanket of water over the ash pond and water spraying system will prevent dust emission from ash pond, coal/petroleum coke storage yard and belt conveyor facilities. All liquid waste generated from boiler blow down, cooling tower blow down, water from leaks and vents, oily water from turbine floor and transformer areas, waste water from workers' colony and offices etc. will be drained to and treated as per provincial standards and other international standard in sewage treatment plant and oil water separator. After treatment the liquid will be mostly used as gardening water for green belt and other area.

2.10 ASH DISPOSAL

The Ash will be transported to Cement Mill after collected by Ash Bin. Fly Ash collected by the first stage ESP hopper will transport to boiler by air transporter.

Fly Ash quantity	3.5 t/h
Bottom Ash quantity	0.6 t/h

SO_2

Sulphur oxides are emitted from the combustion of most fossil fuels through oxidation of the sulphur contained in the fuel. Measures to remove sulphur oxides, mainly SO_2, Presently, there are many ways of reducing SO_2 emissions generated by coal combustion. Fuel treatment to reduce SO_2 is possible with coal and involves using physical, chemical, or biological processes to wash the coal before it is burned as it was referred on the coal introduction of this chapter (EC, 2006). Other control technologies for SO_2 include post-combustion technologies. Post-combustion flue gas desulphurization (FGD) techniques can remove SO_2 formed during combustion by using an alkaline reagent to absorb in the flue gas and produce a sodium or a calcium sulphate compound. These solid sulphate compounds are then removed in downstream equipment. FGD technologies are categorized as wet, semi-dry, or dry depending on the state of the reagent as it leaves the absorber vessel.

Application of Flue Gas Desulphurization System (FGD)

Flue gas desulfurization is commonly known as FGD and is the technology used for removing sulfur dioxide (SO_2) from the exhaust combustion flue gases of power plants that burn coal to produce steam for the turbines that drive their electricity generators. The most common types of FGD contact the flue gases with an alkaline sorbent such as lime or limestone. As sulfur dioxide is responsible for acid

rain formation, stringent environmental protection regulations have been enacted in many countries to limit the amount of sulfur dioxide emissions from power plants and other industrial facilities.[1]

The Advanced Flue Gas Desulpherization (AFGD) unit successfully achieved the target of removing more than 90% of the SO2 from the flue gas. Five Midwestern bituminous coals, having sulfur contents between 2.25% and 4.5%, were burned during this demonstration. SO_2 removal efficiency averaged 94%, with a maximum of over 98%. The facility was operated for 26,300 hours during the demonstration, with system availability of 99.5%. High availability eliminates the need for a spare absorber.

[1]references/pdfs/chemical_engineering/Flue_Gas_Desulfurization.pdf

CHAPTER 3

INSTITUTIONAL, LEGISLATION AND POLICY FRAMEWORK

3.1 GENERAL OUTLINE AND SCOPE

This chapter section of the IEE document gives an overview of the policy framework and provincial legislation that applies to the proposed Project. The proposed project is expected to comply with all the applicable Provincial and National legislation guidelines relating to environmental and social aspects, and all the required regulatory clearances will be obtained.

The environmental study primarily includes review of Pakistan Environmental Protection Agency (PEPA) EIA/IEE regulations 2000 and KPK Environmental Protection Act 2014. Other laws and guidelines relevant to the project as given in **Exhibit 3.1** have also been reviewed.

Exhibit 2. 1: Policies, Legislation and Guidelines

Provincial and National Environmental Policy, Legislation and Guidelines
National Conservation Strategy (NCS)
National Environmental Policy 2005
National Climate Change Policy, 2011
National Power Policy, 2013
National Environmental Action Plan-Support program (NEAP-SP)
KPK Environmental Protection Act 2014
Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, 2000
Land Acquisition Act, 1894
Khyber Pakhtunkhwa Antiquities Act, 2016
Electricity Act, 1910
The Khyber Pakhtunkhwa Wildlife and Biodiversity Act, 2015
Khyber Pakhtunkhwa Forest Ordinance, 2002
The Pakistan Environmental Assessment Procedures, 1997
World Bank Guidelines on Environment
World Bank EHS General Guidelines, 2007

3.2 PROVINCIAL AND NATIONAL ENVIRONMENTAL POLICY, LEGISLATION AND GUIDELINES

The enactment of comprehensive legislation on the environment, covering multiple areas of concern, is a relatively new and ongoing phenomenon in Pakistan. Whereas, a basic policy and legislative framework for the protection of the environment and overall biodiversity in the country is now in place, detailed rules, regulations and guidelines required for the implementation of the policies and enforcement of legislation are still in various stages of formulation and discussion. A brief overview of the existing national policies, legislation and guidelines is presented below

3.2.1 National Conservation Strategy (NCS)

The National Conservation Strategy (NCS) is the primary Policy document of the Government of Pakistan on national environmental issues. The Policy was approved by the Federal Cabinet in March 1992. The Strategy also attained recognition by international donor agencies, principally the World Bank. The NCS identifies 14 core areas including conservation of biodiversity, pollution prevention and abatement, soil and water conservation and preservation of cultural heritage and recommends immediate attention to these core areas in order to preserve the country's environment.

A midterm review of the achievements of the NCS in 2000 concluded that achievements under the NCS have been primarily awareness raising and institutional building rather than actual improvement to environment and natural resources and that the NCS was not designed and is not adequately focused as a national sustainable development strategy[1]. The need therefore arose for a more focused National Environmental Action Plan (NEAP) required to bring about actual improvements in the state of the national environment with greater emphasis on poverty reduction and economic development in addition to environmental sustainability.

The NEAP was approved by the Pakistan Environmental Protection Council under the chairmanship of the President/Chief Executive of Pakistan in February 2001. NEAP now constitutes the national environmental agenda and its core objective is to initiate actions that safeguard public health, promote sustainable livelihoods, and enhance the quality of life of the people of Pakistan.

A National Environmental Policy has been approved by the Federal Cabinet in its meeting held during June 2005[2]. This policy has already been endorsed by the Pakistan Environmental Protection Council during 2004. The new policy has total 171 guidelines on sectoral and cross-sectoral issues. The objectives of new policy include assurance of sustainable development and safeguard of the natural wealth of country. The following are the approved Sectoral Guidelines;

- Water Supply and Management;
- Air Quality and Noise;
- Waste Management;

[1]Arthur J. Hanson et al, Pakistan's National Conservation Strategy Renewing Commitment to Action, Report of the Mid-Term Review, 2000

[2]National Environmental Policy, GoP, 2005

- Forestry;
- Biodiversity and Protected Areas;
- Climate Change and Ozone Depletion;
- Energy Efficiency and Renewable;
- Agriculture and Livestock;
- Multilateral Environmental Agreements.

3.2.2 National Environmental Policy 2005

The national environmental policy aim to protect, conserve and restore Pakistan's environment in order to improve the quality of life of the citizens through sustainable development. The objectives of the policy are:

- Conservation, restoration and efficient management of environmental resources.
- Integration of environmental considerations in policy making and planning process.
- Capacity building of government agencies and other stockholders at all level for better environmental management.
- Meeting international obligations effectively in line with the national aspirations.
- Creation of a demand for environment through mass awareness and community mobilization[3].

3.2.3 National Climate Change Policy, 2011

To ensure that climate change is mainstreamed in the economically and socially vulnerable sectors of the economy and to steer Pakistan towards climate resilient development. The main objectives of Pakistan's Climate Change Policy include:

- To pursue sustained economic growth by appropriately addressing the challenges of climate change.
- To integrate climate change policy with other inter-related national policies.
- To focus on pro-poor gender sensitive adaptation while also promoting mitigation to the extent possible in a cost-effective manner.
- To ensure water security, food security and energy security of the country in the face of the challenges posed by climate change.
- To minimize the risks arising from the expected increase in frequency and intensity of extreme weather events such as floods, droughts and tropical storms.
- To strengthen inter-ministerial decision making and coordination mechanisms on climate change.

[3]National Environmental Policy, 2005.

- To facilitate effective use of the opportunities, particularly financial, available both nationally and internationally.
- To foster the development of appropriate economic incentives to encourage public and private sector investment in adaptation measures.
- To enhance the awareness, skill and institutional capacity of relevant stakeholders.
- To promote conservation of natural resources and long term sustainability[4].

3.2.4 National Power Policy, 2013

The Ministry of Water and Power of the Government of Pakistan has developed an ambitious power policy to support the current and future energy needs of the country. This bold strategy will set Pakistan on a trajectory of rapid economic growth and social development. Simultaneously, it will address the key challenges of the power sector in order to provide much needed relief to the citizens of Pakistan.

- Build a power generation capacity that can meet Pakistan's energy needs in a sustainable manner.
- Create a culture of energy conservation and responsibility.
- Ensure the generation of inexpensive and affordable electricity for domestic, commercial, and industrial use by using indigenous resources such as coal (Thar coal) and hydel.
- Minimize pilferage and adulteration in fuel supply
- Promote world class efficiency in power generation
- Create a cutting edge transmission network
- Minimize inefficiencies in the distribution system
- Minimize financial losses across the system
- Align the ministries involved in the energy sector and improve the governance of all related federal and provincial departments as well as regulators[5].

3.2.5 National Environmental Action Plan-Support program (NEAP-SP)

The government of Pakistan and United Nation Development Program (UNDP) have jointly initiated an umbrella support program called the National Environmental Action Plan-Support Program (NEAP-SP) signed in October 2001 and implemented in 2002. The development objective supported by NEAP-SP is environmental sustainability and poverty reduction in the context of economic growth.

[4] National Climate Change Policy, 2011.
[5] National Power Policy, 2013

3.2.6 KPK Environmental Protection Act 2014

The KPK Environmental Protection Act, 2014 is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The KPK 2014 is broadly applicable to air, water, soil, marine and noise pollution. Penalties have been prescribed for those contravening the provisions of the Act.

The two primary deliberations of the Act are the conduct of projects only after approval of environmental assessments from the KPK and adherence with National Environmental Quality Standards (NEQS).

3.2.7 Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, 2000

The Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, 2000 (The 2000 Regulations) promulgated under PEPA 1997 were enforced on 15 June, 2000. The 2000 Regulations define the applicability and procedures for preparation, submission and review of IEEs and EIAs. These Regulations also give legal status to the Pakistan Environmental Assessment Procedures prepared by Federal EPA in 1997.

The Regulation classifies projects on the basis of expected degree of adverse environmental impacts and lists them in two separate schedules. Schedule I lists projects that may not have significant environmental impacts and therefore require an IEE. Schedule II lists projects of potentially significant environmental impacts requiring preparation of an EIA. The Regulations also require that all projects located in environmentally sensitive areas require preparation of an EIA.

According to these regulations the proposed project falls under the following category:

Schedule I (IEE):

Category B (Energy)

3.2.7.1 National Environmental Quality Standards

The NEQS promulgated under the PEPA 1997 and last revised in 2000 specify standards for industrial and municipal effluents, gaseous emissions, vehicular emissions, and noise levels. The PEPA 1997 empowers the EPA's to impose pollution charges in case of non-compliance to the NEQS.

During the construction and post development phase of the project NEQS will apply to all effluents and emissions. NEQS for municipal and industrial effluents, selected gaseous pollutants from industrial sources and motor vehicle exhaust and noise are attached as **Annexure II**. NEQS Standards for disposal of solid waste have as yet not been promulgated.

3.2.7.2 Tribunal Rules for Non-Compliance

A failure to comply with any provision of these Rules (except rule 8(1), 16(1), 23 or 25) or any order of the Tribunal (except for an order under rules 38 or 39) does not of itself render void the proceedings or any step taken in the proceedings. In the case of such non-compliance, the Tribunal may take such action as it considers just, which may include:

- Waiving or varying the requirement.
- Striking out the claim or the response, in whole or in part, in accordance with rule 34.
- Barring or restricting a party's participation in the proceedings.
- Awarding costs in accordance with rules 69 - 75[6].

3.2.8 Land Acquisition Act, 1894

The Land Acquisition Act (LAA) of 1894 amended from time to time has been the defacto policy governing land acquisition, resettlement and compensation in the country. The LAA is the most commonly used law for acquisition of land and other properties for development projects. It comprises of 55 sections pertaining to area notifications and surveys, acquisition, compensation and apportionment awards and disputes resolution, penalties and exemptions.

3.2.9 Khyber Pakhtunkhwa Antiquities Act, 2016

The act ensures to protect, preserve KP's archaeological heritage. Under the act, a wing will be established within the directorate which will be responsible to control illegal diggings at archaeological sites and monuments and encroachments on the protected, important and registered antiquities. When the owner or the occupant of the land has discovered any ancient burial, occupational or residential site and other remains or unearthed articles, he shall, without altering the existing state of such remains, report the fact without delay to the Director in writing[7].

3.2.10 The Factories Act, 1934

The clauses relevant to the project are those that concern to health, safety and welfare of workers, disposal of solid waste and effluent and damage to private and public property. The Factories Act also provides regulation for handling and disposal of toxic and hazardous materials[8].

3.2.11 Electricity Act, 1910

The Act provides a legal base for power distribution. A licensee under this Act is enabled to operate supply of electricity. This Act obligate licensee to pay compensation for any damages caused during the constructions and maintenance of any power distribution facilities.

3.2.12 The Khyber Pakhtunkhwa Wildlife and Biodiversity Act, 2015

This Act aims to strengthen the administration of the organisation to effectively manage wild animals and their habitats, to holistically manage Protected Areas in a sustainable manners for the best interest of the indigenous communities and local stakeholders. Under it, the Biodiversity and Wildlife Fund to be used for improvement and development of protected areas, national parks, conservation,

[6] The Employment Tribunals Rules of Procedure 2013
[7] http://www.pakp.gov.pk/2013/acts/the-khyber-pakhtunkhwa-antiquities-act-2016
[8] The Pakistan code (The Factories Act, 1934)

research in the field of biodiversity conservation, capacity building of the department and communities and purchase of additional land to add to the protected areas. The Act specifies restrictions on hunting and trade in animals. The Act also defines various categories of wildlife protected areas (i.e. national parks, wildlife sanctuaries and game reserves)[9].

3.2.13 Khyber Pakhtunkhwa Forest Ordinance, 2002

The act empowers the provincial forest departments to declare any forest area as reserved or protected. The Act also empowers the provincial forest departments to prohibit the clearing of forest for cultivation, grazing, hunting, removing forest produce; quarrying and felling, lopping and topping of trees, branches in reserved and protected forests[10].

3.3 NATIONAL AND INTERNATIONAL GUIDELINES OR STANDARDS

3.3.1 The Pakistan Environmental Assessment Procedures, 1997

The Pakistan Environmental Protection Agency prepared the Pakistan Environmental Assessment Procedures in 1997. They are based on much of the existing work done by international donor agencies and Non-Governmental Organizations (NGO's). The package of regulations prepared by PEPA includes:

- Policy and Procedures for Filing, Review and Approval of Environmental Assessments;
- Guidelines for the Preparation and Review of Environmental Reports;
- Guidelines for Public Consultation;
- Guidelines for Sensitive and Critical Areas; and
- Sectoral Guidelines for various types of projects.

3.3.2 World Bank EHS General Guidelines, 2007

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. These General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors. EHS considerations into corporate and facility-level business processes in an organized, hierarchical approach that includes the following steps:

- Identifying EHS project hazards and associated risks as early as possible in the facility development or project cycle, including the incorporation of EHS considerations into the site selection process, product design process, engineering planning process for capital requests,

[9] Khyber Pakhtunkhwa Wildlife and Biodiversity (Protection, Preservation, Conservation and Management) Act, 2015

[10] http://kpcode.kp.gov.pk/uploads/THE_[KHYBER_PAKHTUNKHWA]_FOREST_ORDINANCE,_20021

engineering work orders, facility modification authorizations, or layout and process change plans.

- Involving EHS professionals, who have the experience, competence, and training necessary to assess and manage EHS impacts and risks, and carry out specialized environmental management functions including the preparation of project or activity-specific plans and procedures.
- Understanding the likelihood and magnitude of EHS risks, based on:
  - The nature of the project activities
  - The potential consequences to workers, communities, or the environment
- Favoring strategies that eliminate the cause of the hazard at its source, for example, by selecting less hazardous materials or processes that avoid the need for EHS controls.
- Improving EHS performance through a combination of ongoing monitoring of facility performance and effective accountability[11].

[11]Environmental, Health, and Safety General Guidelines

CHAPTER

4

PHYSICAL ENVIRONMENT

4.1 GENERAL OUTLINE AND SCOPE

This section of the IEE document presents a detailed description of physical environmental conditions of the study area. The data collection techniques are combination of both primary and secondary means by field verifications, observations, sampling and monitoring which was supplemented by review of published literature and previous IEE studies conducted in the proposed project surrounding areas. The base line data defines, elaborates and present physical environmental quality within the project surrounding. (Refer **Exhibit 4.1** for pictorial presentation of baseline investigations and observations)

Key Features of Physical Baseline

- Topography and land use
- Geology
- Climate
- Air Quality
- Water Resources

Exhibit 4. 1: Pictorial Presentation of Baseline Investigations and Observations

GEMS team Initial site survey

Ecological observation through telescope

Canal Water sampling near the proposed project

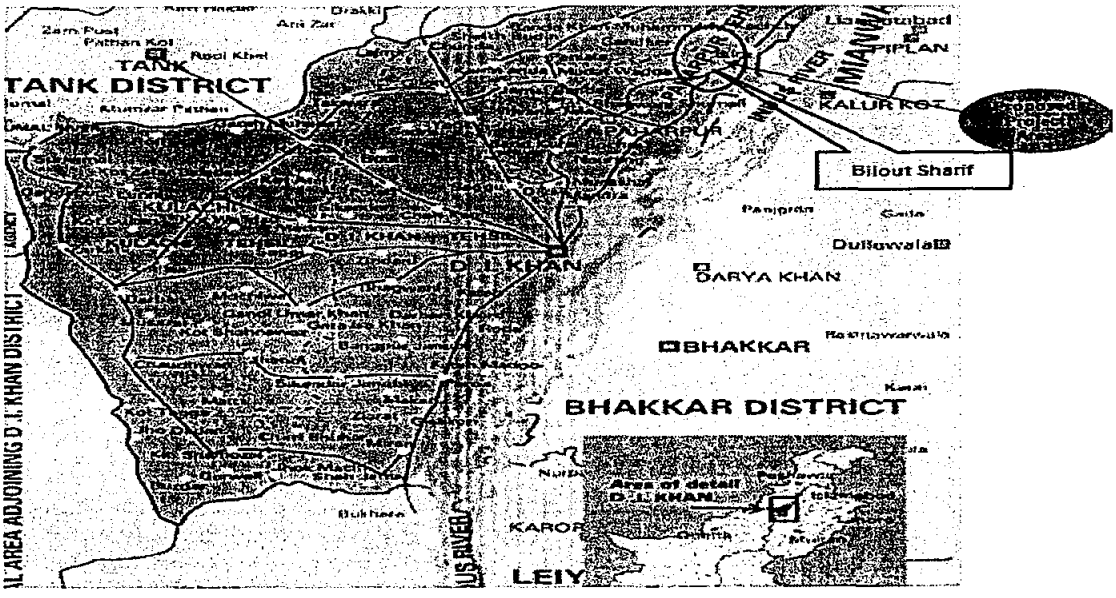
Groundwater sampling in the project site

4.2 GEOGRAPHY

The proposed cement plant project area lies in the district Dera Ismail Khan. Dera Ismail Khan often abbreviated to D. I. Khan, is a district in Khyber-Pakhtunkhwa Province, Pakistan. It is situated on the west bank of the Indus River, 200 miles (320 km) west of Lahore and 120 miles (190 km) northwest of Multan. The district is bounded on the north by Tank and Lakki Marwat districts, on the east by Mianwali and Bhakkar districts and on the south by Dera Ghazi Khan District of Punjab while on its west is the Tribal Areas adjoining to DI Khan district are South Waziristan Agency and Tank district.

Dera Ismail Khan occupies an area of about 7,326 square kilometer. The proposed project area is located adjacent to Bilot Sharif village, which is around 56km in north from Dera Ismail Khan (KPK, Province), located on Chashma road, near Chashma Right Bank canal and associated with Kohisan Mountains. Refer **Exhibit 4.2** to observe Geology of the project area.

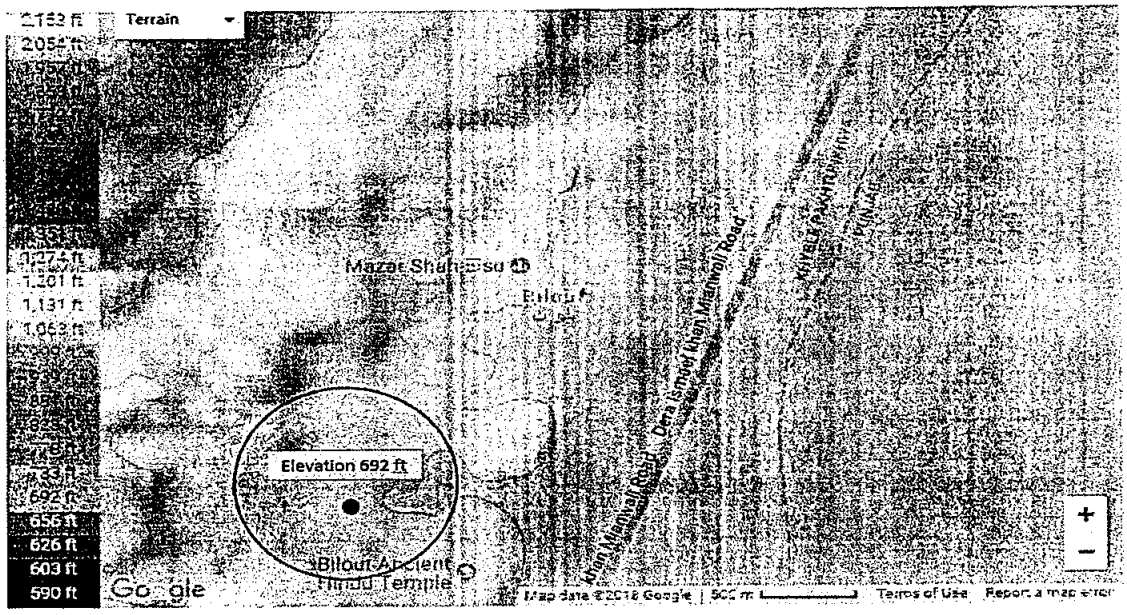
Exhibit 4. 2: Geography of Proposed Project Area



4.3 TOPOGRAPHY

District Dera Ismail Khan is a part of the Lower Indus basin and is composed of alluvial sediments derived from the Indus and its tributaries. Most of the area is a dry alluvial plain commonly referred to as "Daman". The only hills, within the district, are those of Khisore range which lies in the north–eastern part of the district. The Khisore range is also known as the Ratta Koh or Koh–e–Surkh, meaning the red mountains. It runs close to the Indus River in north–east to south–west direction. Furthermore, northwest, parallel to the Khisore Range along the border of Dera Ismail Khan and Lakki Marwat Districts, is the Marwat range that runs up to Pezu pass in the southwest. The highest point in Khisore range is 1406 m above sea level while the highest point of Marwat range is 1376 m. The topographic elevation map of the proposed project site is represented below as **Exhibit 4.3.**

Exhibit 4. 3: Topographic Map of the Proposed Project Site



4.4 LAND USE PATTERN

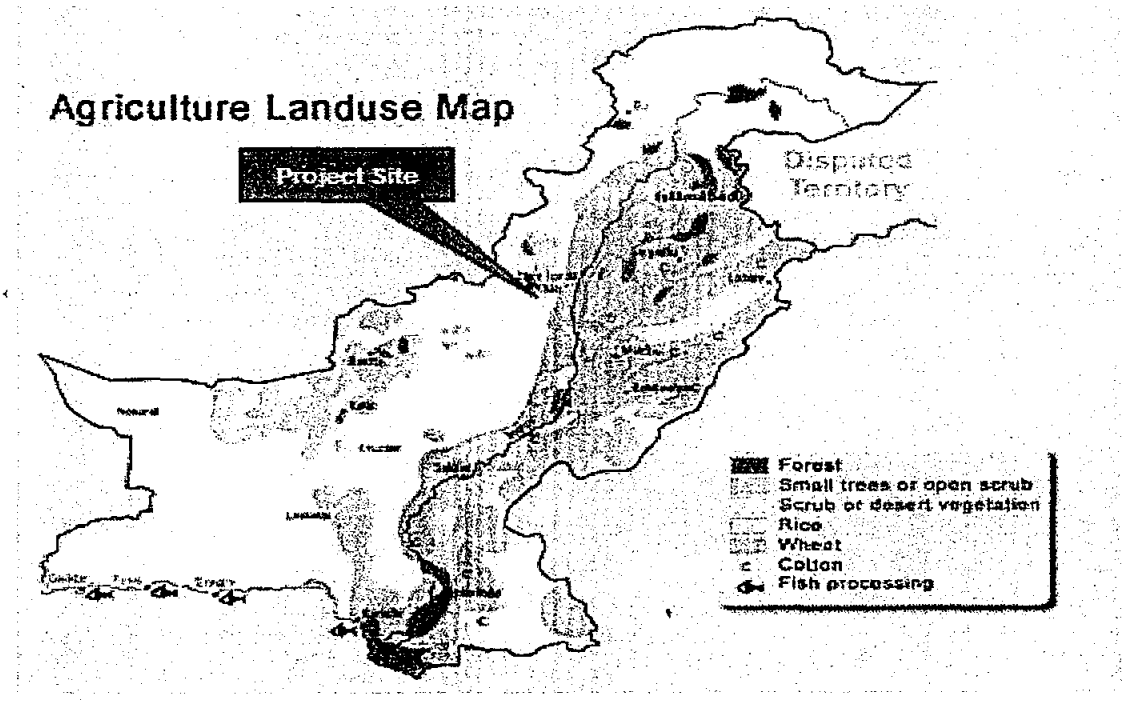
The land use of Dera Ismail Khan is initially dominated by agricultural fields and forest area. But, the proposed cement/lime plant and power plant specified area mostly dominated by barren land. The area is mainly barren land, A few patches of rain-fed (Barani) agriculture land also exist within the project site along the chashma road and village Bilout Sharif. Land Use pattern of the District Dera Ismail Khan is represented below as **Exhibit 4.4,** while the agricultural land use map of the project area can be seen as **Exhibit 4.5.**

Exhibit 4. 4: Land Use Pattern of District Dera Ismail Khan

Land Use Class	Area (Hectares)
Total Land	732,481
Cultivable Land	731,992
Irrigated	147,710
Rod Kohi (Hilll Torrent)	254,952
Rain fed	329,260

Source: IDV, Spate irrigation report 2003 and District Census Report, 1998.

Exhibit 4. 5: Agricultural Land Use of the Project Area



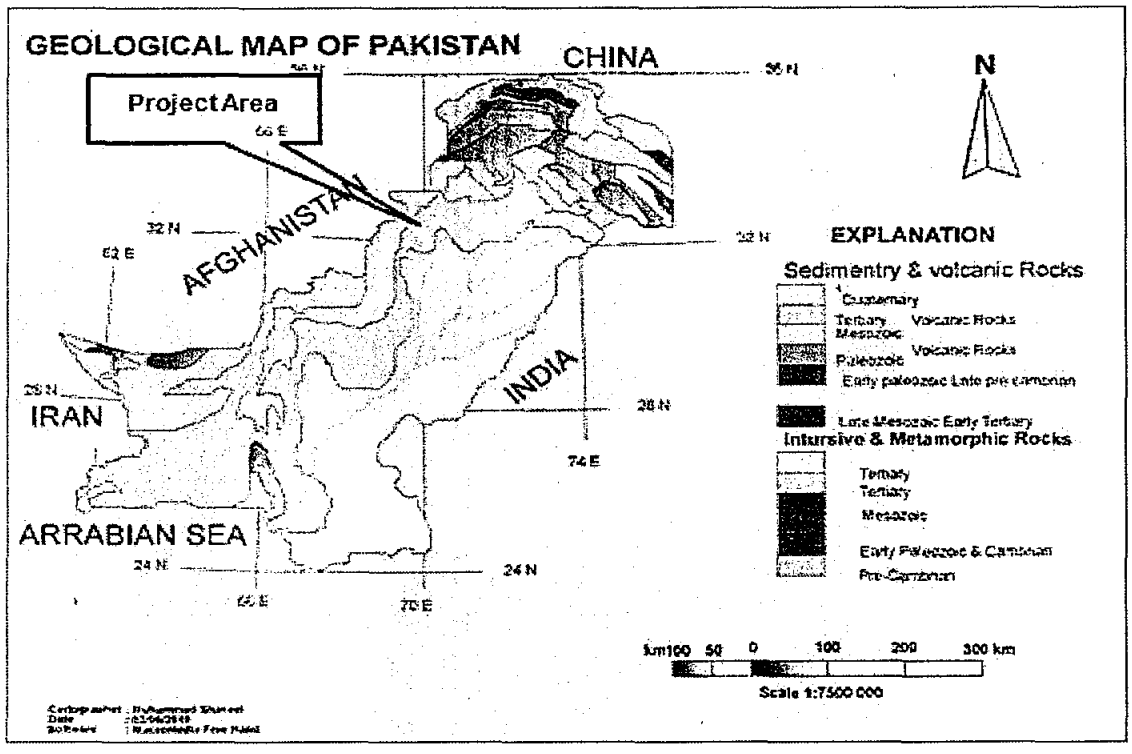
4.5 GEOLOGY AND SOIL

Dera Ismail Khan, the southernmost district of KPK, consists of an arid and stony plain penned in between the Indus and the western Sulaiman Hills. The whole plain, which extends down into the Punjab, is-known as Derajat.

Dera Ismail Khan occupies an area of 7,326 square kilometer. This area contains two main physiographic units: the alluvial low lands, which include the structurally undisturbed Indus plains, and the folded belt, which includes the Khisor, Marwat, Bhittanni and Suleman Ranges, as well as the highlands of Waziristan. These ranges and highlands form a nearly continuous mountain system between the Salt Range-Potowar Plateau region to the northeast and Baluchistan to the southwest.

Total Stratigraphic thickness exceeds 14,000 feet in the Khisor and Marwat Ranges. Sedimentary rocks of the following age are present mainly, Permian, Triassic, Jurassic, Cretaceous, middle and late Tertiary, and Quaternary. Lower Tertiary rocks are not present. Stratigraphic terminology for rocks in the Khisor and Marwat Ranges is the same as that used in the Salt Range and Potwar Plateau region to the northeast. The proposed project area marked on the geological map of Pakistan is represented as **Exhibit 4.6.**

Exhibit 4. 6: The Proposed Project Area Represented on the Geological Map of Pakistan



4.6 CLIMATE

The climate of the district Dera Ismail Khan is dry and hot in summer season and mild in winter season. Temperature begins to rise in April and the months of May, June, July and August are extremely hot. June is the hottest one in which the temperature shoots above 42 degree centigrade, while January is considered to be the coldest month of the year. Temperature reaching to mean maximum 41°Cand extreme maximum 49°C and down to mean minimum 5°Cand extreme minimum 2°C. The district experiences *extreme* seasonal variation in the perceived humidity. The higher humidity during summer due to higher rates of evapo–transpiration as the monsoon rain, irrigation and Kharif cropping pattern favors its rise. In May and June the humidity is very low. The hot wind, called loo, blows across the district. Following are the overall seasons of the project area:

- Winter (October to February) moderate to extreme and dry;
- Spring (March to April) pleasant with moderately cold;
- Summer (May to September) very hot to humid;
- Monsoons (June to August) wet. Although the temperatures are milder but due to appreciable humidity the heat is oppressive; and
- Post–Monsoon summer (September to October) moderate and slightly humid.

Exhibit 4.7 given below represents the Project Location with Reference to Temperature Regimes, whereas month wise 30 Years Mean Temperature and Relative Humidity recorded at Dera Ismail Khan Stations can be seen as **Exhibit 4.8** and **Exhibit 4.9** respectively.

Exhibit 4. 7: Project Location with Reference to Temperature Regimes

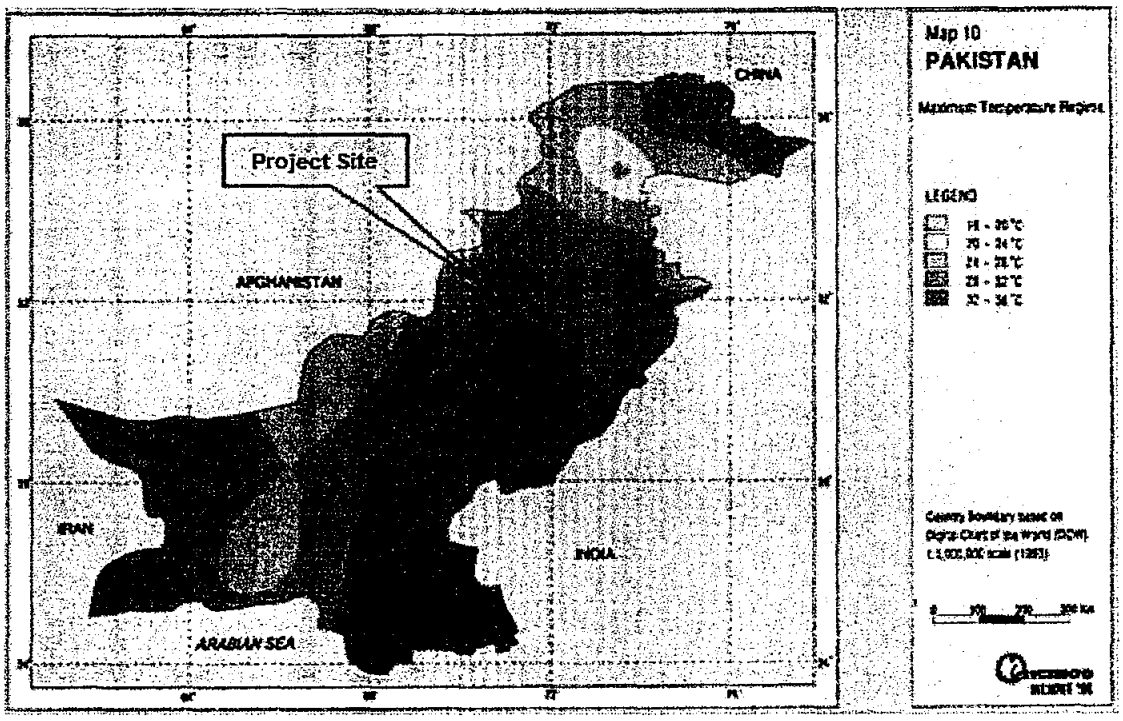
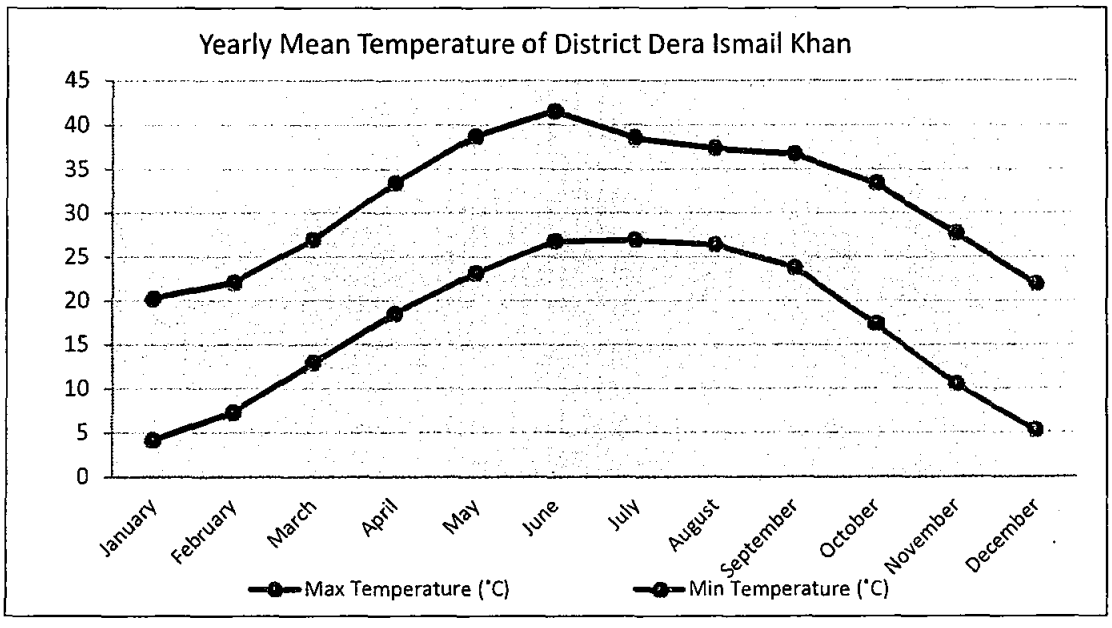
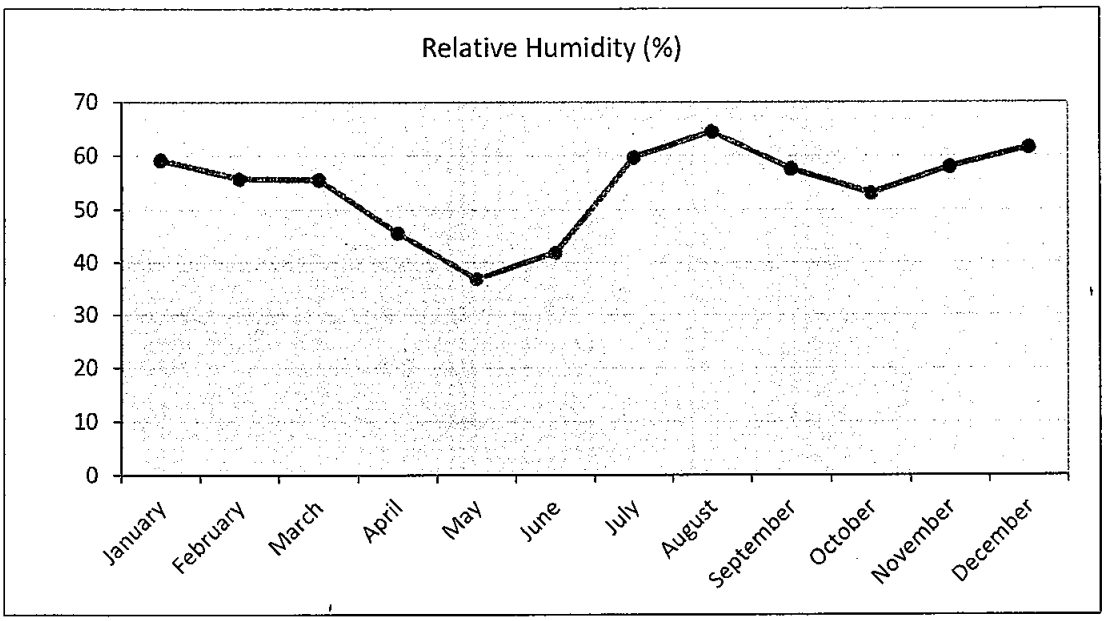


Exhibit 4. 8: Mean Maximum and Minimum Temperature



Source: Data Processing Center Pakistan Meteorological Department Karachi.

Exhibit 4. 9: Relative Humidity

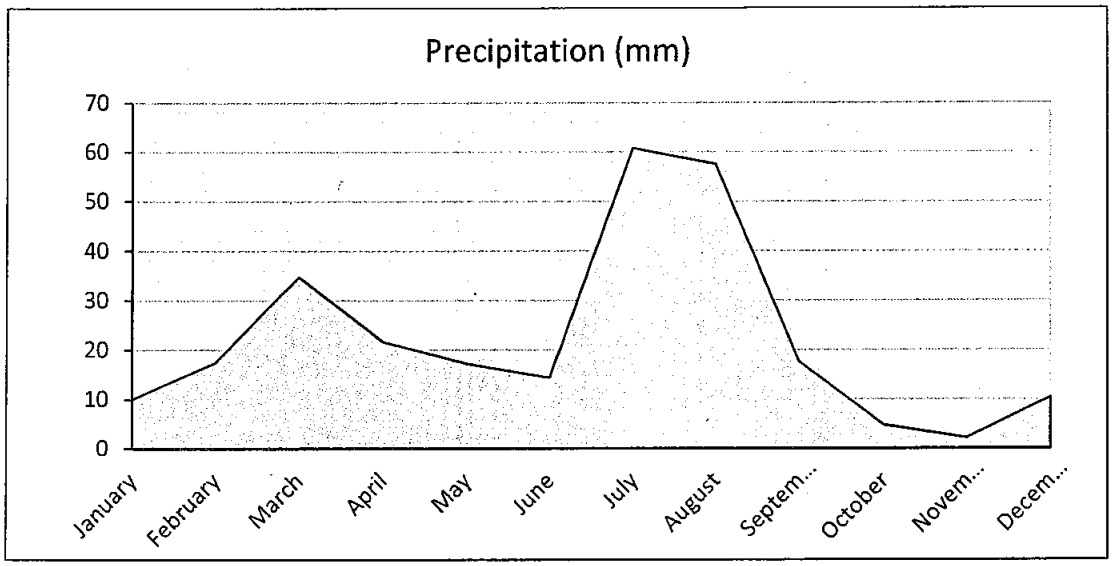


Source: Data Processing Center Pakistan Meteorological Department Karachi.

4.6.1 Rainfall

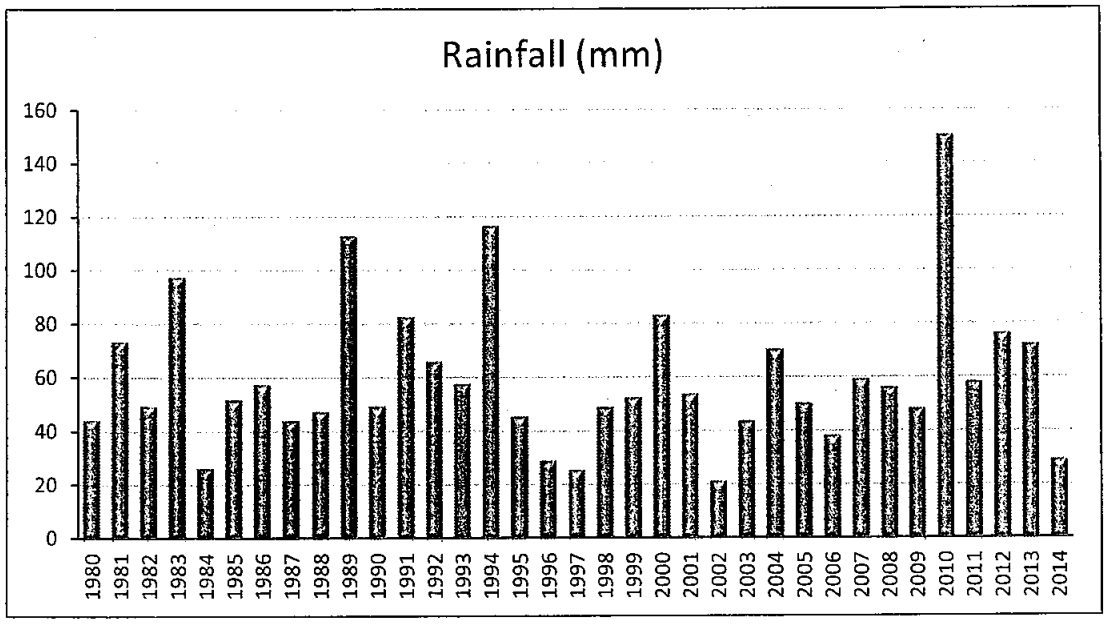
The district D.I Khan experiences little and very erratic monsoonal rains. Precipitation mainly falls in two distinct periods, in the late winter and early spring from February to April, and in the monsoon in June and July, the average annual rainfall varies from 290 mm on the hills in the north and not more than 200 mm in Ramak in the south. The Month wise 30 Years Mean Precipitation recorded at Dera Ismail Khan Stations can be seen as **Exhibit 4.10,** with its graphical representation as **Exhibit 4.12.**

Exhibit 4. 10: Average Precipitation (mm)



Source: Data Processing Center Pakistan Meteorological Department Karachi.

Exhibit 4. 11: Graphical Representation of One Day Annual Maximum Rainfall (mm) (From 1980 to 2014)



4.6.2 Wind Speed and Direction

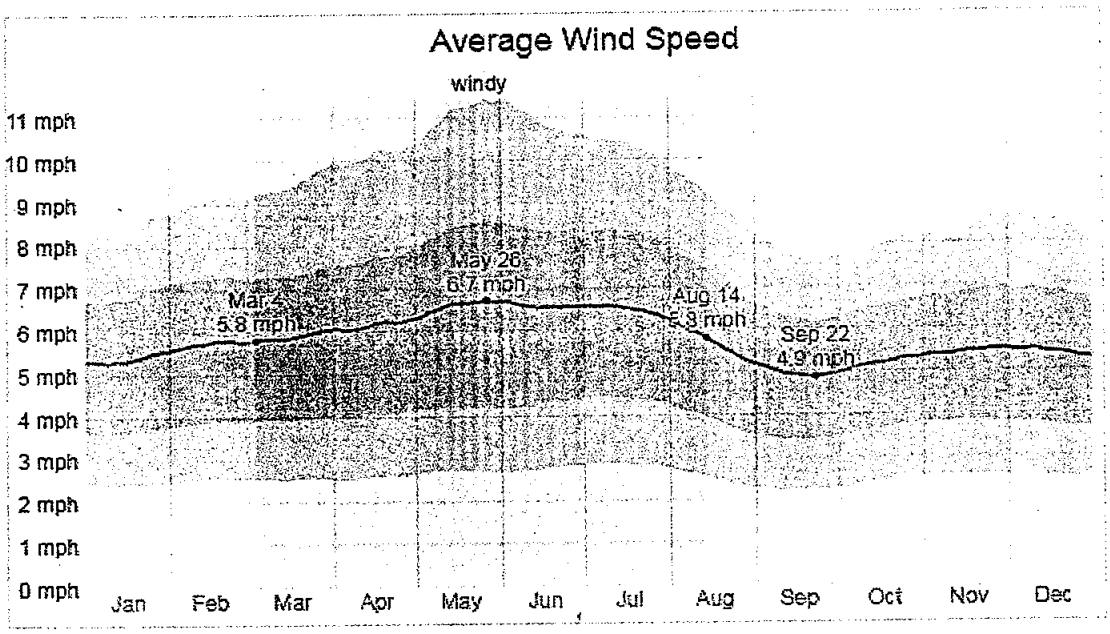
This section discusses the wide-area hourly average wind speed and direction at 10 meters above the ground. The average hourly wind speed and wind direction at Dera Ismail Khan experiences mild seasonal variation over the course of the year. The windier part of the year lasts for approximate 5 months, from March 4 to August 14, with average wind speeds of more than 5.8 miles per hour. The windiest day of the year is May 26, with an average hourly wind speed of 6.7 miles per hour.

The calmer time of year lasts for approximate 7 months, from August 14 to March 4. The calmest day of the year is September 22, with an average hourly wind speed of 4.9 miles per hour.

The wind is most often from the *east* for *1 month and a week*, from *May 18* to *June 24* and for *3 months*, from *July 11* to *October 8*, with a peak percentage of *48%* on *August 8*. The wind is most often from the *south* for *2.4 weeks*, from *June 24* to *July 11*, with a peak percentage of *44%* on *July 8*. The wind is most often from the *north* for approximate *7 months*, from *October 8* to *May 18*, with a peak percentage of *45%* on *January 1*.

Exhibit 4.12 and **4.13** shows the average wind speed and direction of wind in the proposed project area.

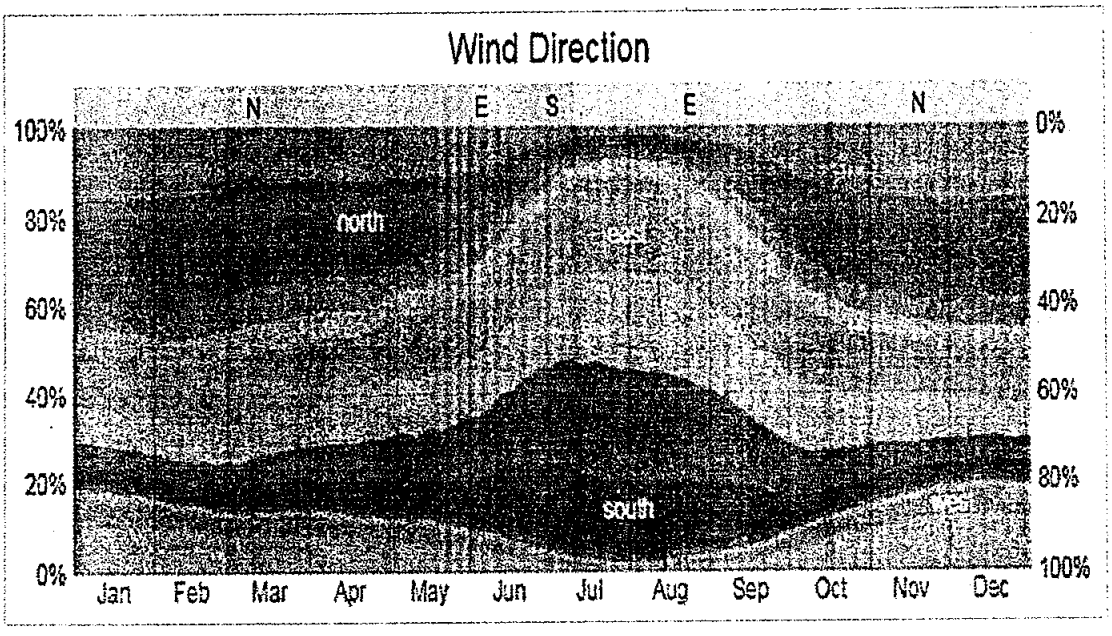
Exhibit 4. 12: Average Wind Speed (January 1-1980 to December 31-2016)



Dark Gray line represents the average of mean hourly wind speeds

Source: *Weather Spark.com*

Exhibit 4. 13: Wind Direction over the Entire Year (January 1-1980 to December 31-2016)



The percentage of hours in which the mean wind direction is from each of the four cardinal wind directions (north, east, south, and west), excluding hours in which the mean wind speed is less than 1 mph.

Source: *Weather Spark.com*

4.7 AMBIENT AIR AND NOISE QUALITY (AANQ)

Air pollution has a direct impact on the health of humans and the environment. Different emissions affect air quality, excessive level of noise is also harmful for the human health and its continuous exposure causes depression and can damage the nervous system. Focusing on the proposed project site, which is located in the Dera Ismail Khan, to assess the current conditions of the project site, air quality baseline parameters* was monitored at this location continuously for 24 hours. The ambient air monitoring and sampling was carried out by the Global Environmental Laboratory on 12th December, 2018 and the primary baseline data was compiled for baseline of the project surrounding.

Ambient Air Quality Baseline Parameters*

- SPM
- $PM_{2.5}$
- PM_{10}
- CO
- SO_2
- NOx
- Noise Levels

The ambient air and noise sampling location map is presented as **Exhibit 4.14** whereas the monitoring results along with graphical representation is given in **Exhibit 4.15** and **4.16** respectively.

Exhibit 4. 14: Ambient Air Monitoring Location Map

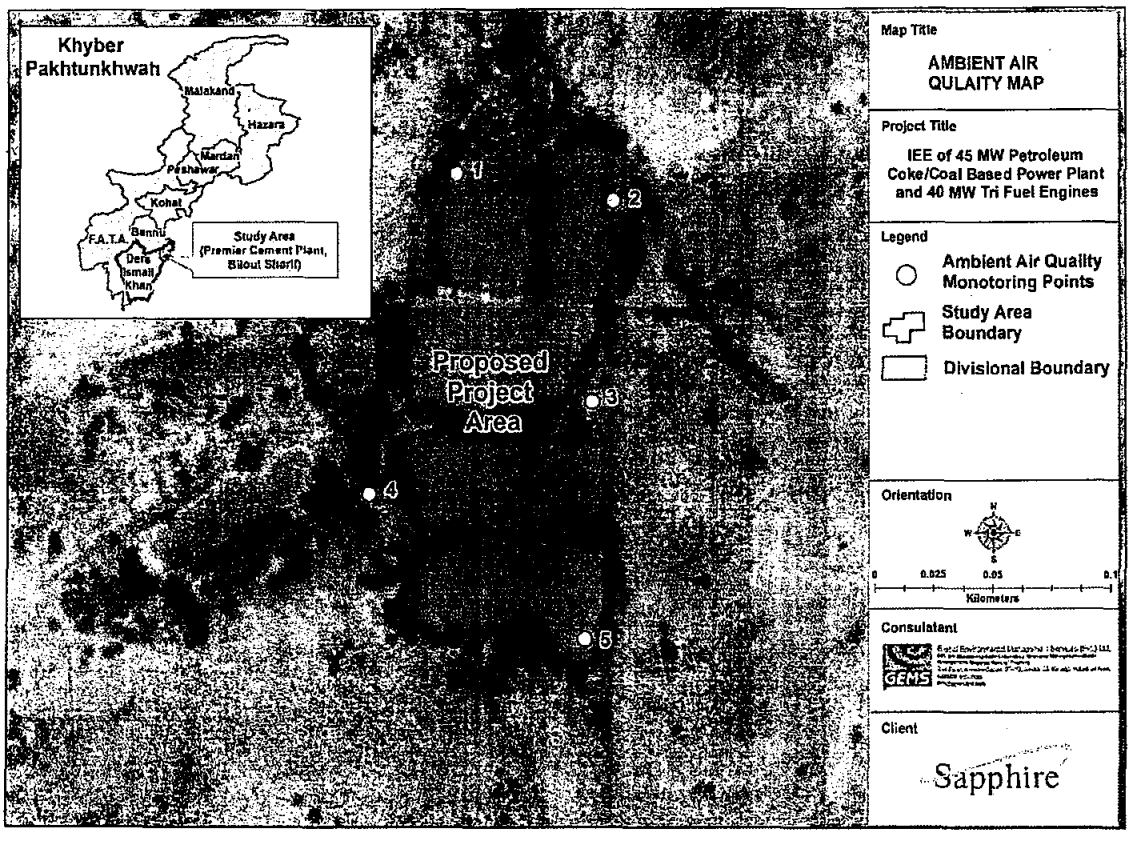
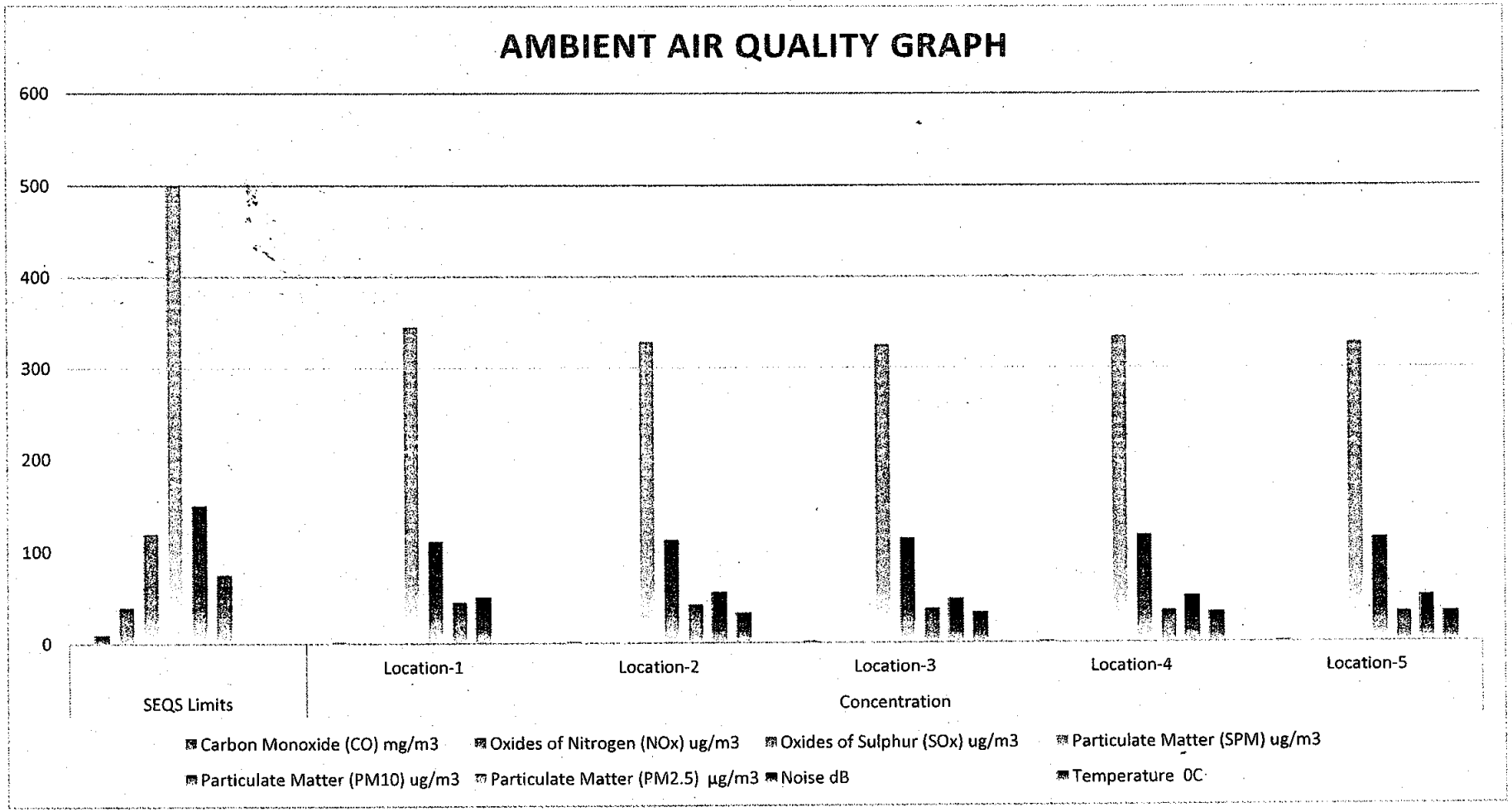


Exhibit 4. 15: Ambient Air Quality and Noise Monitoring Results

S.NO	Parameters	Units	NEQS Limits	Concentration				
				Location-1	Location-2	Location-3	Location-4	Location-5
1.	Carbon Monoxide (CO)	mg/m^3	10	02	02	02	02	02
2.	Oxides of Nitrogen (NOx)	ug/m^3	40	0.02	0.03	0.02	0.02	0.04
3.	Oxides of Sulphur (SOx)	ug/m^3	120	0.03	0.04	0.02	0.03	0.04
4.	Particulate Matter (SPM)	ug/m^3	500	345	328	325	335	327
5.	Particulate Matter (PM_{10})	ug/m^3	150	111	112	114	117	114
6.	Particulate Matter ($PM_{2.5}$)	$\mu g/m^3$	35	45	42	38	35	33
7.	Noise	dB	75dB (A)Leq Industrial Area-Day Time	50	55	48	50	50
8.	Temperature	^0C	---		32.8	32.8	32.7	32.6
9.	Relative Humidity	%	---		55.1	51.5	61.5	57.2

NEQS: National Environmental Quality Standards

Exhibit 4. 16: Graphical representation of Ambient Air Quality and Noise Monitoring Results at Proposed Project Site



4.8 WATER RESOURCES

This section details the water resources of the proposed project area. Both, surface and ground water resources have been summarized in this section of the report. Data was compiled from secondary sources and through field observations and data collection (IEE field survey).

4.8.1 Surface Water Resources

River Indus is the major surface water source of project area. It is perennial and flows throughout the year. It also causes floods in project corridor in the monsoon season, when it receives excessive rainfall water from upstream. A large number of intermittent and perennial streams enter the Dera Ismail Khan from the western Suleiman Mountains. The major streams which sustain perennial flow in Dera Ismail Khan are Tank Zam, Gomel River and Khora River (Daraban Zam).

Chashma Right Bank canal is located around 2 Km from the project area, traversing at Chashma road. Dera Ismail Khan's surface tapers down from Suleman Mountains on the west towards river Indus on the east, the canal cannot feed the area on its west (as it cannot flow from low to a higher point). A new project Chashma Right Bank Canal project envisages irrigating the western side of the canal. It is an extensive irrigation project constructing a 274-kilometer canal along the Indus River. Pictorial profile of Chashma Irrigation Link Canal can be seen as **Exhibit 4.17.**

Furthermore, to establish baseline of the proposed project area canal water was collected and subjected to chemical analysis in the laboratory to examine the quality of surface water. The **Exhibit 4.18** represents the laboratory results of canal water.

Exhibit 4. 17: Pictorial Profile of Chashma Irrigation Link Canal

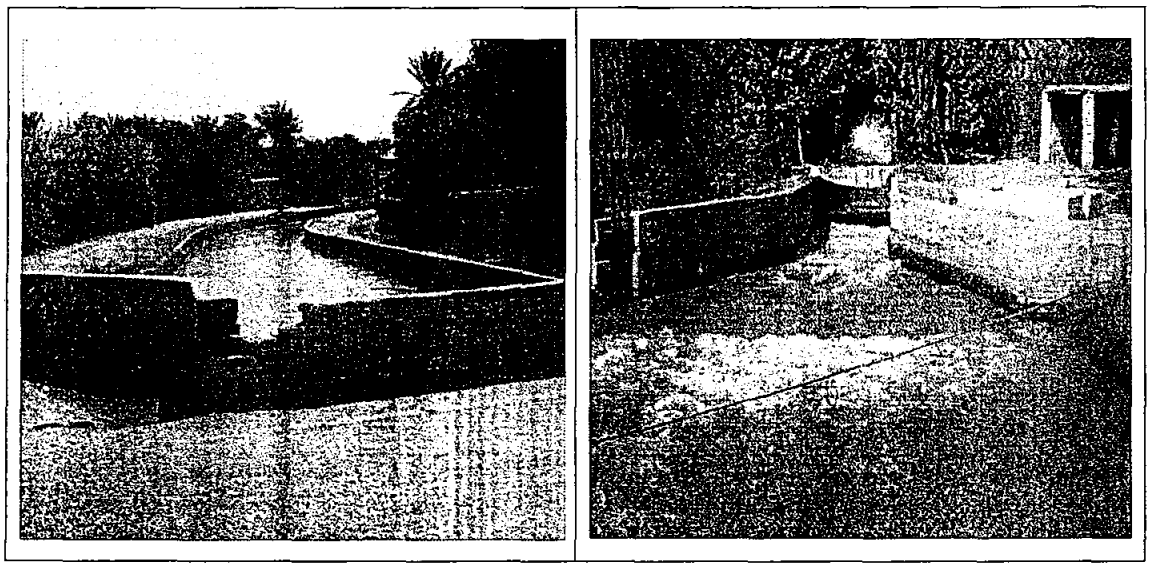


Exhibit 4. 18: Chemical Analysis Test Results of Canal Water

S. No	Parameter	Units	NEQS Limits	Concentration
1	Total Coliform / E.Coli	cfu/100ml	Must not be detectable in any 100mL sample	Negative
2	Color	TCU	≤15	32.7
3	Taste	---	Non-objectionable/ Acceptable	Acceptable
4	Odour	---	Non-objectionable/ Acceptable	Acceptable
5	Turbidity	NTU	< 5	45.2
6	Total Hardness as $CaCO_3$	mg/l	< 500	75
7	TDS	mg/l	< 1000	144
8	pH	---	6.5-8.5	8.1
9	Nitrate (NO_3)	mg/l	≤ 50	< 0.5
10	Nitrite (NO_2)	mg/l	≤ 3	< 0.06
11	Residual Chlorine	mg/l	0.2-0.5	< 0.01
12	Chloride (as Cl^-)	mg/l	< 250	13
13	Fluoride (F)	mg/l	≤ 1.5	0.2
14	Phenolic Compounds (as Phenols)	mg/l	-	< 0.001
15	Cyanide	mg/l	≤ 0.05	< 0.02
16	Cadmium (Cd)	mg/l	0.01	< 0.005
17	Chromium	mg/l	≤ 0.05	< 0.005
18	Copper (Cu)	mg/l	2	0.044
19	Lead (Pb)	mg/l	≤ 0.05	0.0204
20	Mercury (Hg)	mg/l	≤ 0.001	< 0.0001
21	Selenium (Se)	mg/l	0.01	< 0.005
22	Nickel (Ni)	mg/l	≤ 0.02	0.0206
23	Silver (Ag)	mg/l	1.0	< 0.005

S. No	Parameter	Units	NEQS Limits	Concentration
24	Zinc (Zn)	mg/l	5.0	0.08
25	Arsenic (As)	mg/l	≤ 0.05	0.0111
26	Barium (Ba)	mg/l	0.7	0.0794
27	Aluminum (Al)	mg/l	≤ 0.2	0.284
28	Manganese (Mn)	mg/l	≤ 0.5	0.0398
29	Boron (b)	mg/l	0.3	< 0.005

NEQS: National Environmental Quality Standards

4.8.2 Groundwater Resources

The major components of recharge of the groundwater aquifer in Dera Ismail Khan are sub–surface inflow of groundwater from the mountainous area, infiltration of surface runoff mainly of streams and rivers entering the area from the adjacent mountains and overland flow during heavy rains. The local population is generally reliant on installed hand pumps, electric motors and supply from tube wells. Freshwater wells are also present in the area. The chemical quality of ground water in the district varies area wise and depth wise. To establish baseline of the proposed project area groundwater was collected with subjected to chemical analysis in the laboratory to examine the quality of groundwater. The groundwater quality result is given as **Exhibit 4.19.**

Exhibit 4. 19: Chemical Analysis Test Results of Groundwater

S. No	Parameter	Units	NEQS Limits	Concentration
1.	Color	PTCO	≤ 15	22
2.	Total Hardness as $CaCO_3$	mg/l	< 500	277
3.	TDS	mg/l	< 1000	368
4.	pH	---	6.5-8.5	7.4
5.	Nitrate (NO_3)	mg/l	≤ 50	3.1
6.	Nitrite (NO_2)	mg/l	≤ 3	0.002
7.	Residual Chlorine	mg/l	0.2-0.5	0.01
8.	Chloride (as Cl^-)	mg/l	< 250	16
9.	Fluoride (F)	mg/l	≤ 1.5	0.56

S. No	Parameter	Units	NEQS Limits	Concentration
10.	Cyanide	mg/l	≤ 0.05	0.002
11.	Chromium	mg/l	≤ 0.05	< 0.005
12.	Copper (Cu)	mg/l	2	0.01
13.	Lead (Pb)	mg/l	≤ 0.05	< 0.0005
14.	Selenium (Se)	mg/l	0.01	< 0.005
15.	Nickel (Ni)	mg/l	≤ 0.02	0.0179
16.	Zinc (Zn)	mg/l	5.0	0.0327
17.	Arsenic (As)	mg/l	≤ 0.05	0.01
18.	Manganese (Mn)	mg/l	≤ 0.5	< 0.005
19.	Boron (b)	mg/l	0.3	0.0229m

NEQS: National Environmental Quality Standards

4.9 FAULTS, EARTHQUAKES AND SEISMIC HAZARD

Being located close to the collision boundary of the Indian and Eurasian plates, Pakistan lies in a seismically active zone. Pakistan is located in the Indus-Tsangpo Suture Zone, which is roughly 200 km north of the Himalaya Front and is defined by an exposed ophiolite chain along its southern margin. Seismic zone mapping of Pakistan has divided the country into four seismic zones ranging in term of major, moderate, minor and negligible zones with respect to ground acceleration values. Under this zoning Dera Ismail Khan lies in 2A region, which is low to medium seismic area. The detail about the seismicity along with the intensity is given as **Exhibit 4.20,** the tectonic map of Pakistan is presented in **Exhibit 4.21,** while the **Exhibit 4.22** represents the seismic map of Pakistan showing the Proposed Project area.

Exhibit 4. 20: Seismicity and Intensity

Sr.#	Earthquake Magnitude (1902–2014)	Seismic Zone
1	0.0-2.8	Zone 1
2.	2.9-5.0	Zone 2A
3.	5.1-6.0	Zone 2B
4.	6.1-7.0	Zone 3

Exhibit 4. 21: Tectonics Map of Pakistan

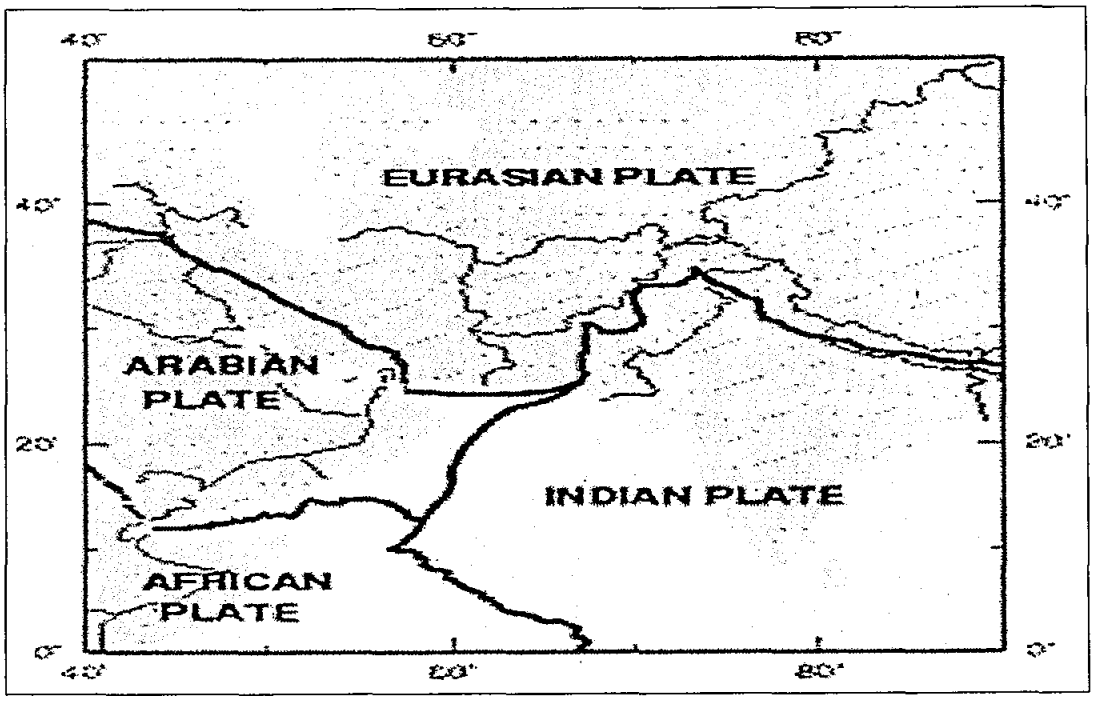
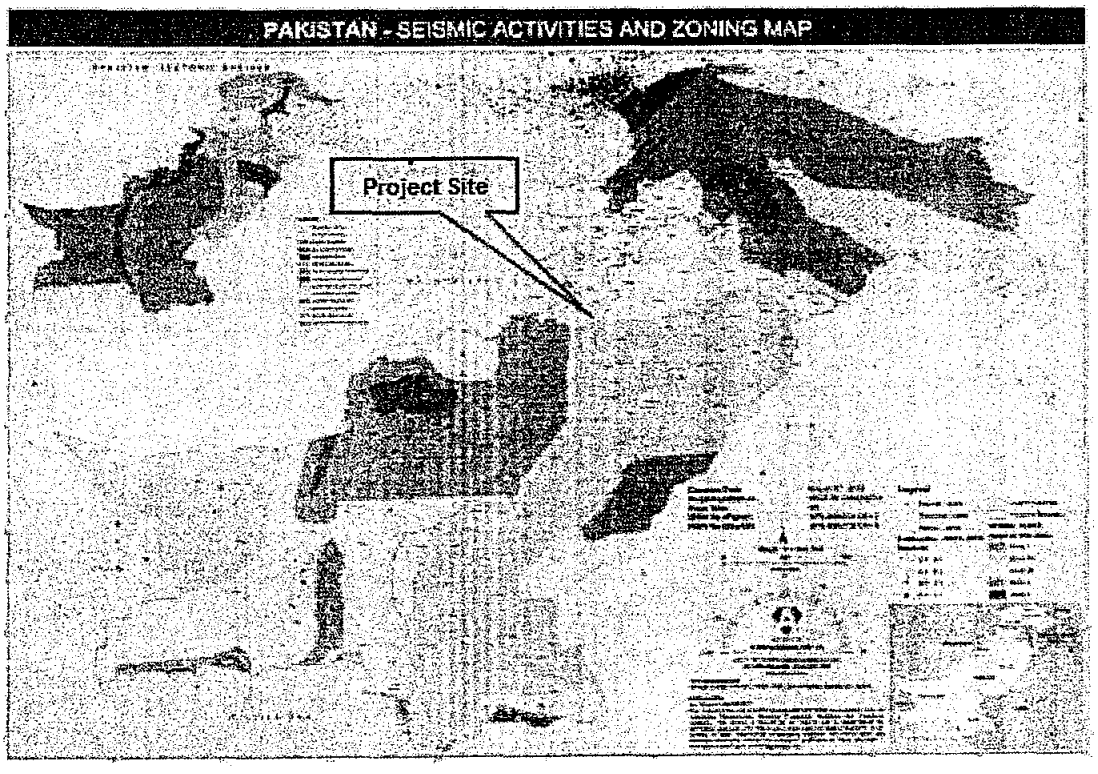


Exhibit 4. 22: Seismic Map of Pakistan Showing the Proposed Project Area.



4.9.1 Flooding

The surrounding area of the proposed site is not vulnerable to extreme flood event, despite the flood disaster on July 2010. But, the main Chashma road adjacent to the project site which links DI Khan to North Punjab (including Islamabad was badly damaged due to this event. Damage occurred to several interlinking bridges at different localities.

Monsoon rains started in Khyber Pakhtunkhwa on July 27, 2010, causing flash floods and eventually resulting in damages in several parts of DI Khan District. The area was cut off due to destroyed roads and collapsed bridges. Of the total 53,930 Households in 49 localities, 811 percent of Households was significantly affected by the disaster.

CHAPTER

5

ECOLOGICAL ENVIRONMENT

5.1 GENERAL OUTLINE AND SCOPE

This section gives the detailed description of the ecological environmental conditions of the study area. The proposed project area under review was assessed for its potential impact on biodiversity, and ecosystem in short and long term. The data collection techniques are combination of both primary and secondary means. Primary means by field verifications, observations, sampling and monitoring within the close proximity of proposed project area.

KEY FEATURES OF ECOLOGICAL BASELINE

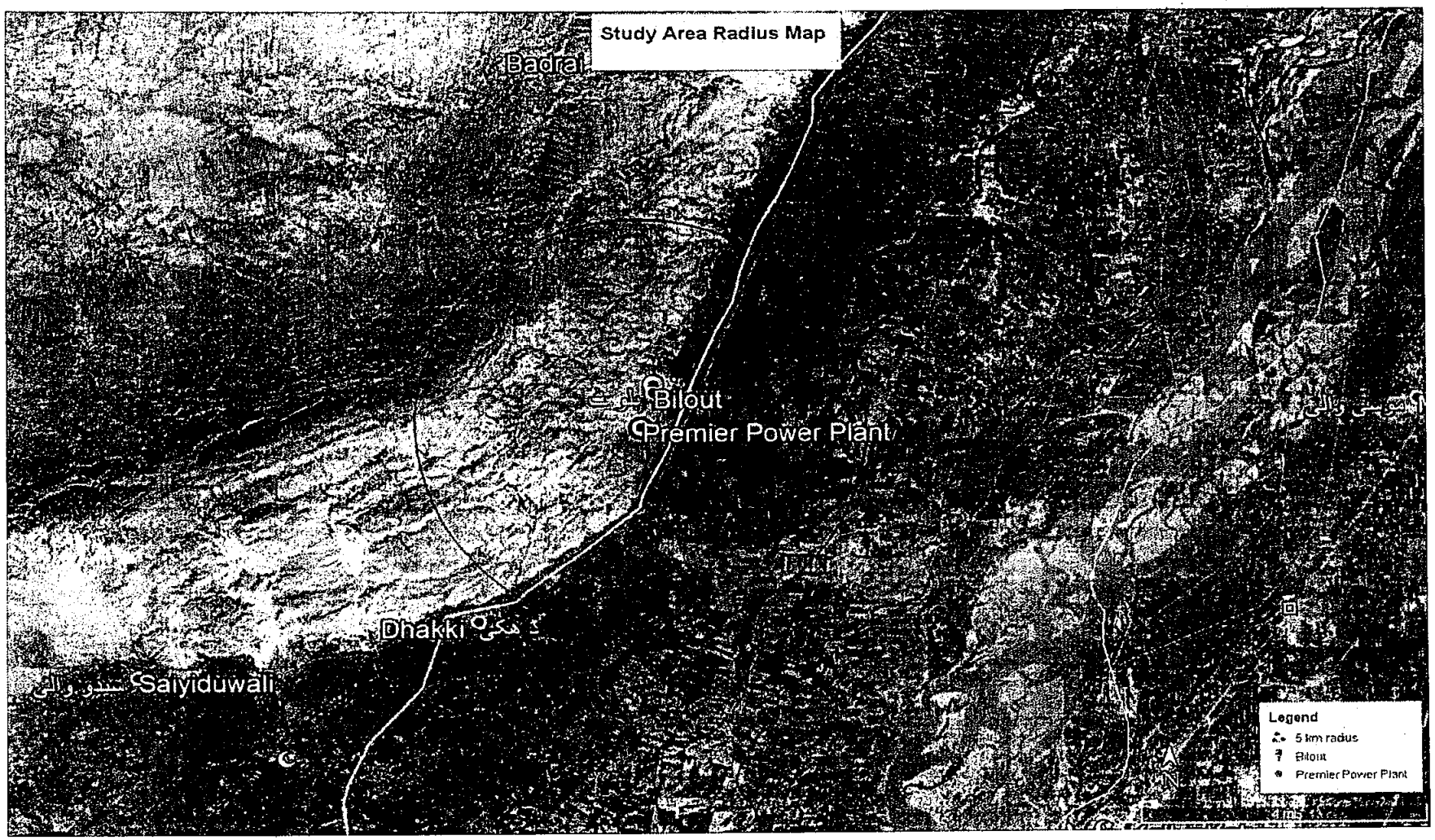
- ✓ General Habitation of Study Area under Focus
- ✓ Flora of The Study Area under Focus
- ✓ Fauna of The Study Area under Focus

The floral and faunal diversity was determined by random sampling in and around the area under focus. The objective of the study was to establish terrestrial ecological baseline of the proposed project site and its vicinity. Sampling locations for the identification of flora and fauna, assemblages were carefully selected so that the maximum number of species can be observed and significant ecological baseline be generated for the proposed project area. Data was also supplemented by secondary means, which included review of published literature and previous EIAs/IEEs studies, conducted in the proposed project surrounding areas. The base line data defines and elaborates the present ecological environmental quality and features of the proposed project surrounding

5.2 GENERAL HABITATION OF AREA UNDER FOCUS

The proposed project is located in the Khyber Pakhtunkhwa which is rich in biodiversity at the ecosystem, species and genetic level. These biological resources provide essential ecological services and a wide range of social, cultural, and economic benefits to the people. However the proposed project site is not located on any biologically sensitive area. The proposed project site does not have any sensitive species of Flora/Fauna. **Exhibit 5.1** given below represents the area under focus for ecological baseline establishment.

Exhibit 5. 1: Biodiversity Study Area under Focus



5.3 TERRESTRIAL FLORA

5.3.1 Survey/Sampling Methodology for Terrestrial Flora

The area surveyed by adopting a plot less methodology based on ocular observations was prepared for the proposed project area.

5.3.2 Brief Description

Most of the DI Khan district is a dry alluvial plain commonly referred to as "Daman". The only hills, within the district, are those of Khisore Range which lies in the north - eastern part of the district. The physiographic diversity of the KP province has given a unique status to the province with respect to its wildlife resources. The lowest elevation at Dera Ismail Khan support xerophytic vegetation and their associated species of wild fauna. The natural vegetation within and around the proposed project area is mostly composed of shrubs, planted trees but jungle at few places. The most common plants are Keekar, Masquit, Tamarix, Phulai, Ber, Sanatha, Kangan, Ak and Kaho. The linear plantations of medium to large sized trees are also planted around the Al-Abbas College at Chashma road, which are around 75-80 trees.

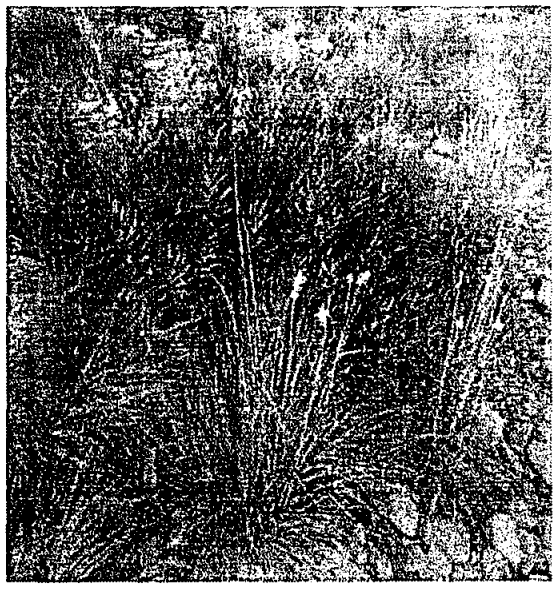
The different ecological divisions of the project area are the hills, up–lands, plain areas. The hills reflect a barren face with scanty vegetation. A few clusters of trees spotted in the depressions and along the low lying slopes. The general floral species observed in Dera Ismail Khan is presented as **Exhibit 5.2**, while the pictorial profile of common floral species observed at Dera Ismail Khan is represented as **Exhibit 5.3.**

Exhibit 5. 2: Floral Species Observed in Terrestrial Habitat of Proposed Project Area

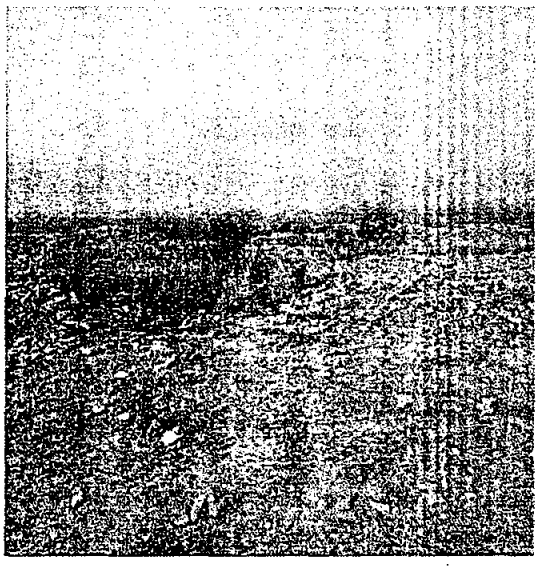
S. No	Plant Species Botanical Names	Common Names
1	*Alternantherasessilis*	Sessile joy weed
2	*Bacopa moneiri*	Water hyssop
3	*Bolboschoenus affinis*	Alkali bulrush
4	*B. glaucus*	Tuberous Bulrush
5	*Brachiaria ramose*	Browntop millet
6	*Centella asiatica*	Pennywort
7	*Coronopus didymus*	Swine cress
8	*Cyperus alopecuroides*	Foxtail flatsedge
9	*C. difformis*	Variable flat sedge
10	*C. iria*	Flat sedge
11	*C. pymaeus*	Pygmy fringetree

S. No	Plant Species Botanical Names	Common Names
12	*C. rotundus*	Nut–sedge
13	*Cynodon dactylon*	Bermuda grass
14	*Echinochloacrus–galli*	Barnyard grass
15	*Eclipta prostrate*	False daisy
16	*Eleocharis geniculate*	Spike–rush
17	*E. palustris*	Common spikerush
18	*Fimbristylis bisumbellata*	
19	*F. dichotoma*	Forked fringerush
20	*F. ferruginea*	West Indian Fimbry
21	*F. quinquangularis*	Five angle fimbry
22	*Mentha logifolia*	Horse mint
23	*Oxalis carniculata*	Wood–sorrel
24	*Paspalum papaliodes*	Water grass
25	*Phalaris minor*	Bird's seed grass
26	*Phragmites karka*	Common reed
27	*Phyla nodiflora*	Frog fruit, cape weed
28	*Polygonum barbata*	Joint Weed
29	*P. flaccidum*	Smart weed
30	*P. glabrum*	Marsh buckwheat
31	*Portulaca oleracea*	Purslane
32	*Pycreus flavidus*	
33	*Ranunculus muricatus*	Butter–cup
34	*R. scleratus*	Blister butter–cup
35	*Rumex detatus*	Toothed dock
36	*Schoenoplectus litoralis*	
37	*S. triqueter*	Streambank bulrush
38	*Suaeda fruticose*	Sea Blite
39	*Typha domingensis*	Southern cat–tail
40	*Typha elephantine*	Elephant grass

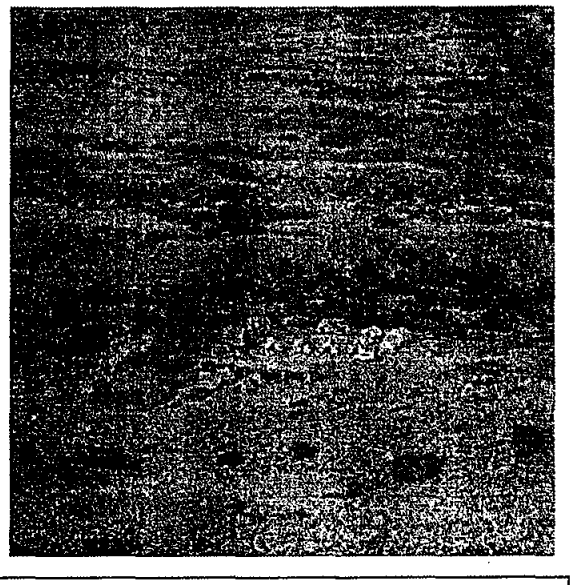
Exhibit 5. 3: Pictorial Profile of Common Floral Species Observed



Common Prevalence of Floral Species in the Proposed Project Area



Scattered Patches of Herbs and Shrubs



Aerial View Showing the density of flora within and around the Project Area

5.3.3 Conservation Status

Based on information available in the EIA/IEE for projects in Dera Ismail Khan, and literature review, no threatened or endemic terrestrial plant species has been reported from the Study Area. In addition, their distribution is not limited to any specific site or habitat type, and is widespread.

5.4 TERRESTRIAL FAUNA

5.4.1 Survey/Sampling Methodology for Mammalian Fauna

Direct count method was adopted to identify total number of identified species during the ecological / baseline surveys.

5.4.1.1 Brief Description

The most commonly seen mammals in the proposed project area include the hog deer, ravine deer, black buck and blue bull. Jackals, porcupines and mongoose are also found in the area. Additionally, the records were obtained for the species within the District, local people, government authorities including District forest/wildlife offices were consulted to gather information regarding the mammal species found in the proposed project area and detail of the species of mammals recorded is given below as **Exhibit 5.4**.

Exhibit 5. 4: Mammalian Fauna Observed at Proposed Project Area

S.No	Common Name	Scientific Name
1	Atali weasel	*Mustela altaica Pallas*
3	Goral	*Naemorhedus*
4	Hog deer	*Axis porcinus*
6	Long tail marmot	*Marmota caudata*
7	Long eared bat	*Plecotus auritus*
8	Indian Grey Mongoose	*Herpestes edwardsii*
9	Stoat	*Mustela erminea*

5.4.1.2 Conservation Status

Based on information available in the EIA/IEE for projects in Dera Ismail Khan, and literature review, none of the species has been reported from the Study Area as protected, threatened or included in the CITES appendices except the Indian Grey mongoose which is listed on CITES Appendix III by India. This species is found in numerous protected areas. Populations are not quantitatively monitored in any country; but the species remains widely and commonly seen in human-dominated areas, indicating a lack of significant ongoing threats and no need for conservation action[1].

[1] http://www.iucnredlist.org/details/41611/0

5.4.2 Survey/Sampling Methodology for Herpetofauna

The area was surveyed by active examining during the day with the ocular observations. The sampling sites were actively searched for all types of reptiles with a focus on their microhabitats.

5.4.2.1 Brief Description

The specimens were identified with the help of the most recent keys available in literature (Khan, 2006). A low abundance and diversity of the reptiles species has been observed and reported in the study area such lizards, snakes and Geckos. Many species of snakes and lizards are now endangered due to increased population, by the hunting through their predator and increased use in medical and educational field.

The natural bio-diversity of the project area has been extremely threatened by a number of 'mega-development' initiatives such as the construction of the Chashma–Jhelum link canal and large-scale industrial plants in district Dera Ismail Khan. However, some species of reptiles were recorded during field visit in the Dera Ismail Khan. **Exhibit 5.5** represents the species of reptiles recorded in the proposed project area.

Exhibit 5. 5: List of Reptiles observed at Proposed Project Area

S.No	Common Name	Scientific Name
1.	Common house Geckos	*Hemidactylus frenatus*
2.	Common ground lizard	*Zootoca vivipara*
3.	Monitor Lizard	*Varanus*
4.	Snakes	*Serpentes*

5.4.2.2 Conservation Status

Based on information available in the EIA/IEE for projects in Dera Ismail Khan, and literature review, none of the species has been reported from the Study Area as protected, threatened or included in the CITES appendices and IUCN Red List 2014.

5.4.3 Survey/Sampling Methodology for Endemic Birds

To estimate avifaunal diversity of the proposed project area individual count technique was used by using binocular spotting technique during field surveys and the identified species were immediately recorded and reported accordingly.

5.4.3.1 Brief Description

Avifauna in the proposed project area is mainly found along the Indus River and hilly areas of Salt Range. It is important to note that due to seasonal variation all the reported avifaunal species of the

project area were not sighted during the field surveys therefore additional support from previous EIA/IEE studies was taken in this regard as well as the information was gathered from district wildlife department. The avian species, which are quite abundant and common in the project area, include sparrows, crows, pigeon, dove tiliar (starling), lal mena, parrot, quail, pintail, and humming bird etc. A detailed list of identified avifaunal species is presented as **Exhibit 5.6**.

Exhibit 5. 6: List of Avifaunal Species observed at Proposed Project Area

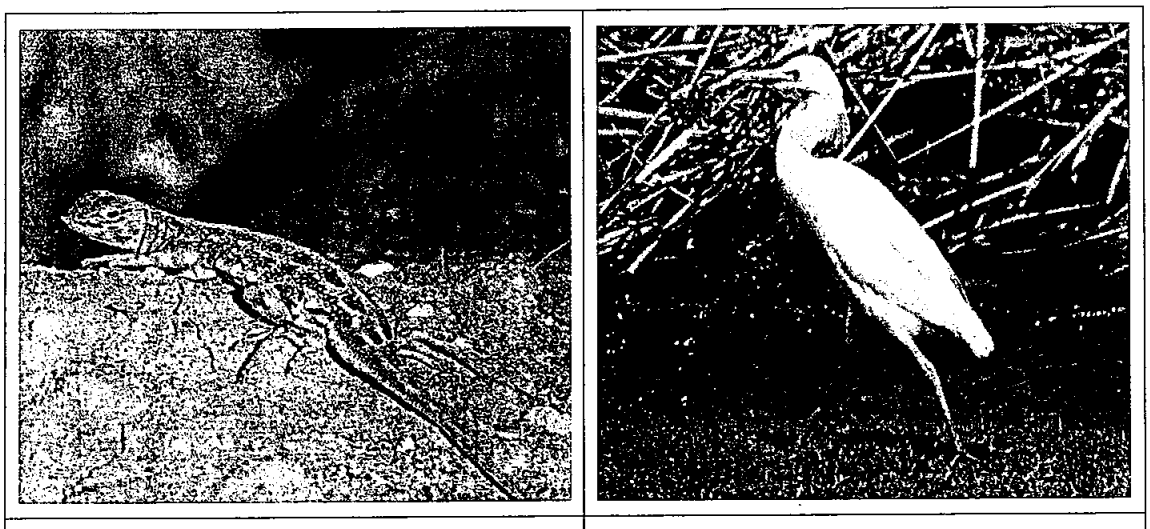
S. No	English Name	Scientific Name
1	Black–necked grebe	*Podiceps nigricollis*
2	Little cormorant	*Microcarbo niger*
3	Great cormorant	*Phalacrocorax carbo*
4	Cattle egret	*Bubulcus ibis*
5	Great egret	*Ardea alba*
6	Intermediate egret	*Ardea intermedia*
7	Little egret	*Egretta garzetta*
8	Purple heron	*Ardea purpurea*
9	Grey heron	*Ardea cinerea*
10	Indian pond heron	*Ardeola grayii*
11	White stork	*Ciconia ciconia*
12	Spoonbilli	*Platalea Linnaeus*
13	Grey laggoose	*Anser anser*
14	Bar–headed goose	*Anser indicus*
15	Ruddy shel duck	*Tadorna ferruginea*
16	Northern pintail	*Anas acuta*
17	Common shel duck	*Tadorna tadorna*
18	Spot–billed duck	*Anas poecilorhyncha*
19	Common teal	*Anas crecca*
20	Mallard	*Anas platyrhynchos*
21	Gadwal	*Mareca strepera*
22	Eurasian wigeon	*Mareca penelope*
23	Shoveler	*Spatula clypeata*
24	White breasted water hen	*Amaurornis phoenicurus*
25	Moorhen	*Gallinula Brisson*
26	Common coot	*Fulica atra*
30	Northern lapwing	*Vanellus vanellus*
31	Red wattled lapwing	*Vanellus indicus*
32	White–tailed plover	*Vanellus leucurus*

33	Little ringed plover	*Charadrius dubius*
36	Redshank	*Tringa totanus*
37	Little stint	*Calidris minuta*
38	Common sandpiper	*Actitis hypoleucos*
39	Indian river tern	*Sterna aurantia*
40	Great black headed gull	*Ichthyaetus ichthyaetus*
41	Herring gull	*Larus argentatus*

Exhibit 5.7 given below presents the pictorial profile of Avifaunal and Reptile Species observation through Telescope, while the pictorial profile of terrestrial fauna observed at proposed project area is represented as **Exhibit 5.8.**

Exhibit 5. 7: Terrestrial Fauna of the Proposed Project Area

Exhibit 5. 8: Patterns of Avifauna species and Reptile Species observation



Common ground lizard	Little egret

CHAPTER 6

SOCIO-ECONOMICS & CULTURAL ENVIRONMENT

6.1 GENERAL OUTLINE AND SCOPE

A team of experts comprising of a sociologist and an environmental assessment specialist carried out a comprehensive study of socio-economic and cultural environment of the proposed project surrounding. The approach and methodology was a combination of primary and secondary data gathering techniques much of the secondary data was extracted from previous IEEs studies conducted in the project surrounding. This section of the report represents the assessment of the socio-economic baseline of the proposed project surrounding based on social surveys, the data were collected from randomly selected sample villages/settlements located around 5 kilometers from the project site through formal and informal consultation and carried out an in–depth socio economic survey in the project surrounding.

KEY FEATURES OF SOCIO ECONOMIC ASSESSMENT

- Administrative Setup
- Demographic
- Amenities
- Health
- Education
- Livelihood
- Economics

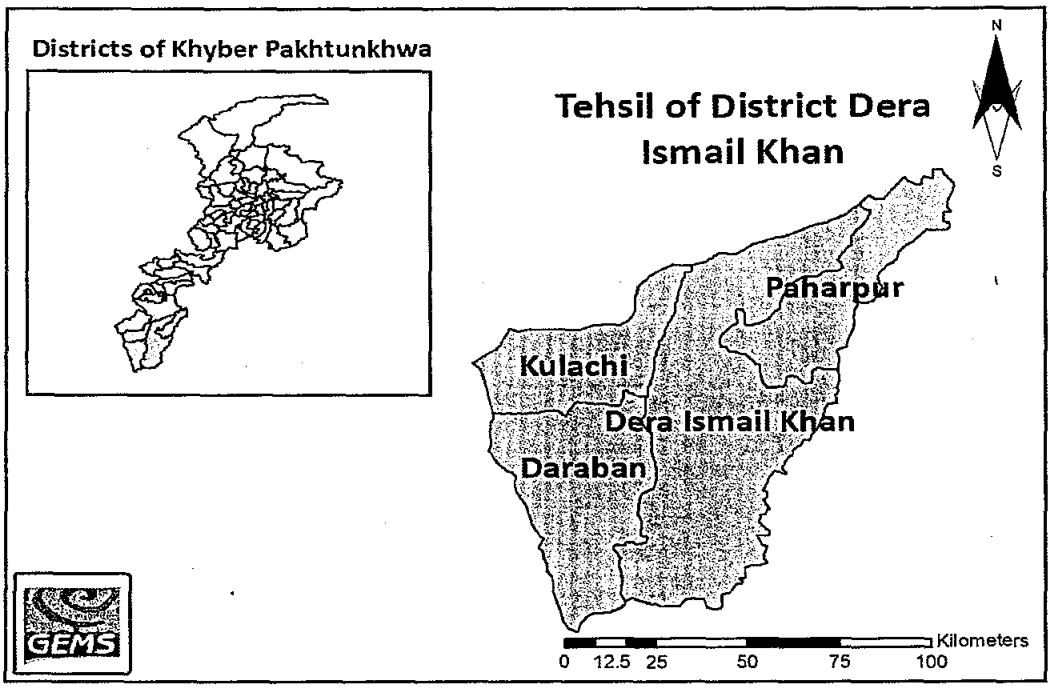
The socio-economic assessment is focused on evaluation of population, languages, literacy rate, educational facilities, health facilities, diseases, available utilities, access to social amenities, road access, availability and medium of transport, occupational statistics, water resources and basic needs of the people living in the area.

The information gained, helped in the measurement and determination of the impacts (positive and negative) on social services, livelihood and cultural pattern of the population under study.

6.2 PROJECT LOCATION AND ADMINISTRATIVE SETUP

Dera Ismail Khan is one of the 26 districts in the Khyber Pakhtunkhwa province of Pakistan. The district has an area of 7,326 km^2 and it is the third largest district with respect to area in the 26 settled districts of the province. The district Dera Ismail Khan is subdivided into 4 tehsils namely Dera Ismail Khan, Kulachi, Daraban and Paharpur which contain a total of 47 Union Councils. The district of Dera Ismail Khan is bounded on the east by the Mianwali and Bhakkar districts of Punjab, to the southwest by South Waziristan district, and to the northwest by Tank and Lakki Marwat districts. The proposed project area is located adjacent to Bilot Sharif village, which is around 56km in north from Dera Ismail Khan (KPK, Province), located on chashma road, near chashma right bank canal and associated with Kohisan Mountains. The administrative map of district Dera Ismail Khan is represented below as **Exhibit 6.1.**

Exhibit 6. 1: The administrative map of district Dera Ismail Khan



6.3 TRAFFIC INLETS AND OUTLETS

The proposed project lies in the district Dera Ismail Khan, it is well connected with various cities in Pakistan. D.I. Khan has its own airport, which connects the southern districts of Khyber-Pakhtunkhwa with other parts of the country. D.I. Khan Airport links the city with various Pakistani cities. The local administration is working on the development and maintenance of roads and infrastructures and has led to the development of link roads. Following are the considerable major access roads of the district.

- Dera Ismail Khan Mianwali Road
- Indus Highway
- Dera–Chashma link road
- Tank-Dera Ismail Khan Road

6.4 DEMOGRAPHICS

Dera Ismail Khan often abbreviated to D. I. Khan was created as an administrative unit of British India, part of the Derajat Division of the North-West Frontier Province, because it is and has historically been Pashtun land. It was formerly divided into two almost equal portions by the Indus River, which intersected it from north to south. According to Census 1998, the population of D.I. Khan was 852995 with an inter-censual percentage increase of 72.5 percent since March 1981 when it was 494,432. The average annual growth rate was 3.26 percent during this period. The growth rate in Dera Ismail Khan is the 7th highest among NWFP districts.

Mainly the population is Muslim, the others are minorities and include Hindus, Sikhs, Christians and Ahmadis. The local residents of D.I. Khan are called "Dera Waal"[1]. Furthermore the Consultation with local inhabitants were also conducted which revealed the population of nearby village such as Bilout Sharif of the proposed project area is around 18000-20000 at present. Overall, the population of Dera Ismail Khan district for the years 1998 (Actual) and 2016 (Projected) are presented as **Exhibit 6.2.**

Exhibit 6. 2: Population of Dera Ismail Khan

District	Population (1998)	Annual Growth Rate	Projected Population for 2016	Gross Area of District	Population Density (Persons/Km)
Dera Ismail Khan	852995	3.26	1519584	7326	207

6.5 NETWORKING AND BUSINESS ACTIVITIES

In Dera Ismail Khan the major proportion of total population is self-employed, others are private employees and government employees. The major occupation in project area is agricultural farming, livestock raring, small businesses and service in public and private sectors. Poor segment of population mainly count on agricultural and unskilled labour activities. The industrial activity in the district Dera Ismail Khan is restricted primarily to small, owner-financed units, operating without government oversight with the exceptions of one or two. There are abundant Limestone and Gypsum deposits in the northern mountains and Sherani hills but area remained under explored. The Sheikh Budin limestone, Lucky Cement Factory, Tribal textile mills, Pak Germen Wood Working Centre, National Woollen Mills and Chashma Sugar Mills are major industrial units in the district. Lucky Cement Limited is one of the largest export houses of Pakistan with the production capacity of 25,000 tons per day of dry process cement and 7.75 million tons per annum. Lucky Cement is Pakistan's first company which exports sizeable quantities of loose cement being the only cement manufacturer to have its own loading and storage terminal at Karachi Port. Moreover, small flour and oil mills also functioning in the area which fulfil local demand[2]. There is a chain of national, district and rural networks of roads in the area. Farms are linked with markets by roads network. Major and important roads of the district are Dera–Chashma link road and Indus highway. Mostly people of the area rely on their own transport sources along with the few mini bus service.

6.6 LIVELIHOOD

There are few livelihood opportunities available for the people of the proposed project. The local economy is chiefly pastoral, with agriculture practiced in a few fertile valleys. Agriculture is the source of income, food and general livelihood for the rural farmers. The traditional Rabi and Kharif crops are cultivated to the respective season. Wheat and grams in Rabi and cotton and pulses in

[1] *https://www.waterinfo.net.pk/sites/default/files/knowledge/Dera%20Ismail%20Khan%20%20Profile%20of%20District%20with%20Focus%20on%20Livlihood%20Related%20Issues%20-%20South%20Asia%20Partnership-Pakistan%20-%202009.pdf*

[2] *adp.gkp.pk/wp-content/uploads/2013/09/KP-SADP_ESA-final_by_KP_-team_October-23-2012-online.pdf*

Kharif are the major crops in irrigated area of project while, in rain fed areas wheat and barley in Rabi season and ground nut and Jawar are the major crops.

Furthermore, most households of the project are engaged in primary-level activities such as subsistence agriculture and livestock rearing, or small-scale business conducted locally. Others are involved in trade within the tribal belt or with down-country markets. Women take active part in agricultural activities, collect fuel wood and fetch water, besides attending to household work and family duties.

Livestock breading is one of the main resource of livelihood of rural and urban population of the project area and serve as an important source of income, it is also a source of rural transport and draft power in agricultural farming. According to survey data average household keeps livestock in small herd of 2 to 5, depending upon the household landholding size and capacity to store the crop residues, fodder and feed animals during the winter. The district D.I. Khan is very famous for livestock production and the landless and smallholders are mostly dependent on it. The sheep, goats, cows and camels are common livestock animals of the district. Additionally, trade of Dhakki Date to other part of the country is another major source of livelihood of the project area. Pictorial profile of typical livelihood of the district Déra Ismail Khan can be seen as **Exhibit 6.3.**

Exhibit 6. 3: Pictorial Profile of Typical Livelihood of District Dera Ismail Khan

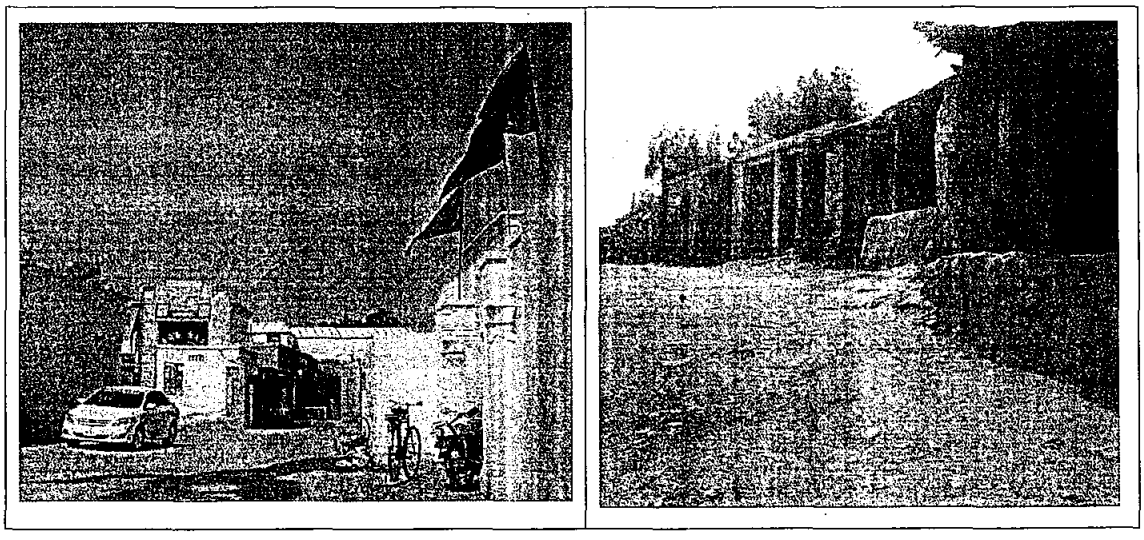
Common Livestock Animals

Agricultural Practices within the Project Area

6.7 HOUSING STRUCTURE

There was mixture of Pacca, Semi Pacca and Kacha houses in the project area except nearby cities like Bilout Sharif, New Choora and Nagri Shah Isa where most of the houses are Pacca. Eighty percent (80%) total houses in project area were Pacca. While, remaining 20 percent fall in the category of Kacha and Semi Pacca. It was observed that all the people were living in self owned houses. Pictorial representation of the housing structure of the proposed project area is given below as **Exhibit 6.4.**

Exhibit 6. 4: Structure of Houses in Nearby Villages



6.8 DRINKING WATER

The easy access to potable drinking water is one of the basic human needs. Clean drinking water in proposed project area is supplied through different sources i.e. tapped water supply, hand pumps, wells, rivers and springs. Tapped water has become the major source of water supply, using plastic pipes. Tapped water supply is considered to be the most hygienic source of drinking water, which is available only in some part of the project area. During consultation it was observed that ground water and drinking water quality has been contaminated due to sewage seepage problem. Most of the people in project area use untreated water.

6.9 EDUCATION

Education has significant impact on the life of an individual and families and serves as key indicator of any socio-economic development of any area and region. According to the population Census of 1998, literacy rate in district Dera Ismail Khan is 31.28%. For male the literacy rate is high (i.e. 43.19%) than the females (i.e.17.86%), which is significantly below than national literacy level of 55%[3]. The renewed educational facilities of the district includes Gomal University, Gomal Medical College, Al-Khair University, Allama Iqbal Open University, Qurtaba University[4]. It was observed during the survey of the project surrounding that educational institutes in the rural areas have shortage of proper staff, furniture, science and computer labs etc. It was observed that Al Abbas College across the chashma road is located within the acquired land for construction of cement plant. The detailed list of educational facilities of the district is presented below as **Exhibit 6.5**, while its pictorial representation is shown in **Exhibit 6.6.**

[3] https://nha.gov.pk/wp-content/uploads/2017/07/Documents-For-Hakla-D.I.Khan-Final-EIA.pdf

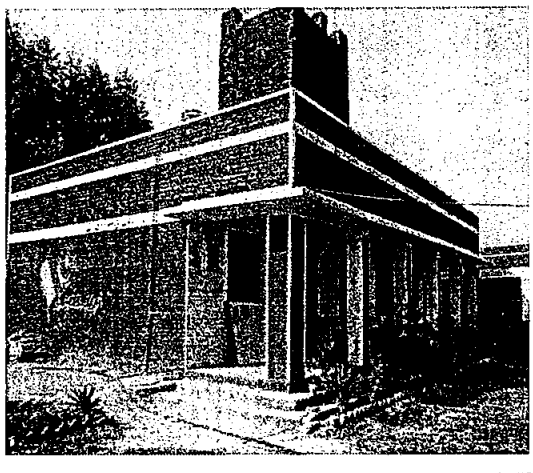
[4] https://www.adb.org/sites/default/files/project-document/82531/37192-044-iee-06.pdf

Exhibit 6. 5: Educational Facilities of the District

Sr. #	Category	Dera Ismail Khan
1	Post Graduate College	4
2	Degree College	10
3	Inter College	4
4	Higher Secondary School	35
5	High School	99
6	Middle School	174
7	Primary School	1244
8	Mosque School	55
9	Vocational/Technical Training Institute	62

Exhibit 6. 6: Educational Facilities of the Proposed Project Area

Al Abbas Science School and College



Government High School Bilout Sharif

6.10 HEALTH

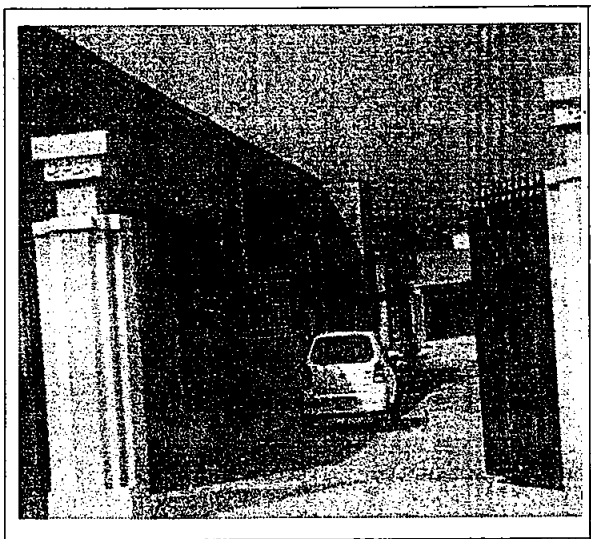
Health care facilities are available within the jurisdiction of the Dera Ismail Khan at different areas. During the consultation with local people of the project surrounding it was observed that hospitalization, rural health centers and mother/child centers are present in all nearby areas of the Dera Ismail Khan, though these health care facilities are not well established as required according to the population. Health care facilities in Dera Ismail Khan are given below as **Exhibit 6.7**whereas the pictorial profile is presented as **Exhibit 6.8** respectively.

Exhibit 6. 7: Health Care Facilities

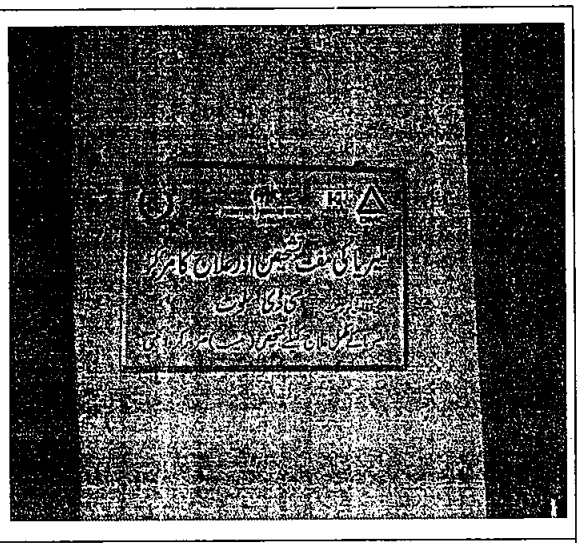
Sr. #	Facilities	Dera Ismail Khan
1	Hospitals	7
2	Basic Health Units (BHUs)	39
3	Dispensaries	24
4	Rural Health Centers (RHC)	4

Source: Health facilities Assessment-Punjab Rawalpindi District, 2011

Exhibit 6. 8: Health Care Facilities in Dera Ismail Khan



Basic Health Unit in Bilout Sharif



Frontier Primary Health Care Bilout Sharif

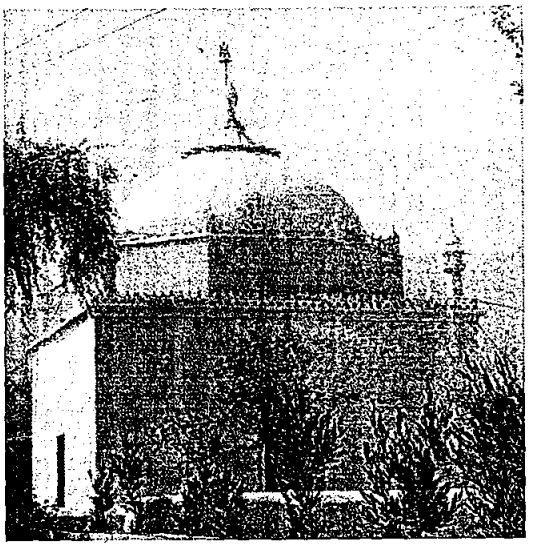
6.11 CULTURE, ETHNICITY AND RELIGION

Dera Ismail Khan is characterized by a very strong tribal bounds and very rich ethnic diversity and cultural heritage. There are about one dozen major tribes with several smaller tribes and sub–tribes. The people of the project area have adopted a mix lifestyle. Saraiki is the native language of Dera Ismail Khan, but Pashto and Hindko are also spoken fluently. Officially Urdu and English both are used the area is the confluence of Pashtun and Balochi tribes. So a little bit of Balochi is also spoken and understood in some parts.

In Dera Ismail Khan, festivals are celebrated with full zeal and zest. Both Eids are greeted with full religious fervor and people visit their relatives and neighbors after the 'Eid' prayers. 'Urs' of saints is also an important festival celebrated by people of the area. Rural people especially participate in these 'Urses' and 'Melas'. There is also one Hindu temple (Caval Ram Mandar) located around 5 Kms from the project site, and currently Hindu people often comes to this temple for religious practices.

During consultation, it was also revealed that people from India visit this temple every year during March April. There are many religious institutions around the project area where students from all over the Dera Ismail Khan are seeking religious education. The pictorial presentation of the religious places of proposed project area is shown below as **Exhibit 6.9.**

Exhibit 6. 9: Religious Places of Proposed Project Area

	
Caval Ram Mandar	

6.12 ARCHAEOLOGICAL AND CULTURAL HERITAGE

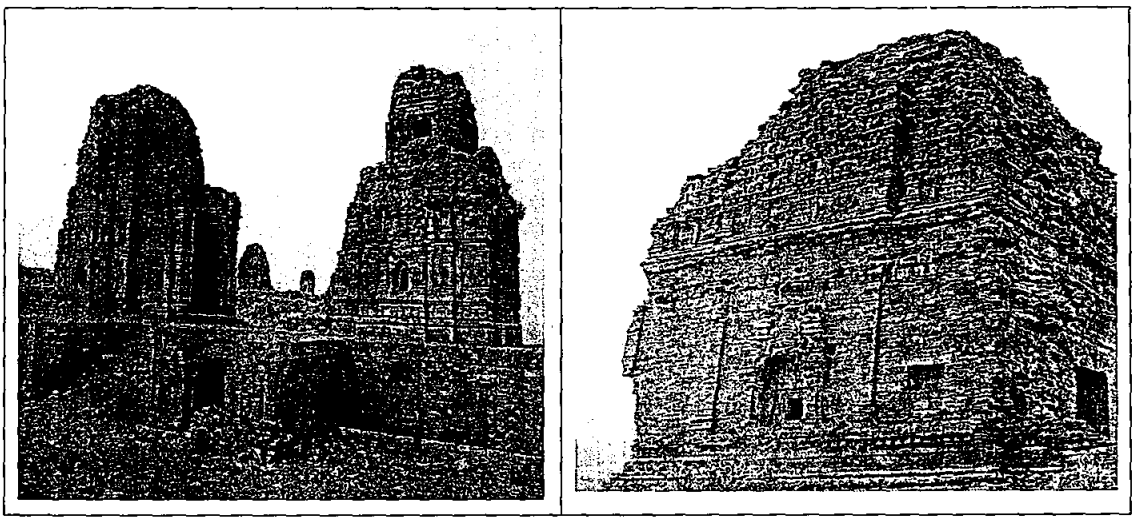
One Archaeological or Cultural Heritage site is identified near to COI of proposed cement plant project known as Northern Kafir Kott Fort stands on low hills and is clearly visible from the road, there are three main temple and shrines on the same plinth. The carving deep chiseled and reminiscent of Mayan sculpture, is fine and well preserved.

The Northern Kafir Kot Fort is about 6 km north of the western end of Chashma Barrage. The fort commands a splendid defensive position. It covers a rubble-strewn area of about 25 hectares (62 acres). Inside there are four temples, two badly eroded, the others intricately carved. The best preserved walls including a fate are on the north side of the fort; the walls are about 8 meters (20 feet) high[5]. The pictorial profile of the Cultural sites is presented below as **Exhibit 6.10.**

Premier Cement Limited has signed a separate contract with the department of Archeology and Museums KPK whereby, Premier Cement Limited will help the department by restoring the temples and also the surrounding areas and road access.

Exhibit 6. 10: Cultural Sites of the Proposed Project Area

[5] http://sadp.gkp.pk/wp-content/uploads/2013/09/KP-SADP_ESA-final_by_KP_-team_October-23-2012-online.pdf



6.13 RECREATIONAL AREAS

The existing city of Dera Ismail Khan is a relatively new, rebuilt after flood of 1823 and many of its original structures are still visible around the city. A popular tourist destination is a pre–Islamic fort called Bilout, 30 miles (48 km) from the Dera Ismail Khan on Chashma highway situated on a hill, also known as Kafir Kott. This site is also considered as Archeological Site.

Exhibit 6. 11: Socioeconomic Features of the Dera Ismail Khan District

Well Being Indicator	*Name of Town / Area*
	Dera Ismail Khan
GPS Coordinates	**32°14'18.32"N.** **71°8'37.96"E**
Major Communities	Urdu-speaking, Saraiki, Pashto, Balochi
Livelihood	Farmer, Labor, small-scale business, shops, Public and private jobs
Electricity	Available
Fueling Source	Available
Major Educational Institutions	Gomal University Qurtaba University
Literacy Rate	Low
Drinking Water	Tapped water supply, hand pumps, wells,
Health Facilities	Not Satisfactory
Major Hospitals	Frontier Primary Health Care, Bilout Sharif
Major Needs	Govt. hospitals. Modern Schools, Security, Drinking Water, Continuous Electricity
Major Markets	Small Markets and Shops
Transport	Motorcycle, cars, Mini Buses

CHAPTER 7

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

7.1 SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

This section discusses the potential environmental and social impacts of the proposed activities, predicts the magnitude of the impact, assesses its significance and recommends mitigation measures to minimize adverse environmental impacts. The discussion starts with a description of the methodology used for the impact assessment. Discussion of the environmental and socioeconomic impact is then organized in the following manner:

- Impacts associated with construction phase
- Impacts associated with operational phase of proposed Power Plant.

7.2 IMPACT ASSESSMENT METHODOLOGY

Potential impacts from the proposed project activities were identified by review of the project activities, study of surrounding environment, review of literature, review of previous similar studies and expert judgment. Once potential impacts have been identified, the assessment of each potential impact follows these steps:

7.3 ENVIRONMENTAL IMPACTS ASSOCIATED WITH CONSTRUCTION AND OPERATIONAL PHASE

7.3.1 Land Use and Soil

Potential Issues

The proposed project will not involve any mega impact on land as the proposed building will be required for development of power plants, therefore no potential issues were identified. However the impact may arise by leaking of oils & other lubricants etc. to the soil, it should be noted that such kind of impact will only arise in case of spills or leakages of such lubricants and soil may get contaminated. Moreover, excavation activities for laying of foundations of storage tanks may result in soil erosion. Moreover, excavation activities for laying of foundations of building structure may result in soil erosion.

Criteria for Determining Significance

There are no standards in Pakistan for maintaining the physical, chemical, or biological properties of soil. An adverse impact on the land will be interpreted if the land as a result of the project activities becomes unsuitable for the purpose for which it was originally intended.

Impact Analysis

The most significant impact will be the changes in the soil structure and degradation of soil quality as a result of erosion and compaction. Moderate amount of soil will be eroded during excavation and laying of foundations. However, cumulatively it is expected that there will be no significant impact on soil. The soil quality will be primarily checked by the contractors and civil works will be done accordingly. Quality of soil may be adversely impacted in case of accidental spill or leakages of oils and or other lubricants.

On the other hand it is important to note, that the impact is only associated with construction phase which may include: excavation, accidental spillage of oils and other lubricants or chemicals used during construction phase

Mitigation Measures

- The construction activities will be planned to minimize disturbances to soil;
- Only limited area should be excavated which is required for laying foundation
- All possible chemicals, lubricants, adhesives, paints etc must be stored at an impermeable area where leakage or leaching in soil is completely ruled out;
- Use of such liquids will be monitored and recorded on site;
- Movement of heavy vehicles, which are expected to carry heavy machinery for proposed construction sites will be restricted to marked pathways only and unnecessary movements will be avoided to reduce soil disturbance;
- Regular inspections will be carried out to detect leakages in construction vehicles, equipment, and storage tanks;
- Appropriate arrangements, including shovels, plastic bags and absorbent materials, will be available near fuel and oil storage areas;
- Contaminated soil will be removed and properly disposed after treatment such as incineration or soil remediation technique etc.

7.3.2 Environmental Impacts during Operation Phase

Impact on Air Quality

Impact assessment of the ambient air quality is one of the key issues for the coal/petroleum coke based power plant Project. This study provides detail emission estimates and air quality result to assess the air quality in the project areas. Construction activities will cause temporary increase in

pollutant emission while operation of power plant will be causing emission of pollutants during the Project life leading to increase the ground level concentration of air pollutants. The air pollutants considered in the air quality analysis include Sulfur dioxide (SO_2), Oxides of nitrogen (NO_X), carbon monoxide (CO), and particulate matters less than 10 microns and 2.5 microns in diameter (PM_{10} and $PM_{2.5}$).

Pollutants of Concern

The power plant will be run though imported coal/petroleum coke which will be transported by covered conveyer belt from the storage yard. Emissions from the power plant are a serious concern especially for the coal/petroleum coke based power plant project. In addition, the proposed other coal-fired power plants will also be a significant source of emissions in the air-shed. Potential pollutants of concern released from the proposed coal/petroleum coke fired power plant are Sulfur Dioxide (SO_2), Nitrogen oxides (NOx), Particulate Matter ($PM_{2.5}$ and PM_{10}) and Carbon Monoxide (CO). The amount of SO_2 released is dependent on the properties of the fuel, the higher the sulfur content of the fuel, higher the amount of SO_2 will be released. High levels of SO_2 can lead to acid rain, which damages crops, forests, and soils, and acidifies lakes and streams. Combustion of coal/petroleum coke can also be a significant source of particulate matter. Ash is the main source of particulate maters. Coal/Petroleum Coke-fired power plants also tend to release a significant amount of particulate matter in the form of soot and fly ash. The formation of thermal NOx is dependent on 3 factors during combustion; (i) oxygen concentration, (ii) peak temperature, and (iii) time of exposure at peak temperature. Fuel combustion releases NOx which is composed of NO and NO_2. NO_2 is of particular concern and is considered a criteria pollutant. NO_2 is used as the indicator for the larger group of nitrogen oxides (NOx). In addition to contributing to the formation of ground-level ozone, and fine particle pollution, NO_2 is linked with a number of adverse effects on the respiratory system. Significant health risks are associated with high levels of ambient NO_2, CO and $PM_{2.5}$ concentrations. Emissions from the power plant are estimated for two scenarios (i) Baseline scenario and (ii) project case scenario.

Pollution Abatement Measures

Abatement of Particulate Matter

Handling and storage facilities of coal/petroleum coke shall be equipped with dust suppression system. The conveyor belt shall be covered and the transfer point shall be equipped with dust suppression system. Hence, dust generation from coal/petroleum coke handling and storage activities shall be minimum and within the standard limit. Nevertheless, sometime, within the close proximity of the handling and storage facilities, SPM of the local air might rise but automatic dust sensor and suppression system shall control the generated dust. The options of removing particulate matter from exhaust gases using cyclones, bag houses (fabric filters), and ESPs have been reported. Bag houses can achieve removal efficiencies of 99.95% or better for particulate matter of all sizes. ESPs are available in a broad range of sizes for power plants and can achieve removal efficiencies of 99.7% or better for particulate matter of all sizes. The choice between a bag house and an ESP will depend on fuel and ash characteristics, as well as on operating and environmental factors. As per feasibility study, the coal/petroleum coke combustion process will produce maximum 12.77% ash (design specification) from the total coal/petroleum coke inflow. In order to maintain the standard limit of particulate matter (e.g. PM_{10} & $PM_{2.5}$) controlling devices must be added before the flue gas emission. Based on

technical and economic analysis, Electrostatic Dust Precipitator (ESP) has been selected for each of the unit.

Application of Flue Gas Desulphurization System (FGD)

Flue gas desulphurization (FGD) is the current state-of-the art technology used for removing Sulphur dioxide from the exhaust flue gases in power plants. SO_2 is an acid gas and thus the typical sorbent slurries or other materials used to remove the SO_2 from the flue gases are alkaline. [1]

Advanced Flue Gas Desulphurization (AFGD) processes can be categorized as (a) wet and (b) dry or semidry systems. In most wet FGD systems, SO_2 is removed from the flue gas by reaction with a calcium-based sorbent in an aqueous solution or slurry. A relatively high degree of SO_2 removal is usually achieved, with a high level of sorbent utilization. In addition, wet FGD systems generally achieve excellent particulate removal because of intimate contact between the gas and liquid phases. Dry and semidry FGD systems involve injecting a solid sorbent (dry), usually limestone, or a sorbent slurry (semidry), usually lime, into the furnace or flue gas duct; the by-product solids are collected in a dry form along with the fly ash from the boiler in the existing particulate removal equipment. Compared with wet FGD systems, SO_2 removal efficiency and sorbent utilization are usually lower. [2]

The AFGD unit successfully achieved the target of removing more than 90% of the SO_2 from the flue gas. Five Midwestern bituminous coals, having sulfur contents between 2.25% and 4.5%, were burned during this demonstration. SO_2 removal efficiency averaged 94%, with a maximum of over 98%. The facility was operated for 26,300 hours during the demonstration, with system availability of 99.5%. High availability eliminates the need for a spare absorber.

- **Particulate matter**

Dust emissions will cause Particulate matter to disperse in the environment. This may occur due to excavation activities, vehicular movement on unpaved areas and improper piling or stacking of raw materials.

Criteria for Determining Significance

There will be no long term significant impact on air quality. Since the proposed project does not included heavy construction activity and civil works will be completed within a limited time scale, as readymade steel building will be mounted on project site. In both construction and operational phase, a significant effect on the environment will be interpreted if there is an increase in visible dust or emissions beyond the boundaries of the proposed project site due to activities undertaken at site

Impact Analysis

Potential issues of particulate matter emission may arise from dust emission by Vehicle and machinery movement, excavation activity and compaction of land during construction phase. However during operation phase the generator will be the only source of gaseous emission.

[1] 130 International Journal of Chemical Engineering and Applications, Vol. 3, No. 2, April 2012

[2] Advanced Technologies for the Control of Sulfur Dioxide Emissions from Coal-Fired Boilers

Mitigation Measures

- Installation of proper exhaust systems and fans will be ensured prior to paint activities in order to reduce the exposure probability of VOCs in the ambient environment; this would also reduce the severity of health effects.
- Machineries involved in power generation should be tuned so VOCs maintained
- It should be ensured that all the vehicles, machineries and or generators that may be used in future will be properly tuned in order to reduce the probability of other emissions.
- Emission reduction techniques should be employed on a regular basis.
- Sprinkling of water on unpaved areas will be done so that less dust emissions are emanated from vehicular movement.
- Speed limits must be kept at minimum.

Residual Impacts

The effects of the VOCs and particulate matter nuisance are temporary with no long lasting impact expected after the completion of proposed project.

Monitoring Requirements

- Periodic monitoring of stack emissions from the generators will be carried out and recorded to ensure continued compliance with NEQS.

7.3.3 Noise Level

Depending on the construction equipment used and its distance from the receptors, the commuters travelling on the road and the nearby industries may exposed to intermittent and variable noise levels however the chances of locals getting exposed to noise is quite low since the project activities would only be limited within premises..

In general, human sound perception is such that a change in sound level of 3dB is just noticeable, a change of 5dB is clearly noticeable, and a change of 10dB is perceived as a doubling or halving of sound level.

Potential Issues

No potential issues are comprehended. However, noise levels during construction works might be elevated which may affect the workers themselves. Therefore, care must be taken during the works.

Criteria for Determining Significance

The World Bank for noise guidelines requires that the sound level in industrial and commercial areas should not exceed 70dB (A). An alternate criterion is the World Health Organization (WHO) guidelines.

The maximum noise level is important when there are distinct events to the noise. NEQS levels for industrial zones vary 85 dB according to time of day. As far as NEQS limits for the time of night is vary 65 dB.

Impact Analysis

The cumulative effect of the baseline noise scenario that may be exhibited from project activities was only limited within the enclosed boundary. Moreover, during the operational phase the workers may get exposed to escalated levels of noise while working within the site.

Mitigation

The following mitigation measures are recommended in order not to further exceeding the noise due to construction activities:

- Use noise-abating devices wherever needed and practicable.
- Immobile machinery which may generate noise should be placed in enclosed rooms.
- It should be ensured that noise generating from one unit will be prevented by means of suitable noise absorbers such as UPVC doors (Unplastisized polyvinyl chloride) which reduces noise up to 75 dB (A)
- Vehicles must be tuned and maintained to reduce their noise levels.
- Civil works must be planned such that all works are in a sequence and no cumulative effect is formed which may escalate noise levels altogether.

Residual Impacts

If proper mitigation measures are followed the noise from the construction and operational activities is expected to be within the allowable, NEQS therefore no residual impacts are expected.

Monitoring Requirements

Periodic monitoring of noise level will be carried out and recorded to ensure continued compliance with NEQS.

7.3.4 Water sourcing

Water during the construction activity will be required for the concrete mixing and for wetting the fresh concrete structures etc. at the construction site as well as water sprinkling for dust suppression. The use of water for construction may affect water availability for other users if water is not taken from existing factory water supply. Moreover the leakages, spillages and improper handling of oil, lubricants and other solid hazardous waste may have adverse impact on underground water. To minimize these impacts following mitigation measures should be followed.

Impacts on Natural Drainage System

The proposed power plants project is located in Bilout Sharif. All the water resources system within the area is being maintained by control way by the Water Management Department. The proposed project implementation activities will not be create any drainage problems to the surrounding areas of the power plant project. Whereas, from the project site about 6 km natural drainage system is exists.

Potential Issues

The use of water during construction phase will be limited to batching of construction material, sprinkling on materials and unpaved areas as well as for domestic use such as, cleaning, sweeping, ablution, and/or drinking purposes. The potential issue that may arise is unsustainable use of water on the other hand seepage of oil and lubricants from proposed project sites may result in ground water contamination.

Existing Conditions

The existing water resources of the proposed site and its surroundings have been discussed in Chapter-4.

Impact Analysis

The water requirement for the construction phase will not affect the water availability for other water users as most of the water will be taken from existing water supply and Ground water will augment its water supply to the area to cater for the water requirements of the project. Moreover adherence to the below mentioned mitigation measures will further ensure efficient use of water.

Mitigation

Following mitigation measures will be incorporated to minimize any impacts.

- A complete record of water consumption during construction and operational phase will be maintained;
- Water conservation program will be initiated to prevent wastage of water;
- The water supply lines will be checked and repaired for leaks in order to reduce wastage of water;
- Ensure that water efficient sanitary fittings are used throughout the development e.g. low flush toilets, efficient cleaning showers etc.
- Ensure that contractor will follow OGRA (NFPA 30) guidelines for construction of oil storage tanks to prevent any seepages or leakages.

Residual Impacts

Residual impacts are foreseen to be negligible / low in this case if recommended mitigation measures are adhered with.

Monitoring Requirements

- Water consumption during the construction and operational activities will be monitored and recorded.

7.3.5 Traffic

Potential Issues

It is expected that traffic load will remain unaffected, during construction and operational phase as the project activities will be limited within the proposed project area.

Existing Conditions

The traffic is mainly comprised of cars, buses heavy trucks and tankers. The traffic flow is more or less uniform during the peak hours of the day for instance from 9:00am to 9:00pm. However there is a significant reduction in traffic at night with a minimum traffic flow occurring during the hours of 3:00am to 7:00am.

Criteria for Determining Significance

A significant impact will be interpreted if the additional operational phase traffic results in traffic congestion and becomes a hassle for the existing road users.

Mitigation Measures

The following mitigation measures will be incorporated to prevent traffic congestion:

- It should be ensured that employees park their vehicles within the parking area designated for parking within the facility to reduce the probability of traffic congestion and disturbance.
- Designate construction vehicles to follow pathways and proper parking plans during complete construction phase.

Residual Impacts

Implementation of the proposed mitigation measures is not likely to leave any residual impact.

7.3.6 Wastewater Generation

Potential Issues

There will be almost no waste water associated with construction activities and operational phase. In addition to that no waste water will be produced during construction phase as there is no involvement of large quantity of water use at any stage of construction. However waste water will be generated during operational process making sludge form & domestic activities only, including sewage water which is usually drained into sewage lines via Septic Tanks.

Criteria for Determining Significance

A significant impact on the environment will be interpreted if the wastewater discharged is not in compliance with the NEQS for municipal effluent if discharged offsite. Or improper discharge onsite causes odour nuisance, and health hazard.

Impact Analysis

The source of wastewater will include toilets, power plant process & washrooms. The collected sewage generally consisting of sanitary & Sludge wastewater will be routed to a drain/ sewerage system via Septic Tanks. Power Plant blow down water is circulated through cooling towers and recycled.

Mitigation Measures

The following mitigation measures will be taken:

- Domestic Wastewater generated should be routed to irrigation / gardening via Septic Tanks.
- Proper channel and pipeline must be used for drainage of waste water.

Residual Impacts

Implementation of the proposed mitigation measures is not likely to leave any significant residual impacts.

Monitoring Requirements

Monitoring is required in this case the generated waste water are heavy pollution load in water bodies.

7.3.7 Solid Waste Generation and Management

a. Solid Waste Generation and Management during Construction Phase

Potential Issues

The construction phase of the proposed project is expected to generate wastes including; packing waste; scrap, excess construction materials and debris, empty containers and drums, used lubricating oils, Sludge, and chemicals etc. Besides being an eyesore, the waste can also pose a health hazard; pollute soil, surface and ground water if disposed of improperly.

Non-Hazardous Waste Generation

Solid Waste

During construction, large amount of construction waste that includes unused construction materials, construction debris, excavated spoils, abandoned or broken machine parts, debris, kitchen wastes from labor sheds, packaging materials, used home appliances, etc will be produced. Moreover, food waste, plastic, papers, cock sheet, cartons, metal or plastic binders, etc. may be produced as solid waste during this stage. If these wastes are not disposed and maintained properly, these would have impact on surrounding environment. Space for storage and disposal of stuffs and materials generated along with old and used equipment and materials is limited.

Unarranged piling up and disposal of construction waste will cause unhealthy situation in the area and become visual tiring. If not properly managed, this impact would remain during the life span of the Project but would be extended within the plant premises only. It is very likely to take place if proper management is not adopted which is the requirement of national and international environmental regulations. Considering all of these, it can be assumed that the magnitude of the impact would be moderate. Sensitivity of this impact would be medium as the Project has will be taken the waste management plan. From the analysis of sensitivity and magnitude, it is apprehended that the significance of the impact would be moderate adverse.

Liquid Waste and Sewerage

It is assumed that during construction phase laborers will be living at site for construction related activities. Considering the 260L/day per-capita sewerage generation, it is estimated that sewerage would be generated from temporary labour sheds and officers' residence. A small portion of this sewerage may escape sewerage collection and disposal system. The fecal sludge would go to the existing septic tank and septic tanks of the temporary toilets. This added sewerage would not have any significant impact on the existing sewerage system. The magnitude of the impact would be moderate and sensitivity would also be medium. Thus significant of the impact would be **medium adverse** and needs to be controlled by adopting EMP.

Generally, effluents from the proposed power plant would be boiler blow down, cooling tower blow down, back flash from ion exchanger and iron filter of water treatment plant, floor and yard drains (cleaning), oily water from turbine hall and sub-station yard, etc. Generally this waste water is contaminated with Chlorine, It is estimated that a significant quantity of the effluent from the power

plant (excluding effluent from domestic water use) would be around released from different sources and discharged maintaining the concept of zero discharge law.

Mitigation Measures

- Waste generation will be minimized by adopting waste management strategy of reduce, reuses and recycle.
- A waste management plan will be prepared, implemented and monitored for the safe collection, storage and disposal of solid waste.
- Records of all waste generated will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a Waste Tracking Register.
- Training will be provided to personnel for identification, segregation, and management of waste.
- All inert and non-hazardous wastes will be disposed to the existing tipping sites within or outside of the city limits.
- Waste storage areas should be located within the facility and sized to the quantities of waste generated.

Waste Disposal

Solid and Liquid Waste

Solid waste from the power generation activities, domestic and project process sources as could lead to the pollution of soils and water near disposal sites. Inefficient use of aggregate, energy and water could lead to unnecessary consumption, generation of waste and other emissions. Significant volumes of overburden and reject material will be generated as quarries are developed. Intentional or accidental discharges of liquid or solid waste may occur. Spills could potentially occur during refueling, use and maintenance of equipment and vehicles. Such emissions of hazardous waste on land could cause contamination of soils affecting ecosystems, underlying groundwater and future use of the land for agriculture etc. The hazardous and nonhazardous solid and liquid waste generated due to the operational phase of mining activities if not handled, segregated, stored and managed properly may result in adverse aesthetic view, environmental pollution and serve as a disease causing vector.

Impact Mitigations

- Training will be provided to personnel for identification, segregation, and management of waste.
- It is recommended to ensure Proper housing keeping.
- Sludge from the septic tank must be removed on regular basis
- The material to be used during operational phase should be limited and should not exceed the needed amount so as to prevent solid waste production at project site.
- Prior to site works, a solid waste management plan will be developed for recyclable and non-recyclable waste, which may provide details of garbage collection and its disposal as well as recycling procedures.

- No waste will be dumped at any location outside the proposed site boundary.
- Any hazardous waste at project site will be disposed by engaging PEPA certified contractor.

Residual Impacts

Residual impacts are foreseen to be negligible / low in this case if recommended mitigation measures are adhered with.

Monitoring Requirement

A Proponent will carry out monthly visual inspections to ensure good solid and liquid waste management practices at project site.

Criteria for Determining Significance

A significant impact will be interpreted if the waste management is not carried out properly during installation and operational phase; which may effect to health of workers, pollution of soil, surface or groundwater:

- Excessive wastes are generated, recyclable waste is not recycled, waste are scattered, handling of wastes results in contamination, and wastes are improperly disposed of causing pollution.

Impact Analysis

Majority of the construction material to be used and waste generated as a result of construction activity will be inherently less reactive and chemically inert under normal conditions however, its handling and storage may pose adverse impacts of minor nature which could easily be controlled by employing the recommended mitigation measures in this report.

Waste from construction and associated activities by all the project contractors will be properly managed by proposed controls discussed in the following section.

Mitigation Measures

A waste management plan will be developed before the start of the construction activities. Key elements of the waste management system will be the following:

- Separate bins will be placed for different type of wastes - plastic, paper, metal, glass, wood, and cotton;
- Recyclable material will be separated at source. The recyclable waste will be sold to waste contractors for recycling;
- No waste will be dumped at any location outside the proposed site boundary;

- All hazardous waste will be separated from other wastes. Hazardous wastes will be stored in designated areas with restricted access and proper marking. Hazardous wastes will be disposed of through approved waste contractors;
- Surplus construction materials including partially filled chemical and paint containers will be returned to suppliers. Inert construction wastes will be sold as scrap to contractors;
- Record all waste generated during the construction period will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a Waste Tracking Register;
- Training will be provided to personnel for identification, segregation, and management of waste.

Residual Impacts

Proper implementation of the mitigation measures will ensure that the residual impact from waste is minimal. Monitoring and inspection will be undertaken to ensure compliance and minimize any residual impact.

Monitoring Requirements

The monitoring measures will include:

- The proposed construction site will be periodically inspected to verify that no project related waste is scattered in these areas.
- Waste management inspection will be undertaken on a regular basis of on-site waste management and of waste disposal contractors to ensure that the waste management procedures are being followed.

7.3.8 Disturbance to Wildlife

As the proposed project site is present in an already urban developed area with minimal presence of wild life, therefore no significant impacts are envisaged on the wildlife during the construction and operational phase.

7.3.9 Socio-economic Impacts

a. Employment and Business

Implementation of the project will create new employment opportunities and ensure employment opportunities for the communities as well as in the country as electricity is the main need for industrial development. This Project will encourage in establishing industries which will obviously provide employment opportunities to a large number of population. Newly developed industries may appear as a strong source of livelihood. Land price of the adjacent areas of the project will increase significantly. A variety of new industries may be developed for the availability of electricity to meet

the demand of industries. Environment especially water and sanitation may be disturbed by the labors. Health injury may be occurred in power plant for handling of heavy machineries.

The proposed development will create employment during its construction and operational phase. During construction of proposed project, about 10-20 people are expected to be employed. The proposed development will create employment opportunities for some 10 professionals and other supporting staff. Most of the workforce will consist of local people. The generation of employment is likely to be another major beneficial impact arising from the proposed project during both construction.

b. Cultural Resources

There are no protected or otherwise cultural or archaeological sites within the premises of the proposed project site and hence no impact of the proposed project will occur on cultural or archaeological resources.

Mitigation Measures

- Designated parking areas will be provided for different type of project vehicles within and around are project site;
- Employment preference will be given to the locals;
- Local contractors will be given preference for hiring equipment and machinery during construction/ operation;
- Ensure maximum quantity of water to be treated in order to lessen its burden on the existing sewerage system;
- Locals, surrounding businesses, city government are kept on the same page during all stages of the development of the project;
- A complaint register will be maintained on site during construction and operation to record complaints of the nearby residents.
- It must be ensured that there is proper arrangement of reaching up to the top level in case of fire and extinguishing it.

7.3.10 Health and Safety

Potential Issues

The construction Phase and operational phase expected the major or minor incident in the depot premises. In addition for the operational phase fire hazard, dispersion of volatile substance in ambient environment as well.

Criteria for Determining Significance

A significant impact will be interpreted if the procedure and training is not given to employee properly; which may affect the Safety of employees. Prior to any site works, the proponent and contractor will develop a construction and operation management and waste management plan. Such plans will be reviewed and approved by the proponent, and their implementation will be monitored by third party consultants and relevant authorities.

Impact Analysis

During construction activities the worker safety affected when the heavy machineries work on the project site. Employee's health issues related to suffocation, headache, irritation & respiratory disorders due the contamination of ambient environment. The contractor will ensure that activities at the site will not cause damage to lives and properties by implementing the following measures to ensure the health and safety of workers and the public.

Mitigation Measures

- Only skilled workers will be allowed to work during construction and operation activities.
- Activity areas will be fenced to avoid accidents and will be properly drained to avoid ponding of water that could harbor mosquitoes and other disease vectors,
- A proper fire safety system should be installed.
- Basic medical facilities and appropriate safety gear will be provided to workers.

Residual Impacts

Proper implementation of the mitigation measures will ensure that the residual impact from any Accident to risk is minimal. Monitoring and inspection will be undertaken to ensure compliance and minimize any residual impact.

Monitoring Requirements

Safety inspections will be undertaken on a regular basis of on-site. Ensure the health & safety procedure. Fire precaution and extinguisher are up to date and randomly monitor, Safety guideline & procedures are being followed by the employee to save work practice.

CHAPTER

8

ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

8.1 OVERVIEW AND SCOPE

This chapter provides the proposed environmental monitoring programme for the proposed project to access the environmental attributes after the commissioning of the project.

The potential environmental impacts of the proposed Power Plants on various environmental components such as social, biological and physical environment were predicted in the course of this IEE study. The IEE has also identified mitigation measures to minimize the environmental impacts of the proposed project, keeping these effects within acceptable limits.

The Environmental Management and Monitoring Plan (EMMP) has been designed to address how the proposed measures will be implemented. It defines the responsibilities of the project developer and contractor; develops a system of checks and balances; proposes actions that are to be taken by each role player; and lays down the required documentation, communication, and monitoring procedures.

8.2 PURPOSE AND OBJECTIVES

The purpose of this EMMP is not only to address the expected environmental impacts of the proposed project, but also to enhance project benefits and to introduce standards of good practice to be adopted for the proposed project.

The primary objectives of the EMMP are to:

- Facilitate the implementation of the mitigation measures that are identified in the IEE;
- Define the responsibilities of the project proponent and contractor and to provide a means for effective communication of environmental issues between them;
- Identify monitoring parameters in order to ensure the effectiveness of the mitigation measures.
- An integrated Environment Management System play important role in sustainable industrial development if their Environment Management and Monitoring Plan is more affective and economically beneficial covering all activities of the industry and give proper implementable guidelines.

The EMMP has been prepared specifically for the activities of the proposed Power Plants. The detailed EMP in **Exhibit 8.1**.

Exhibit 8. 1: Environmental Management Plan

Activities	Impact	Mitigation Safeguards	Monitoring Parameter	Monitoring Location	Monitoring Frequency	Monitoring Responsibility
Construction Phase						
Topography & Land-Use Patterns	Accidental spillage of oils, lubricants, paints and leachate discharge from concreate mixing may impact the soil as well as aquatic life. Soil erosion Micro topographical change	- Proper site leveling should be ensured. - The construction activities will be planned to minimize disturbances to soil as well as surface water quality of the proposed location. - Leachate of any material such as leachate from concrete mixing should be prevented from mixing to the soil and the water bodies. - Regular inspections will be carried out to detect leakages in construction vehicles, equipment. - Ensure that lubricants and oils will be stored properly, having impermeable floors to reduce the probability of leaching of these lubricants into the soil.	Surface topography	Project site	Monthly	Premier Cement /Contractor

Activities	Impact	Mitigation Safeguards	Monitoring Parameter	Monitoring Location	Monitoring Frequency	Monitoring Responsibility
Site Aesthetics	scattered waste may result leachates which will produce nuisance and ground water contamination	- Construction material and solid waste should be stored at a separate designated storage area. - The dragged or excavated material should be reused in backfilling . - Construction waste and residue will be stored at a designated area till its final disposal. Residual waste from construction will not be allowed to be disposed at open land and outside the storage area. - Strictly prohibited to dump any type of waste at site or its surrounding during construction and as well in operational phase of the proposed project. - Proper site specific housekeeping is to be ensured during project activities of construction phase. - Proper site-specific housekeeping is to be ensured during operational activities.	Housekeeping and waste management practices	Project site	Continuous	Premier Cement /Contractor

Activities	Impact	Mitigation Safeguards	Monitoring Parameter	Monitoring Location	Monitoring Frequency	Monitoring Responsibility
Ecology	Unorganized and un planned operation activities might resulted: - Ecological disturbance - Habitat loss	- Plantation and green belt should be developed in order to rehabilitate native plants. - Unnecessary cutting of tress should be restricted - The environment and natural beauty of hills should be preserved.	- Green area - Reptile habitat	Project site	As and When Required	Premier Cement /contractor
Air Quality	Impairment of ambient air quality from coal power plant emissions. Upper respiratory diseases and other health impacts due to air emissions and dust dispersion. Flue gas emission by generators machineries and vehicle on the Project site.	- Ensure use of standard, maintained and certified equipment and vehicles. - Dust abatement technique on unpaved, vegetated surfaces to minimize dust. - Air emission devices should be installed, training should be provided to workers periodically to reduce the dust emission and safe work. - Construction vehicles and machinery should be well maintained and tuned in order to control emission of CO2, SOX and NOX. - Toned certified standard and low emission transport and machinery will be preferred	NOx SOx PM_{10} $PM_{2.5}$ CO	Project site	Quarterly	Premier Cement /Contractor

Activities	Impact	Mitigation Safeguards	Monitoring Parameter	Monitoring Location	Monitoring Frequency	Monitoring Responsibility
		- All the dusty material should be sprayed with water prior to loading unloading and transfer to control. - Water sprinkling should be done where necessary to contain dust emission. - Dust respirator should be provided to workmen. - Covering of material during transportation. - Monitoring of gaseous emission of vehicles and ambient air should be done as per prescribed NEQS in law.				
Noise Levels	Un-tuned and noisy construction equipment along with construction activities like hammering, piling and plugging etc. may result in following impacts: - Headaches - Hearing problems	- Worker should be provided with proper PPE's i.e proper Ear plug or Ear muffs - Noise abating devices should be installed - Noise monitoring should be done as prescribe in EPA law. - Construction equipment/ machineries will be provided with suitable silencers.	Noise levels	Project site	Quarterly	Premier Cement /Contractor

Activities	Impact	Mitigation Safeguards	Monitoring Parameter	Monitoring Location	Monitoring Frequency	Monitoring Responsibility
	- Hear loss - Accumulation of stress hormones - Hypertension	- Workers working at project site will be provided with ear muffs and ear plugs during working hours.				
water Quality	Oil, lubricants and chemical spillage from construction equipment as well as solid waste disposal into open ground may result in ground water contamination.	- Safe and hygienic drinking water should be provided to worker - Ensure strict implementation of spill prevention and control plan in order to prevention ground water contamination.	pH Temperature Turbidity Oil & Grease TDS TSS Sulphide Phenolic Compounds Total Metals	Groundwater source Surface water source Oil/Chemical storage and usage areas	Quarterly	Premier Cement /Contractor
Health & Safety	Access of un-authorized and un-skilled personnel at project site might cause harm to themselves and others	- Implementation of all the relevant health and safety guidelines such as, OSHA and other health and safety standards to be implemented according to project operation.	HSE inspections reports Risk assessment reports Record of PPEs	Project site	Monthly	Premier Cement /Contractor

Activities	Impact	Mitigation Safeguards	Monitoring Parameter	Monitoring Location	Monitoring Frequency	Monitoring Responsibility
	Lack of awareness among general laborers about safety may lead to accidents Un organized Construction works may increase risks and hazards that may lead to severe injuries	- First aid facility should be provided at work site. - Emergency response plan should be developed and implemented. - Periodically training should be provided to worker regarding emergency response, emergency fire drill and first aid. - Proper safety sign and symbols should be placed - Do not placed any flammable or hazardous substance with explosive material - Before any activity notice the worker by loudspeaker - SOPs must be developed for process with special consideration of health and safety protocols - Trained personnel will be appointed for the specific work	Work permits Severe injuries and hazards Safe man hours			

Activities	Impact	Mitigation Safeguards	Monitoring Parameter	Monitoring Location	Monitoring Frequency	Monitoring Responsibility
		- Unauthorized personnel will not be allowed to access the project site without permission and safety permits. - Appropriate PPEs must be used for technical work.				
Social Environment	Conflicts between laborers/project developers and nearby communities	- Address concerns of neighboring land users as per this report. - Conflict resolution by taking the relevant concerns of communities into confidence by addressing their grievance and concerns by proper mitigations - Maintain complaint register to record the complains of people and nearby people;	Complaint register and Grievance Redress Mechanism (GRM) Local Consultations records	Project site	As and when required	Premier Cement /Contractor
Traffic	Irregular movement of construction vehicles may result in incident and may affect the patients and their attendant	- Traffic management plan should be devised for safe transport movement in the project site; - Use alternate routes for traffic to minimize the traffic congestion;	- Traffic - Vehicle movement	Project site	Daily	Premier Cement /Contractor

Activities	Impact	Mitigation Safeguards	Monitoring Parameter	Monitoring Location	Monitoring Frequency	Monitoring Responsibility
Biological Environment	Cutting of trees may resulted ecological disturbance and habitat loss	- Transfer the trees which is need to be cut during construction better transfer to safe green place or compensate the cut tree by the ratio of 1:10 for mature and 1:5 for immature. - Ensure that no extra trees are cut or cleared during construction or mobilization of machineries. - Green belt should be provided and maintained	No. of trees	Project site	Monthly	Premier Cement /Contractor
Solid Waste Disposal	Inadequate disposal of solid waste may result in health hazards, may contaminate affect the ground water quality, air quality and resulted unaesthetic.	- Hazardous waste must be disposed off by EPA certified contractor. - A waste management plan should be developed that contains a waste tracking mechanism from the originating location to the final waste reception location - SWM policy should be developed and implemented in which enhance the recycling and reused efficiency. - Solid waste should be reused in leveling and restoration activity.	Solid waste quantification and management reports Hazardous waste disposal quantity and EPA Certified contractor's disposal certificate	Project site	Quarterly	Premier Cement /Contractor

Activities	Impact	Mitigation Safeguards	Monitoring Parameter	Monitoring Location	Monitoring Frequency	Monitoring Responsibility
Air Quality – Power plant emissions	The air quality of an air shed can deteriorate rapidly if control measures fail or stop performing well	- All Pollution Control equipment should be regularly inspected and maintained; - If all redundant pollution control systems fail, plant should be immediately shut down until problem is resolved; - All air emissions including Coal dust should regularly be monitored and if any parameter exceeds; - Top layer of Coal piles should be kept moist;	Sox, NOx, CO, PM	Stacks, Boiler, generator	Quarterly	Premier Cement /Contractor
Water Quality	Waste water can adversely impact the marine ecosystem by several means which can have short term as well as long term effects;	All wastewater generated anywhere inside or due to any construction or operation activity shall be treated before disposal; The sludge generated as a result of ETP operation shall be disposed according to hazardous waste management plan;	Effluent flow, Temperature, pH, TSS, Oil and Grease	ETP	Quarterly	Premier Cement /Contractor

Exhibit 8. 2: Environmental Monitoring Plan

Aspect	Location	Parameters to Monitor	Monitoring frequency	Responsibility
Emissions	Stacks, Generators, Boilers,	- SOx, NOx, CO and Particulates, Heavy Metals	Quarterly	Premier Cement
Ambient Air	All operational areas including the residential area in the power plant vicinity.	- PM10, $PM_{2.5}$ and TSP, filter based low volume sampler, ambient, CO, Sox, NOx and Lead using active sampler.	Quarterly	Premier Cement
Wastewater	All effluent discharge points	- Temperature, pH, TSS, Oil and Grease, Effluent flow,	Quarterly	Premier Cement
Solid Waste	Project Area	- Solid waste quality, quantity and disposal methods / locations Visual checks to assess the situation.	Quarterly	Premier Cement
Fire & Safety	All operational areas	- Fire hazards & safety protocols	Continuous	Premier Cement
Noise	All operational areas	Noise intensity measurement dB(A)	Monthly	Premier Cement
Hazardous spill	All operational areas	Spill on Land	Continuous	Premier Cement
Traffic management	Entry exit routes, road- loading terminal area	Traffic Management Plan	Continuous	Premier Cement

CHAPTER

9

CONCLUSION

The IEE for the IEE of 50MW Petroleum Coke/Coal Based and 40 MW Tri-Fuel Engines Power Plant at Premier Cement Company has achieved the following goals:

- Identification of national environmental regulatory requirements that apply to the proposed project and its processes;
- Identification of the environmental features of the project area and the likely impact on the environment as a result of the operation of Power Plant and its processes;
- Recommendation of appropriate mitigation measures that the proponent will incorporate into the project design to minimize all adverse environmental impacts.

Baseline environmental and socio-economic information was collected from a variety of sources, including published literature and field surveys. The information collected was used to compose profiles of the natural and socio-economic environments likely to be affected by the project activities.

An assessment was then made of the potential impacts of the described project on the area's natural and socio-economic environments. Communities and other primary stakeholders were also consulted in the process to assess the impact and seek their consent.

The impacts of the proposed activities in the project area and surroundings will be insignificant, provided the generic mitigation measures proposed in this report are implemented. In areas where these activities may have a significant impact, additional mitigation measures are given to reduce impacts to as low as reasonably possible.

After assessing the proposed project activities and investigating the project area, the environmental consultants, Global Environmental Management Services (GEMS) have concluded that:

"If the activities are undertaken as proposed and described in this report, and the recommended mitigation and environmental management measures are adopted, the project will not result in any long-term or significant impacts on the local community or the environment".

FEASIBILITY STUDY REPORT

34 MW COAL FIRED POWER PLANT

FOR

PREMIER CEMENT LIMITED

INTRODUCTION:

The Coal Fired Power plant would be constructed and developed by Premier Cement Limited to meet energy requirement to produce 8,500 tpd of clinker. Plant and machinery would be supplied by Sinoma Energy Conservation Ltd.

The decision to develop captive power plant was made due to expensive tariff from PESCO with added problem of grid instability which would result in shutdowns, wastages, increased repair and maintenance of cement plant and failure to meet production / sales targets. The coal fired power plant would be developed to supply uninterrupted power supply at economical cost compared to national average tariff.

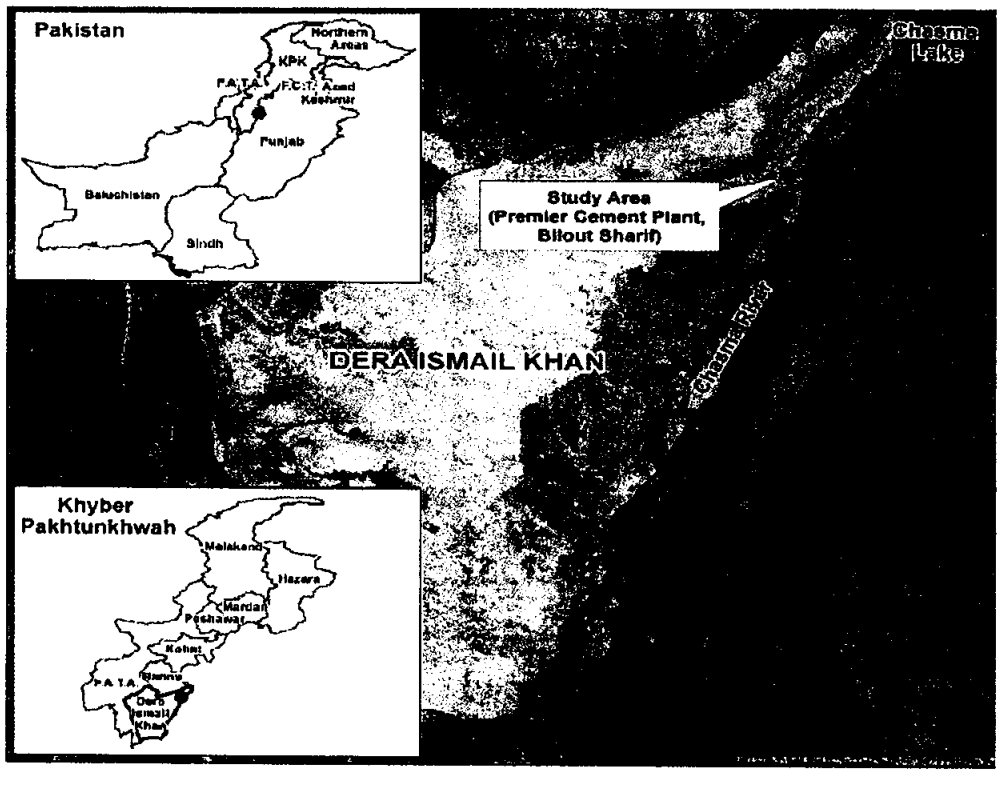
The power plant's output of Ash would be used as input to clinker manufacturing process by Premier Cement Limited. This would further add to savings for Premier Cement Limited.

PROJECT DEVELOPER:

The project developer Premier Cement Limited is part of Sapphire group. Sapphire Group, with investments of 1 billion USD, is among Pakistan's largest conglomerates. Its products are exported to more than 35 destinations around the globe. The project developer is highly committed to sustainable development by adopting best industry practices and environmental security.

PROJECT LOCATION AND ACCESSSIBILITY:

The plant would be located adjacent to Premier Cement Limited site (in Bilot village in Dera Ismail Khan district in the province of KP). The land required for the power plant is 4 acres. It would be purchased from Premier Cement Limited which has already acquired land for its manufacturing plant. Premier Cement Limited will allocate land in the vicinity of cement plant as depicted in below illustration:



The project location coordinates are given as below:

Latitude	32.245913°	Longitude	71.146877°
Latitude	32.246969°	Longitude	71.146770°
Latitude	32.247487°	Longitude	71.150367°
Latitude	32.246693°	Longitude	71.150622°

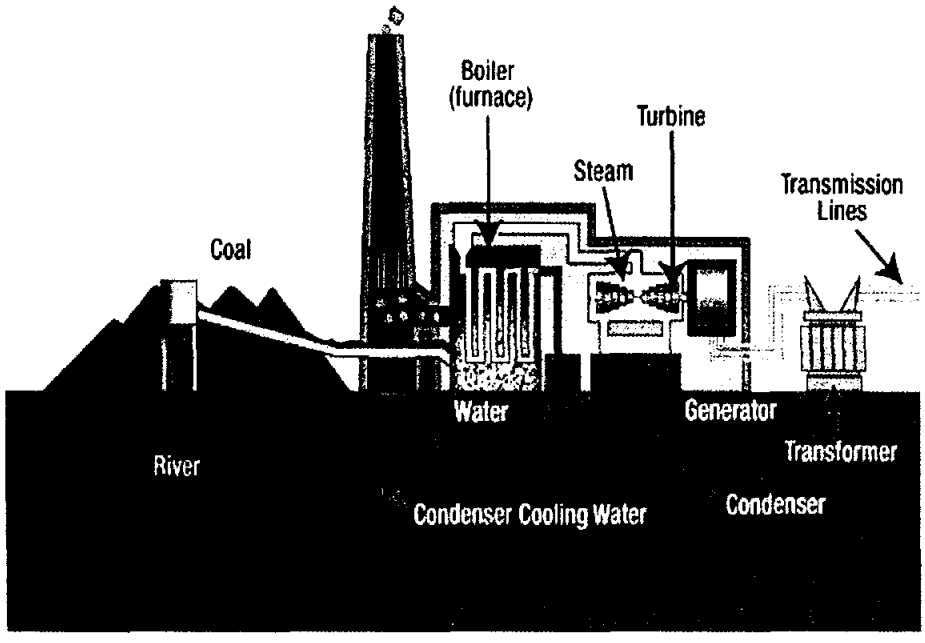
The plant location is accessible through Hakla – Dera Ismail Khan motorway as well as GT road.

PLANT SPECS:

The proposed plant would be located with main configuration of 34 MW condensing type turbine equipped with 34 MW brushless excitation generator, and 120 t/h Boiler, with high temperature (540 C) and sub high pressure (13 MPA). Annual operation hours are set as > 8000 hours. Outgoing feeder voltage of generator is 6.3 KV which is synchronized to the grid of the processing plant. Supply Power is ~30 MW.

The plant would be Pulverized Coal Fired Power Plant of 34 MW Gross ISO capacity. Auxiliary consumption would be 10.14%. Hence, Net Capacity would be ~30.55 MW. Efficiency of the power plant would be 34%.

The plant would have boiler structure, turbine, generator, control room building, transformer yard, switch yar, coal stock yard, ash pond and ash dyke, conveyor belt, greenbelts, roads, security post, FGD and ESP system, compressor house, fire station, laboratories, and workshops.



DESIGN SCOPE:

1 set of High temperature and high pressure 120 TPH PC boiler is set for this project during this phase, together with 1 set of 34 MW extraction condensing STG unit. Main steam inlet temperature is 540°C); Generator is supplied in matching model; Rated power is 34 MW. Outgoing feeder voltage level is 6.3 kV.

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1 set of PC boiler model has Rated capacity is 120 TPH. Steam pressure is 13 MPa. Steam temperature is 540°C.)

- One 120 t/h high temperature and high-pressure PC Boiler with auxiliary System
- 30 MW Turbine System
- Generator System
- Fuel Conveying System
-Pulverized Coal preparation system
- Limestone Injection into the Boiler
- Ash & Slag Handling System
- Chemical Water Treatment System
- Water Supply & Drainage System of Power Plant
- Firefighting System of Power Plant
- Electrical System
- Control & Instrumentation System
- Ventilation and Air Conditioning System
- Other Civil Works Matched with The Above System

DESIGN PHILOSOPHY:

- Safety, economical and reliable design
- Go for mature and reliable technology
- Rational design the automation level and reduce the plant personnel with easy operation system
- Ash and slag produced by PC boiler should be used in cement production to make resource utilization

GENERAL LAYOUT OF PLANT:

General layout of plant shall be designed according to construction scale of 1 boiler and STG. The whole power plant is successively arranged with water treatment area, circulating cooling water area; main power building, coal conveying trestle, coal crusher house, coal storage area, ash and slag discharging area.

FUEL SPECS:

Imported Coal would be used as primary fuel. Coal with calorific value of minimum 6,000 Kcal would be imported primarily from South Africa via ship and transported to site through roads network through trucks. The coke yard would have a capacity of 10,000 tons. To run 34 MW CFPP, approximately 97,200 tons of coal would be consumed per year. Coal will be transported to dry coal sheds by trucks.

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FUEL CONVEYING SYSTEM:

The power plant is equipped with a set of dry coal sheds having capacity of 10000 tons meeting 10-day coal demand of the power plant. Coal in dry coal shed is transported to coal belt conveyor by coal feeder / dozer below underground through coal hopper and then sent back to raw coal bunker / bins of main power building by belt conveyor after iron removal and crushing. The belt conveying system shall be outdoor arrangement and equipped with passage for operation and maintenance. Hood covers shall be fixed on the conveyors. One crusher in the crusher house shall be used for this project. The capacity of the crusher is around 60 tons/hr. Its inlet particle size is less than 100 mm and outlet particle size is less than 30 mm. After crusher the coal shall be fed into coal mill for grinding. The coal scale will be less than 20% (diameter > R90 um)

ASH CONSUMPTION:

Fly Ash quantity would be 2 t/hr while Bottom Ash quantity would be 0.27 t/hr. The Ash will be transported to Cement Mill after being collected by Ash Bin. Fly Ash collected by first stage ESP hopper will be transported to boiler by air transporter.

Owing to a number of cement plants in vicinity and multiple uses in different processes, it can be safely assumed that 100% fly ash would be utilized. It is assumed that 12% of total coal quantity consumed will be derived in the form of ash.

PROJECT DEVELOPMENT:

Based on finalized design, the civil works shall be completed. Mechanical and Electrical installations shall be completed using suitable construction machinery. Equipment would comply to applicable standards and best practices to ensure safety and long economic life. Power plant testing and commissioning would be done as per relevant standards and codes. Power plant shall be operated as per operations manual and guidance by OEM. Execution will be done in following phases:

1. Pre-Construction Phase
    a. Selection of project site
    b. Land acquisition and site establishment
    c. Mobilization of construction contractor
    d. Finalization of O&M Contractor
2. Construction Phase
    a. Civil Construction and technological installations
    b. Supervision of E&M works by contractor
    c. Post erection check and pre commissioning test
    d. Commissioning test
    e. Reliability Test Run
3. Operations Phase
    a. Commencement of Commercial operations
    b. Monitoring of EMP
    c. Monitoring of O&M Contractor

The required material and human resource are available. Construction material will be obtained from nearby local markets. Raw material usage during construction and operation phase would be as follows:

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Cement	6600 Tons
Other aggregates	20000 Tons
Rebar	1800 Tons
Electro Mechanical Equipment	4000 Tons

Experience technical Human resource is employed by the developer's parent concern whose services will be utilized for the project. The project would also provide employment to locals besides upgrading their skill through workshops and on-job training opportunity.

Electricity demand during pre-construction and construction phase would be met through nearest public utility substation or diesel-based power generator(s).

Water for construction and drinking can be drawn from ground water using Deep tube wells. Water consumption for proposed 34 MW CFPP would be 0.3 cusecs of water during construction phase and 1.25 cusecs during operational phase.

CONSTRUCTION TIME:

The plant is expected to be constructed in 18 months.

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PROCESS DESCRIPTION:

Coal would be supplied to crushing plant. From the silos the crushed coal would be fed to the PC boiler. For dust suppression, water spray shall be used. The coal handling system would be controlled from control handling control room.

The power plant shall have FGD and ESP/ Bag House system to control emission compliant with NEQS. There would be a 6.3 KV GIS sub-station for incoming power. In addition to coal, light diesel fuel would be used for startup as well as flame stabilization during low load operation. Other installations would include a Hydrant system with high velocity spray system for fire protection. A network of piping would be spread out through the plant area supplying pressurized water to Hydrant strategically located throughout the plant.

WASTE MANAGEMENT:

Solid wastes like concrete pipes, small cut pieces of MS bars / rods, empty cement bags, empty cartons, garbage etc. and waste from worker's camps, human, wastes, kitchen wastes etc. will be generated. ___ cubic meters of liquid waste will be generated per hour mainly including water from boreholes, non-consumptive construction water and waste water from worker's camps. Human wastes would be managed by constructing sanitary latrine which will be finally demolished and refilled. Construction wastes and kitchen wastes will be disposed off in covered Plastic containers kept at designated places which will be periodically collected for final disposal.

During operation phase, ash particle will be the major solid waste to be generated from power plant. Dry ash can be taken to buffer hoppers for its onward transportation in dry form to storage silo near plant boundary for utilization.

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ESIA APPROVAL:

The Initial Environmental Examination for the coal fired power plant was conducted by GEMS (a renowned environmental consultant). IEE has been conducted as per applicable legislative and regulatory requirements by KP government. Potential Projects impacts studied were:

- Ambient air quality
- Ecology of the area
- Local communities
- Water quality

Based on data gathered, consultation with stakeholders including locals and local administration, the report concluded that the impact of the proposed project in the subject area and surroundings will be insignificant in the long term on the local community or the environment, provided the generic mitigations measures in the IEE report are implemented.

The proposed project falls under Category B "Energy" of Schedule I (IEE). KP EPA has approved the aforementioned study with its recommendations on mitigation measures vide its letter dated 18th March, 2021.

ENVIRONMENTAL PROTECTION:

Influence of power plant to surrounding environment is mitigated as followings after project

Desulfurization and Dust Control:

As external desulfurization system and bag filter shall be installed after the furnace. Comprehensive de-sulfurization efficiency can reach 80%. Emissions shall be largely as per NEQS. SO2 at stack outlet is < 400 mg/Nm3. The option of dust control shall be bag filter and the dust emission is less than 20mg/ Nm3, the emission of NOx content less than 600mg/Nm3.

Continuous Emission Monitoring System (CEMS):

CEMS shall be installed on the flue after the stack. CO2, SO2, NOx, temperature and humidity of flue gas. CO monitoring will be installed at boiler outlet before cyclone.

Water Environmental Protection:

Closed cycle circulating cooling system is used for power plant without external drainage or thermal pollution. Industrial wastewater and living sewage of power plant shall be used in the cement plant and for horticulture after sewage treatment without environment pollution

TECHNICAL OUTLOOK:

- Rated Gross Power : 34 MW
- Net Power : 30.55 MW
- Self-Consumption : 3.45 MW (10.14%)
- Allowable Frequency range : 48 Hz – 52 Hz (±4%)
- Rated Voltage : 6.3 kV
- Rated Power Factor : 0.8

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- Rated Speed : 3000 rpm
- Rated Efficiency : 97.6%
- Rated Current : 3437 A
- Short Circuit level of Electrical Equipment (Medium Voltage – 6.3kV) 50 KA / 3sec
- Ramp up Time from Cold start : 06 hours
- Degradation : 10 %

FINANCIAL OUTLOOK:

Cost estimation and financial analysis is a crucial factor in the decision to go ahead for the project. The captive power project should be cost efficient and economical in comparison to electricity from available DISCO in addition to providing a reasonable rate of return to project sponsor. The workings in this section are based on best available estimates and may change as per award of EPC Contract.

The sponsor is interested to award EPC contract in most transparent manner and price competitive basis.

- The project will be financed by 100 % equity
- CAPEX has been assumed as 0.8 million USD / MW
- Project Cost can be divided as per following:

PROJECT COST	**USD**
PLANT AND EQUIPMENT	24,480,000
CIVIL COST	2,720,000
TOTAL PROJECT COST	**27,200,000**

- Tariff for B4 consumers under PESCO is Rs. 19.71 (Peak) and Rs. 14.23 (Off-Peak) as per last indexation approved by NEPRA
- For a tariff of Rs. 12/KWh, the IRR would be around 22.9% with a payback of 6.48 years
- Exchange rate (PKR/USD) has been assumed to be Rs. 178 in the first year of commercial operation. Currency devaluation of 4.5% has bee assumed.
- Coal cost has been assumed at 80 $/Ton and projected to increase annually by 3%. Coal transportation cost has been assumed 20$/Ton
- Disco Tariff is set to increase significantly in coming years thereby increasing the saving differential
- The following factors make the power project economically viable:
    - Continuous dispatch
    - Infrastructure to procure imported coal (fuel)
    - Developer's sister concerns already running CFPP as captive power plant for textile units
    - By products usage as input for clinker manufacturing process further add to the economic viability
    - With conservative estimates, the project offers a decent rate of return

PLANT GENERATION AND CONSUMPTION:

As per plant design, the plant efficiency is 34% which would result in consumption of 421.88 grams/KWh for generation of 1 KWh. This is based on assumption of calorific value of 23,794 BTUs/Kg. The plant would be producing 261,120 MWh energy per annum.

Total coal consumption would be 110,160 tonnes per annum resulting in cost of production of 2,123 million PKR per annum including landing costs and freight charges for coal to reach the power plant. Following heads would be added to coal cost to arrive at final cost of coal at power plant:

- 5% custom duty
- 1.05% Sindh Excise Duty
- Stevedoring at $ 2.80 / ton

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- Marine insurance at 0.01%
- Inland insurance at 0.4%
- LC Charges at 017%
- Clearing charges at 0.09 $/ton
- Wastages assumed as 0.05%

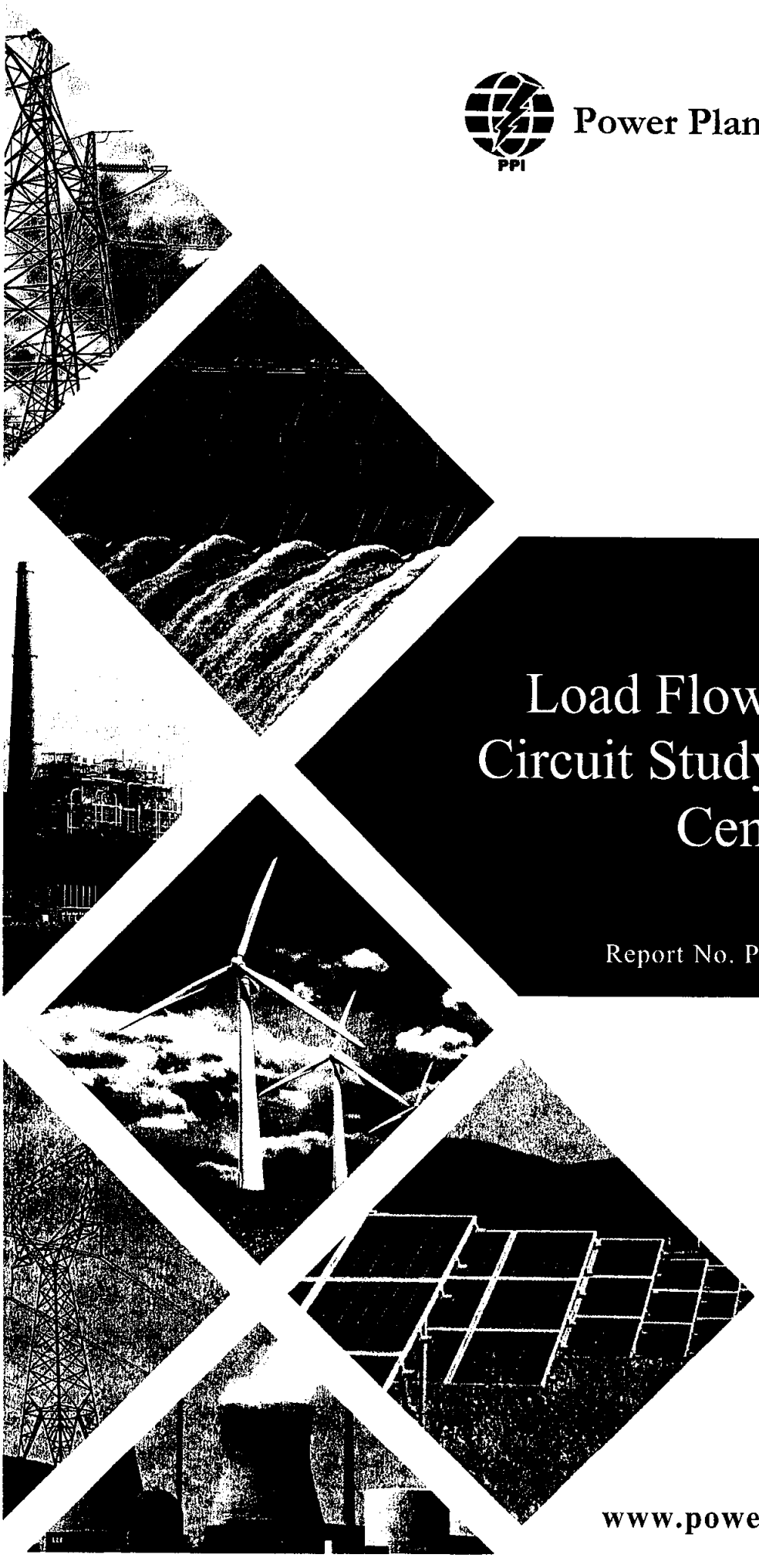
Based on above calculations, the coal cost would be Rs. 8.13 per kwh in the first year of commercial operations.

CAPEX DISBURSEMENT:

CAPEX disbursement would be made in two years (equally divided i.e. 50%).

OPERATING COSTS:

Operating costs include O&M Cost which includes cost of stores & spares, general consumables, annual Maintenance costs and the Coal as fuel cost. Per unit costs (Rs/kWh) have been computed based on dependable capacity – the maximum possible energy the plant can deliver per annum.



Power Planners International

Load Flow and Short Circuit Study for Premier Cement

Report No. PPI-424.1-Draft/21

www.powerplannersint.com

Load Flow and Short Circuit Study for Premier Cement

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Executive Summary

- The Draft Report on the Load Flow and Short Circuit Study for Premier Cement is submitted herewith.
- The study have been conducted based on the data provided by the client.
- Premier Cement Factory has installed a 34 MW coal fired generation plant for internal consumption and plans to take the rest of the power supply from PESCO via 132 kV Grid Station.
- The total load in the facility is divided into multiple loads, a major portion of which is being for the cement production processing units.
- There is a main 6.3 kV bus bar in the facility which is further stepped down to 0.4 kV using 4 transformers to feed a 4 MW auxiliary load. Additionally, this bus bar feeds around 36 MW to the cement factory and 3.6 MW miscellaneous load.
- Steady state analysis by load flow shows that there are no capacity constraints in the facility to feed different loads
- The short circuit analysis has been carried out to calculate maximum fault levels at the 6.3 kV bus bar of the facility. These levels come out to be 23.99 kA for 3-phase and 27.31 kA for 1-phase.
- Keeping in view the industry standard switchgear of the short circuit rating of 40 kA would be fine taking care of the additional generation addition or network reinforcement in the system.
- There are no constraints in the operation of Premier Cement Factory as per the system conditions defined in the report.

TABLE OF CONTENTS

Appendices

Appendix – A:

- **Data received from the Client**

Appendix – B: Plotted Results of Load Flow for Chapter – 4

Appendix – C: Results of Short Circuit Analysis for Chapter – 5

1. Introduction

Premier Cement factory has installed a 34 MW coal fired generation unit in it facility for internal usage. The total load of the facility including the Auxiliary load of the plant is about 46.6 MW. The internal generation will feed the maximum load and the remaining load of would be fed through PESCO via the 132 kV G/S.

The major load at Premier Cement is the Cement Processing load of around 36 MW which is directly fed through the 6.3 kV bus bar. Then there is around 3.6 MW miscellaneous load fed directly through the 6.3 kV bus bar. Additionally, 6.3 kV is stepped down using four 6.3/0.4 kV transformers to fed auxiliary load of 4 MW.

The overall objective of this study is to make sure that the 34 MW internal supply plus the supply from PESCO feeds all the loads in the facility without any technical constraint. The specific objectives of this report are:

- To model the complete setup of Premier Cement as comprehensively as possible
- To perform and analyze the load flow patterns in the facility using Load Flow Analysis.
- To evaluate the fault levels at the 6.3 kV bus bar of the facility, making sure that the introduction of a generation source does not cause the fault currents levels to exceed the already installed switchgear ratings in the facility.

2. Assumptions of Data

The following assumptions have been made for the study as per the data provided by the client attached in Appendix - A:

2.1. Premier Cement Plant Data

Generation Capacity	= 34 MW
Power Factor	= 0.8
MVA Rating	= 42.5 MVA
Generation Voltage	= 6.3 kV
Auxiliary Transformers	= 4x1600 kVA
Transformer Impedance	= 6-8%

2.2. Load Data

Cement Load	= 36 MW
Admin/Workshop Load	= 3 MW
Auxiliary Load	= 3.4 – 4 MW
Feed Water Pumps	= 2 MW
ID Fans	= 1.6 MW

2.3. Cable Data

The cables installed internally are:

At 6.3 kV:

Single Core 400 mmsq. With the 8 Cables per phase.

At 0.4 kV:

Three core 120 mmsq.

3. Study Approach and Methodology

3.1. Understanding of Problem

Premier Cement has installed a 34 MW coal fired generation unit in its facility for self-consumption. This study is being conducted to ensure that the generation at Premier Cement and the supply from PESCO feeds the load at the facility without any technical constraints.

3.2. Approach to the Problem

The consultant has applied the following approaches to the problem:

- A base case network model has been prepared for Premier Cement which has been made as comprehensive as possible by modelling each cable, transformer, current limiter, generator and load.
- Perform Load flow analysis to assess the load flow patterns and ensure power transfer without any cable/transformer overloading
- Perform Short Circuit analysis to ensure that the short circuit levels remain within the ratings of the switch gear equipment already installed at the facility.

4. Detailed Load Flow Studies

The complete modelling of Premier Cement has been done in PSS/E using the detailed data provided by the client. This includes the 6.3 kV bus bar and associated cables, transformers, current limiter and the 34 MW coal fired generation.

The results of normal case are plotted in ***Exhibit 1.0***. The power flows on the circuits are seen well within the rated capacities and the voltages on the 6.3 kV bus bar is also within the permissible operating range of ±5 % off the nominal.

It can be seen in Exhibit 1.0 that in addition to the 34 MW self-generation at Premier Cement, the remaining power to feed the load and catering the losses in cables is absorbed from the PESCO network. Therefore, the load flow analysis indicates that the complete load at Premier Cement can be easily fed using the 34 MW self-generation unit and some power supply by PESCO, without any thermal limit violation in cables and transformers. All the voltages are within the permissible limits.

5. Short Circuit Analysis

5.1. Methodology and Assumptions

The methodology of IEC 909 has been applied in the short circuit analysis in this report for which provision is available in the PSS/E software used for these studies.

The maximum fault currents have been calculated with the following assumptions under IEC 909:

- Set tap ratios to unity
- Set line charging to zero
- Set shunts to zero in positive sequence
- Desired voltage magnitude at bus bars set equal to 1.10 P.U. i.e. 10 % higher than nominal, which is the maximum permissible voltage under contingency condition.

For evaluation of maximum short circuit levels we have assumed contribution in the fault currents from the coal fired generation plant in the facility.

The assumptions about the generator and the transformers data are the same as mentioned in Ch.2 of this report.

5.1. Fault Current Calculations with CFPP at Premier Cement

Short circuit analysis of the network with the CFPP has been carried out to evaluate the fault levels.

The short circuit levels have been calculated and plotted on the 6.3 kV bus bar of the facility and are shown plotted in the Exhibit 2.0 attached in Appendix – C. Both 3-phase and 1-phase fault currents are indicated in the Exhibit which are given in polar coordinates i.e. the magnitude and the angle of the current. The total fault current are shown below the bus bar.

The tabular output of the short circuit calculations is also attached in Appendix – C for the 6.3 kV bus bar.

The short circuit analysis results show that the short circuit current levels are 23.99 kA and 27.31 kA for 3-phase and 1-phase faults respectively for the 6.3 kV bus bar. Therefore, the

industry standard switchgear of the short circuit rating of 40 kA would be sufficient, taking care of any future generation additions and system reinforcements in its electrical vicinity.

6. Conclusion

- Premier Cement Factory has installed a 34 MW coal fired generation plant for internal consumption and plans to take the rest of the power supply from PESCO via 132 kV Grid Station.
- The total load in the facility is divided into multiple loads, a major portion of which is being for the cement production processing units.
- There is a main 6.3 kV bus bar in the facility which is further stepped down to 0.4 kV using 4 transformers to feed a 4 MW auxiliary load. Additionally, this bus bar feeds around 36 MW to the cement factory and 3.6 MW miscellaneous load.
- Steady state analysis by load flow shows that there are no capacity constraints in the facility to feed different loads
- The short circuit analysis has been carried out to calculate maximum fault levels at the 6.3 kV bus bar of the facility. These levels come out to be 23.99 kA for 3-phase and 27.31 kA for 1-phase.
- Keeping in view the industry standard switchgear of the short circuit rating of 40 kA would be fine taking care of the additional generation addition or network reinforcement in the system.
- There are no constraints in the operation of Premier Cement Factory as per the system conditions defined in the report.