Environmental Impact Assessment

July 2017

PAK: Jalalpur Irrigation Project

Project No. 46528-002

Part 4 of 12 of the Appendices

Prepared by Irrigation Department, Government of Punjab for the Asian Development Bank (ADB).

Irrigation Department
Government of Punjab

DETAILED DESIGN OF JALALPUR IRRIGATION PROJECT

Appendices

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

MAY 2017

Detailed Design of Jalalpur Irrigation Project

APPENDICES

EIA

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ENVIRONMENTAL MONITORING REPORT

JALAL-PUR IRRIGATION PROJECT

To

NATIONAL ENGINEERING SERVICES PAKISTAN (Pvt.) Ltd (NESPAK)

By

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DISCLAIMER

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Field Supervisor:_____

Signature:

Chief Environmentalist: _____

Signature:

Water analyzed by:

Signature: _____

Chief Chemist: _____

Signature:

ABBREVIATIONS

AA:	Ambient Air
APHA:	American Public Health Administration
BDL	Below Detectable Limit
CO_2:	Carbon Dioxide
CO:	Carbon Monoxide
EPA:	Environmental Protection Agency
NO:	Nitrogen Oxide
NO_2:	Nitrogen Dioxide
NO_x:	Oxides of Nitrogen
PEQS:	Punjab Environmental Quality Standards
JIP	Jalal-Pur Irrigation Project
NL:	Noise Level
PEPA:	Punjab Environmental Protection Act 1997(Amended 2012)
SPM	Suspended Particulate Matter
PM:	Particulate Matter
SO_2:	Sulphur Dioxide
SOP:	Standard Operating Procedures
SEAL:	Solution Environmental & Analytical Laboratory
USEPA:	United states Environmental Protection Agency
VOCs	Volatile Organic Compounds

UNITS

M:	Meter
°C:	Degree Celsius
Sec:	Seconds
Ppm:	Parts per Million
Mg/l:	Milligram per Litre
Mg/Nm3:	Milligram per Normal cubic meter
µg/m^3:	Microgram per cubic meter
Mg.kg-1	Milligram per Kilogram

CHAPTER - I

INTRODUCTION

1. Introduction

This section describes the project location and scope of services performed by SEAL.

1.1 Introduction

The Islamic Republic of Pakistan has received a loan as of Project Design Advance (PDA) from the Asian Development Bank (ADB) for financing the cost of preparing Detailed Engineering Design, Construction Drawings and Bidding Documents for Jalalpur Irrigation Project (JIP). The project is expected to increase crop production and reduce the land degradation by minimizing the marginal quality groundwater use. The project envisages construction of new irrigation system and their appurtenant structures to irrigate about 160,000 acres of land in PindDadan Khan and Khushab area.

NESPAK is engineering consultant for detailed design of this project and engaged M/S Solution Environmental& Analytical Laboratory for environmental monitoring at the proposed locations.

1.2 Objectives

The objective of this study is to:

- Comply with the regulatory requirements of the project;
- Monitor air, noise level in study area/survey area;
- Analyze water quality.

1.3 Scope of Services

The environmental monitoring was conducted at advised locations for following environmental parameters.

- Noise Level Monitoring
- Ambient Air Quality Monitoring
- Water quality Testing

1.4 Project Locations

Locations for sampling and monitoring of required environmental parameters were identified by client.

Table 1-1: List of Ambient Air & Noise Level Monitoring Locations

Sr. No.	Monitoring Locations	Latitude	Longitude
1	Misri More (Construction Camp # 1)	32° 41 '49"	73° 30 '28"
2	Jalalpur Sharif	32° 39' 25"	73° 24' 37"
3	Aadowal	32° 37' 14"	73° 11' 00"
4	PindDadan Khan (Construction Camp # 2)	32° 36' 05"	73° 02' 02"
5	TalokarKurar	32° 28' 22"	72° 29' 52"
6	Rai Shahr	32° 28' 49"	72° 45' 48"
7	DhudiThal (Construction Camp # 3)	32° 31' 26"	72° 43' 29"
8	Saroba	32° 34' 28"	72° 51' 53"

Table 1-2: List of Ground Water Sampling Locations

Sr. No.	Category	Sampling Points	Latitude	Longitude	Sample Source
1	Category 1	Near Shahotra	32° 34 '02"	73° 00 '38"	Hand Pump
2		Dhok Noora Near Bugga Sharif	32° 26' 45"	72° 42' 29"	Hand Pump
3		Dewanpur	32° 37' 21"	73° 16' 17"	Hand Pump
4		Shah Kamir	32° 39' 38"	73° 26' 23"	Hand Pump
5	Category 2	Chak Mujahid	32° 39' 30"	73° 14' 26"	Tube Well
6		Dhok Wenis	32° 36' 40"	72° 59' 07"	Tube Well
7		Talokar Kurrar	32° 28' 23"	72° 29' 53"	Tube Well
8		Jalalpur Sharif	32° 39' 18"	73° 24' 45"	Tube Well
9	Category 3	Sahowal	32° 40' 13"	73° 09' 25"	Hand Pump
10		Islam Garh, Khewra	32° 37' 30"	73° 01' 02"	Machine Bore
11		Chakri Karam Khan	32° 40' 51"	73° 21' 07"	Hand Pump
12	Category 4	Misri More. Construction Camp No. 1	32° 41' 49"	73° 30' 28"	Machine Bore
13		P.D. Khan Construction Camp No. 2	32° 36' 08"	73° 02' 04"	Hand Pump
14	Category 5	Rawal	32° 43' 00"	73° 11' 35"	Natural Stream
15		Baghanwala	32° 42' 29"	73° 13' 56"	Natural Stream

Table 1-3: List of Surface Water and Waste Water Sampling Locations

Sr. No.	Sampling Locations	Latitude	Longitude	Sample Type
1	Rai Shahr	32° 28 '36"	72° 46 '00"	Surface Water
2	Head Rasool Barrage	32° 41' 21"	73° 30' 50"	Surface Water
3	Jalalpur Sharif	32° 39' 19"	73° 24' 34"	Surface Water
4	Chakri Karam Khan	32° 40' 52"	73° 21' 06"	Waste Water
5	Pond Near ICI Soda Ash Pond, Khewra	32° 37' 20"	73° 01' 14"	Waste Water
6	Sahowal	32° 40' 15"	73° 09' 22"	Waste Water

Figure 1-4: Monitoring Route for Proposed Project

CHAPTER – II

METHODOLOGY

2. Methodology

Following is the brief description of methodology adopted for this environmental monitoring:

2.1 Survey Planning

The project started with a planning of project activities with a management of the NESPAK.

2.1.1 Identification of Monitoring Locations

NESPAK provided location map of proposed project sites. Following criterion was used to finalize the sampling locations on the given site.

- Area where there will be project activities;
- Present environmental conditions at the site.

2.1.2 Monitoring Plan

On the basis of identified sampling locations a monitoring plan was developed in order to achieve precision and accuracy in the monitoring and sampling of the required environmental parameters. The monitoring plan was developed in consultation with Client's representatives.

Monitoring activity was started on20-01-2017. Because of the heavy rain fall, monitoring activity was stopped on 25-01-2017 and started again at 07-02-2017 to 12-02-2017.

Monitoring Schedule								
	Misri More	Jalalpur Sharif	Aadowal	TalokarKurar	Rai Shahr	DhudiThal	Saroba	PindDadan Khan
20/01/2017								
21/01/2017								
22/01/2017								
23/01/2017								
7/2/2017								
8/2/2017								
9/2/2017								
10/2/2017								
11/2/2017								
12/2/2017								

Table 2-1-2: Monitoring Schedule for proposed Project

2.2 Sampling and Analysis Methods

The sampling and testing methods are given in following sections of the report.

2.2.1 Ambient Air Quality Monitoring

Ambient air quality monitoring was conducted at advised sampling locations to assess the concentration of pollutants (Carbon monoxide, Oxides of Nitrogen (NO, No_2), Sulphur dioxide (SO_2), $PM_{2.5}$ and PM_{10}, SPM, CO_2, V.O.C, Ozone, Lead). Selection of monitoring locations was based on the environmental factors including wind direction on the particular day and amount of turbulence in the air etc.

Reference method used for the measurements are included as **Table 2.1**while the description is provided in subsequent sections.

Table 2-1: Methodology of Ambient Air Quality Monitoring

Air Pollutant	Monitoring Technique	Instrument Used	Reference Method	Measurement Range	Lowest Detection Limit	Sampling Duration
Carbon monoxide (CO)	Non Dispersive Infrared Absorption (NDIR)	HORIBA APNA 360 CO Analyzer	40 CFR Part 50, App. C (US-EPA)	0 – 100 ppm	0.02 ppm	24 hours
Sulfur Dioxide (SO_2)	UV fluorescence (UVF)	HORIBA APNA 360 SO_2 Analyzer	EQSA-0197-114 (US-EPA)	0-0.5 ppm	0.5 ppb	24hours
Oxides of Nitrogen	Reduced Pressure Chemiluminescence (CLD)	HORIBA APNA 360 NO_x Analyzer	40 CFR Part 50, App F (US-EPA)	0-0.5 ppm	0.5 ppb	24 hours
Particulate Matter (SPM, PM_{10}, $PM_{2.5}$	Integrated Sampling Technique	High Volume Air Sampler	40 CFR Part 50, App J (US-EPA)	0 – 1000 µg/m^3	2 µg/m^3	24 hours
Ozone	Electrochemical	ToxiRae Pro (wireless single gas detector)	-	0.1-0.2 ppm	0.1 ppm	1 hour
V.O.C	Photoionization	ToxiRae Pro (wireless single gas detector)	-	0-15,000 ppm	1 ppm	Spot

2.2.1.1 Carbon monoxide (CO)

Carbon monoxide (CO) was monitored using HORIBA APNA 360 CO Analyzer. The APNA-360 CO analyzer measures CO concentration using a non-dispersive infrared (NDIR) absorption method that is based on the nature of CO in that it absorbs special infrared light. Measurement range of the analyzer is 0-100 ppm. Continuous data was recorded for 24 hr.

2.2.1.2 Oxides of Nitrogen

Oxides of Nitrogen (NOx) were monitored using HORIBA APNA 360 NO_x Analyzer. The APNA-360 NOx analyzer measures NO, NO_2 and NOx using chemiluminescence (CLD) method with the help of chemical reaction between NO_2 and O_3. Measurement range of the analyzer is 0-0.5 ppm. Continuous data was recorded for 24 hr.

2.2.1.3 Sulphur Dioxide (SO2)

SO_2Sulphur dioxide was monitored using HORIBA APNA 360 SO_2 Analyzer. The APNA-360 SO_2 analyzer measures SO_2 using UV fluorescence method that operates on the principle that when the SO_2 molecules contained in the sample gas are excited by ultraviolet radiation they emit a characteristic fluorescence in the range of 220- 240 nm. This fluorescence is measured and the SO_2 concentration is obtained from changes in the intensity of the fluorescence. Measurement range of the analyzer is 0-0.5 ppm. Continuous data was recorded for 24 hr.

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

Particulate matter concentration in terms of $PM_{10}$and $PM_{2.5}$ was monitored in the ambient air with the help of High Volume Air Sampler. Measurement range of the equipment is 2-1000 µg/m³ with lowestdetection range of 2 µg/m³. $PM_{10}$and $PM_{2.5}$sampling was conducted for period of 24 hour at identified sampling locations with the help of fiberglass filters. The filters were properly stored and placed in the vacuum zipper bag in order to avoid moisture and transported to SEAL Laboratory for detection of PM_{10}.

2.2.1.5 Volatile Organic Compounds (V.O.C)

A V.O.C monitoring was conducted at identified locations using wireless single gas detector (ToxiRae Pro). All V.O.C monitoring was conducted in accordance with the guidlines. It can detect VOCs uses a built-in on-board library of 190 correction factors to automatically read gases in equivalent units.

2.2.1.6 Weather Station

Weather station was installed on each point measurement to assess the environmental parameters like Ambient Temperature, Relative Humidity, Wind Speed and direction and other weather conditions.

2.2.2 Noise Level

Noise level monitoring was conducted at identified locations using portable Digital Sound Meter (TM, 102). All noise monitoring was conducted in accordance with the guidance set out in BS 7445:2003. Measurements were made using Class 1 Integrating-Averaging Sound Level Meters as defined in IEC 61672:2003. Meters were calibrated and checked before and after each measurement period by using sound level calibrator.

2.2.3 Water

Following methodology was adopted for water sampling and analysis:

2.2.3.1 Sample Collection

The water samples were collected from identified sampling points. The sampling was carried out in accordance to the Standard Operating Procedures (SOP) based on the recognized methods of United State Environmental Protection Agency (USEPA), World Health Organization (WHO) and American Public Health Administration (APHA) for water sampling and analysis.

2.2.3.2 Measurement of Field Parameters

Parameters that quickly degrade after they are sampled must be tested in the field. Following parameters were measured in field that can significantly change during storage and transportation. These includes:-

- ✓ pH (Measured at site)
- ✓ Odour
- ✓ Colour
- ✓ Clarity
- ✓ TDS
- ✓ Temperature

2.2.3.3 Preservation

Preservation is important in order to minimize the changes in the sample. The collected water samples were preserved in appropriate containers as per APHA Guidelines, the method of which is given as under-:

For COD, organics and nitrates sample is preserved below pH -2 by addition of sulphuric acid. For metals sample is preserved below pH-2 by adding nitric acid. For BOD and inorganic sample is stored below 4 ^{0}C.

2.2.3.4 Sample Identification and Chain of Custody

The collected samples were labeled and assigned a unique sample identification number, sampling date and time of collection to collected samples. All the relevant information (sample location, time of collection, sample identification, temperature, pH, collected by, preservation techniques etc.) was recorded immediately on the Chain of Custody form signed by SEAL field Analyst.

2.2.3.5 Transportation

A shipping container (Ice box with eutectic cold packs instead of ice) with maintained temperature of 4° C ±5 °C was used for transporting the sample from the collection site to the environmental laboratory.

2.2.3.6 Parameters

Parameters provided in the scope of work for the testing include following:

- **Groundwater**

Drinkingwater sample was collected from identified sampling point. The collected samples were given to laboratory for analysis of parameters that are listed in table 2.3.

2.2.3.7 Methods of Analysis

Parameters and Methods used for the testing these parameters are included as **Table 2.3**

Table 2-2: Water Testing Methods

S. No.	Parameter	Method / Technique	Reference	Lowest Detection Limit
1.	TDS	Gravimetric method	APHA 2540 C	--
2.	pH	By pH meter	APHA 4500-H^+ B	0
3.	TSS	Gravimetric method	APHA 2540 D	--
4.	Temperature	Celsius thermometer	APHA 2550 B	0
5.	Taste	By Sensory	-	--
6.	Odour	By Sensory	-	--
7.	Chloride Cl^-	Argentometry Titration	APHA 4500-Cl^- B	--
8.	Fluoride F^-	SPANDS Method	APHA 4500-F^- D	0.02
9.	Arsenic Ar	Atomic Absorption Spectrophotometric method	APHA 3500-As	0
10.	Sulphate SO_4^{-2}	Gravimetric method	APHA 4500-SO_4^{-2} C	--
11.	Ammonia NH_3	Titrimetric method	APHA 4500-NH_3 C	--
12.	Total Hardness	EDTA Titrimetric Method	APHA-2340 C	--
13.	Nitrate NO_3^-	Cadmium Reduction Method	APHA-4500-NO_3 E	0.3
14.	Turbidity	Nephelometric Method	APHA 2130-B	0
15.	Iron as Fe^{+3}	Atomic Absorption Spectrophotometric method	APHA 3500-Fe B	0
16.	Sodium Na^+	Flame Photometric Method	APHA-3500-Na B	0.5
17.	Zinc as Zn^{+2}	Zincon Method	APHA 3500-Zn B	0.01
18.	Cyanide as CN^-	Pyridine-Pyrazalone Method	APHA 4500-CN^- D	0.002
19.	Total Coli forms	Membrane Filtration method	APHA - 9222 B	1
20.	Faecal Coli forms (E. Coli)	Membrane Filtration method	APHA - 9222 C	1
21.	Cadmium Cd	Atomic Absorption Spectrophotometric method	APHA 3500-Cd	0
22.	Lead Pb^{+2}	Atomic Absorption Spectrophotometric method	APHA 3500-Pb	0
23.	Mercury Hg	Atomic Absorption Spectrophotometric method	APHA 3500-Hg	0
24.	Nickel Ni	Atomic Absorption Spectrophotometric method	APHA 3500-Ni	0
25.	Boron B	Carmine Method	APHA 4500-B C	0.2
26.	Manganese Mn	PAN Method	HACH Method 8149	0
27.	Barium Ba	Atomic Absorption Spectrophotometric method	APHA 3500-Ba	0
28.	Chromium Trivalent and Hexavalent	1,5-Diphenylcarbohydrazide method	APHA 3500-Cr B	0.1

S. No.	Parameter	Method / Technique	Reference	Lowest Detection Limit
29.	Nitrite NO_2^-	Colorimetric method	APHA-4500-NO_2^- B	0.005
30.	Molybdenum	Ascorbic Acid Method	APHA-4500-P	0.3
31.	Selenium Se	Atomic Absorption Spectrophotometric method	APHA-3500 Se	0
32.	Phenolic Compounds as Phenols	4-Aminoantipyrine Method	APHA 5530 D	0.002
33.	Pesticides	Micro Extraction and Gas Chromatography	APHA D5175	0
34.	Colour	Visual Comparison method	APHA 2120 B	0
35.	Hydrogen Sulphide H_2S	Methylene Blue Method	APHA 4500-S^{2-}	0.01
36.	Aluminum Al	Atomic Absorption Spectrophotometric method	APHA 3500-Al	0
37.	Antimony Sb	Atomic Absorption Spectrophotometric method	APHA 3500-Sb	0
38.	Conductivity	By conductivity meter	APHA 2510-B	1
39.	Bicarbonates	By titration method	APHA 2320-B	--
40.	Iodine I	Amperometric Titration method	APHA 4500-I C	--
41.	Calcium Ca^{+2}	EDTA Titrimetric Method	APHA 3500-Ca B	--
42.	Magnesium Mg^{+2}	Calculation Method	APHA 3500-Mg B	--
43.	Potassium K^+	Flame Photometric Method	APHA 3500-K B	--
44.	Phosphorus as PO_4^{-3}	Ascorbic Acid Method	APHA 4500-P E	0.01
45.	Copper Cu	Atomic Absorption Spectrophotometric method	APHA 3500-Cu	0
46.	Chemical Oxygen Demand (COD)	Dichromate Reactor Digestion Method	APHA-5220 D	0.2
47.	Biochemical Oxygen Demand (BOD)	Respirometric Method	APHA-5210 D	1
48.	Oil & Grease	Partition Gravimetric Method	APHA-5520 B	--
49.	Chlorine	DPD Method	APHA 4500-Cl G	0.01
50.	An Ionic Detergent as MBAS	Spectrophotometric Method	APHA 5540-C	0.025
51.	Dissolved Oxygen (DO)	Azide Modification Method	APHA 4500-O C	1

Note: *APHA=American Public Health Association, ASTM = American Society for Testing and Materials*

CHAPTER – III

RESULTS AND DISCUSSION

3. Results and Discussion

3.1 Ambient Air

This section of the report presents the testing results of Ambient Air (CO, NO_x, SO_2, PM_{10}, $PM_{2.5}$,) and Ambient Noise. Concentration of CO, NO_x, SO_2, PM_{10}, $PM_{2.5}$,were measured at Identified sampling location to get an overview of the air quality. The results of measure concentration at each sampling location are given in **Tables** below.

3.1.1 MissriMor Construction Camp #1 (near Rasool Barrage Check Post)

Table 3-1-1: Ambient Air Quality Monitoring Results

S. No.	Time	CO	NO	NO_2	SO_2	PM10	PM2.5	SPM	Lead (Pb)
	Hours	mg/m³	µg/m³	µg/m³	µg/m³	µg/m3	µg/m3	µg/m3	µg/m3
1	6:00 pm	0.2091	3.198	1.827	10.575	125	15	300	0.4
2	7:00 pm	0.369	3.321	1.015	1.974	120	25	325	0.4
3	8:00 pm	0.3321	3.69	1.421	10.434	130	18	300	0.5
4	9:00 pm	0.3936	3.075	2.436	10.716	120	20	287.5	0.3
5	10:00 pm	0.4059	2.46	1.827	11.562	115	10	322.5	0.6
6	11:00 pm	1.1685	2.583	2.233	11.844	129	13	300	0.4
7	12:00 pm	0.492	1.845	3.857	10.434	120	15	317.5	0.2
8	01:00 pm	0.4428	2.091	3.451	11.844	127	10	310	0.2
9	02:00 am	0.3444	0.2214	3.654	10.434	124	08	262.5	0.3
10	03:00 am	0.5658	1.845	2.233	11.844	105	12	257.5	0.2
11	04:00 am	0.4674	1.599	1.421	11.844	103	07	275	0.3
12	05:00 am	0.3444	0.984	1.624	11.562	110	10	250	0.3
13	06:00 am	0.3936	0.738	1.624	11.562	100	09	327.5	0.2
14	07:00 am	0.3198	1.845	1.624	11.844	131	07	250	0.3
15	08:00 am	0.8118	0.738	2.233	10.998	100	08	287.5	0.3
16	09:00 am	0.5043	1.353	2.639	12.126	115	13	275	0.5

17	10:00 am	1.6605	3.075	2.233	11.28	110	15	302.5	0.4
18	11:00 am	0.4305	1.599	1.827	11.28	121	20	307.5	0.5
19	12:00 am	0.4059	1.107	3.248	10.716	123	17	315	0.7
20	01:00 am	0.4797	1.722	2.639	10.434	126	15	300	0.4
21	02:00 pm	1.3899	1.476	2.639	10.434	120	21	295	0.5
22	03:00 pm	0.492	1.845	3.248	10.716	118	14	290	0.3
23	04:00 pm	0.8364	0.861	2.233	10.998	116	15	330	0.5
24	05:00 pm	0.6765	1.599	3.451	11.28	132	13	300	0.4
Average(24 hrs)		0.5807	1.9	2.3599	10.7806	118.33	13.75	295.833	0.37
PEQS		10	40	80	120	150	35	500	1.5

Monitoring during day time

Monitoring during night time

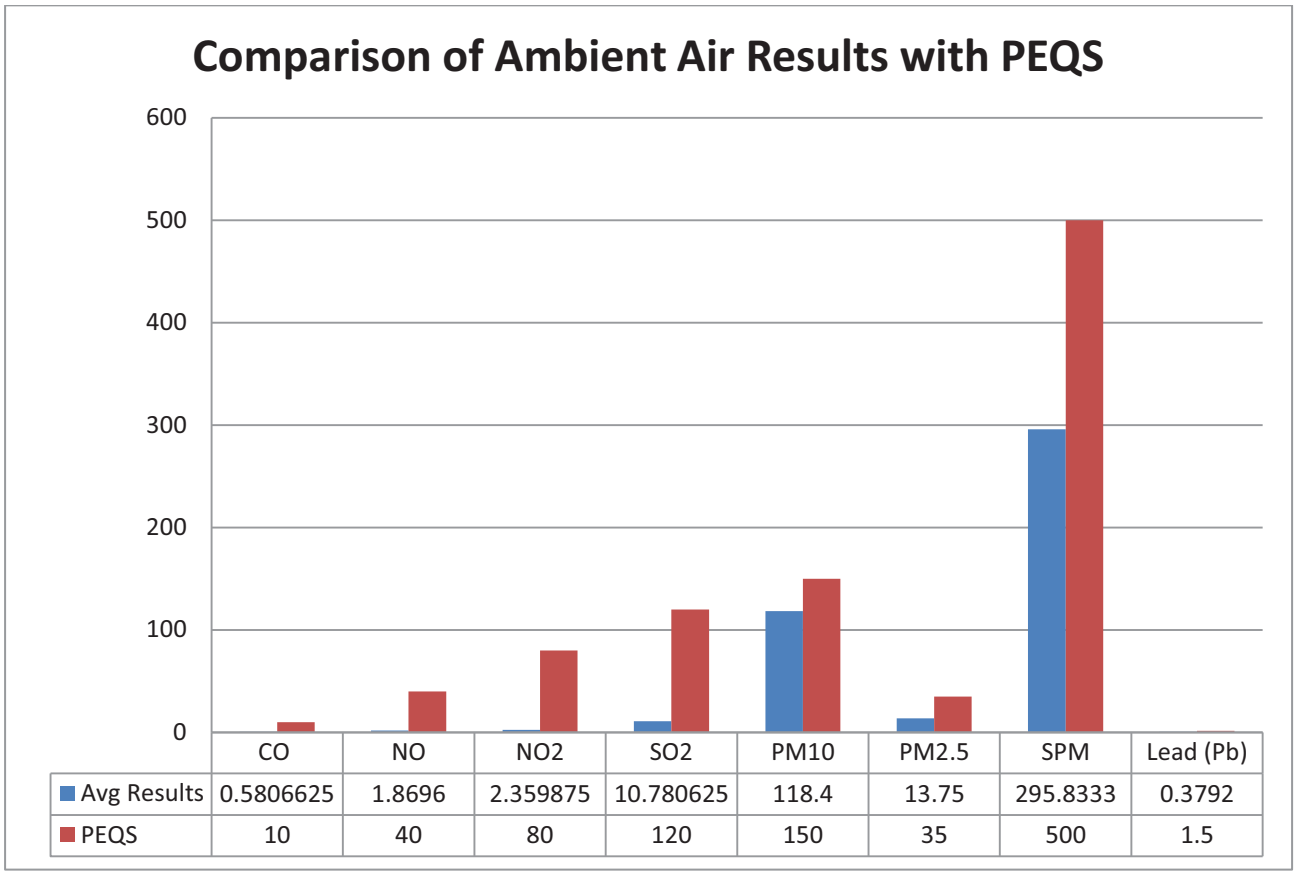


Figure 3-1: Comparison ofAmbient Air Results with PEQS

S. No.	Time	O_3	VOC	CO_2
	Hours	ppm	ppm	ppm
1	12:00 pm	64	0.0	375
2	12:10 pm	67		
3	12:20 pm	62		
4	12:30 pm	69		
5	12:40 pm	64		
6	12:50 pm	67		
7	01:00 pm	64		
Average(1 hr)		65.3	0	375
PEQS		130	NO GUIDELINE VALUE SET	NO GUIDELINE VALUE SET

3.1.2 JalapurShareefSite

Table 3-1-2: Ambient Air Quality Monitoring Results

S. No.	Time	CO	NO	NO_2	SO_2	PM10	PM2.5	SPM	Lead (Pb)
	Hours	mg/m^3	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	µg/m3	µg/m3	µg/m3	µg/m3
1	6:00 pm	0.2091	0.984	11.165	8.46	110	10	275	0.1
2	7:00 pm	0.369	0.246	10.15	8.742	115	16	287.5	0.1
3	8:00 pm	0.3321	0.369	14.21	10.716	119	15	297.5	0
4	9:00 pm	0.3936	0.861	8.729	10.434	102	19	255	0.1
5	10:00 pm	0.4059	0.738	2.2127	10.998	118	21	295	0.2
6	11:00 pm	1.1685	0.984	14.413	10.434	120	19	300	0.1
7	12:00 pm	0.492	0.615	9.744	10.998	115	29	287.5	0
8	01:00 pm	0.4428	1.353	9.947	11.844	117	17	292.5	0
9	02:00 am	0.3444	0.984	11.165	12.126	114	18	285	0
10	03:00 am	0.5658	0.861	18.27	10.998	119	17	297.5	0

11	04:00 am	0.4674	0.738	2.0706	10.152	110	15	275	0
12	05:00 am	0.3444	1.476	19.894	11.28	110	10	275	0
13	06:00 am	0.3936	0.861	19.285	10.998	100	11	250	0
14	07:00 am	0.3198	0.861	69.223	11.28	104	10	260	0
15	08:00 am	0.8118	0.738	1.421	10.434	100	10	250	0.1
16	09:00 am	0.5043	1.353	4.06	10.998	115	12	287.5	0.2
17	10:00 am	1.6605	0.615	10.15	11.28	110	10	275	0.2
18	11:00 am	0.4305	1.23	8.729	10.434	107	13	267.5	0.4
19	12:00 am	0.4059	1.107	7.714	10.998	112	12	280	0.2
20	01:00 am	0.4797	1.722	0.812	10.998	121	12	302.5	0.2
21	02:00 pm	1.3899	1.476	1.624	10.716	128	16	320	0.1
22	03:00 pm	0.492	1.845	0.406	10.716	116	20	290	0.2
23	04:00 pm	0.8364	0.861	6.293	10.716	116	15	290	0.1
24	05:00 pm	0.6765	1.599	5.075	10.716	124	12	310	0.1
Average(24 hrs)		0.5807	1.0096	11.1151	10.7278	113.417	14.9583	283.541	0.1000
PEQS		10	40	80	120	150	35	500	1.5

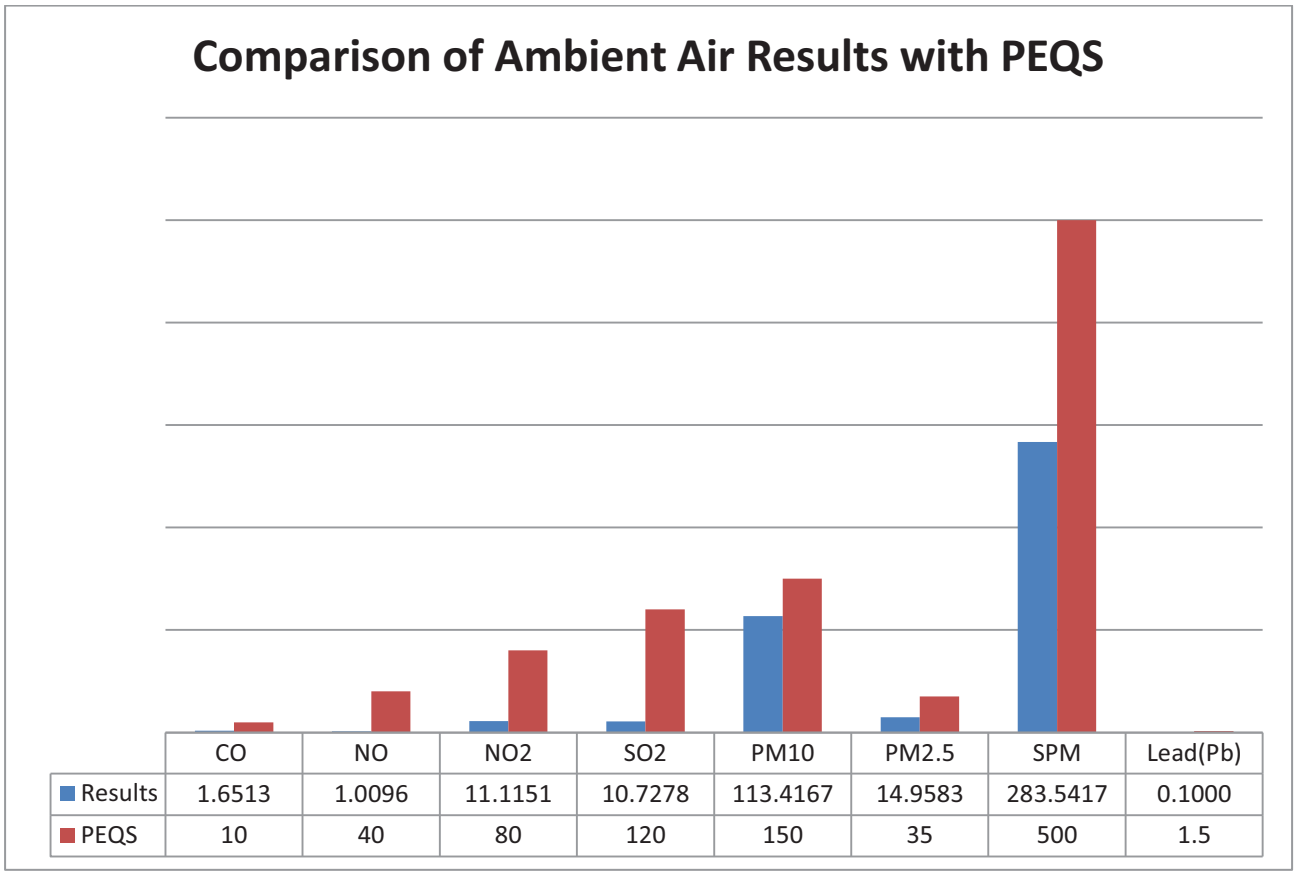


Figure 3-2: Comparison of Ambient Air Results with PEQS

S. No.	Time	O_3	VOC	CO_2
	Hours	ppm	ppm	ppm
1	12:00 pm	43	0.0	361
2	12:10 pm	47		
3	12:20 pm	40		
4	12:30 pm	40		
5	12:40 pm	43		
6	12:50 pm	46		
7	1:00 pm	40		
Average(1 hr)		42.7	0	361
PEQS		130	NO GUIDELINE VALUE SET	NO GUIDELINE VALUE SET

3.1.3 Adowal Site

Table 3-1-3: Ambient Air Quality Monitoring Results

S. No.	Time	CO	NO	NO_2	SO_2	PM10	PM2.5	SPM	Lead (Pb)
	Hours	mg/m³	µg/m³	µg/m³	µg/m³	µg/m3	µg/m3	µg/m3	µg/m3
1	6:00 pm	0.2091	0.492	2.639	9.87	117	15	292.5	0
2	7:00 pm	0.369	0.861	0.203	11.562	120	14	300	0
3	8:00 pm	0.3321	1.476	3.654	11.28	115	15	287.5	0
4	9:00 pm	0.3936	1.107	3.442	11.562	102	17	255	0
5	10:00 pm	0.4059	1.599	2.842	11.562	110	14	275	0
6	11:00 pm	1.1685	1.353	2.842	11.562	104	19	260	0
7	12:00 am	0.492	1.599	13.195	10.998	103	12	257.5	0
8	01:00 am	0.4428	0.738	13.804	12.69	111	15	277.5	0
9	02:00 am	0.3444	0.615	2.233	11.844	112	13	280	0
10	03:00 am	0.5658	1.845	0.406	11.562	110	14	275	0
11	04:00 am	0.4674	1.353	7.105	17.202	110	14	275	0
12	05:00 am	0.3444	1.968	8.323	21.15	100	15	250	0
13	06:00 am	0.3936	2.583	5.278	11.562	103	15	257.5	0
14	07:00 am	0.3198	1.353	7.511	11.844	103	18	257.5	0
15	08:00 am	0.8118	1.353	5.278	11.562	105	16	262.5	0
16	09:00 am	0.5043	0.492	7.511	11.562	112	19	280	0
17	10:00 am	1.6605	1.23	5.278	11.844	110	18	275	0
18	11:00 am	0.4305	0.984	4.466	10.716	116	23	290	0
19	12:00 pm	0.4059	1.107	3.248	10.998	113	11	282.5	0
20	01:00 pm	0.4797	1.23	34.51	11.28	110	17	275	0
21	02:00 pm	1.3899	1.107	1.015	10.998	110	19	275	0

22	03:00 pm	0.492	0.861	7.308	11.562	97	24	242.5	0
23	04:00 pm	0.8364	1.353	8.729	11.844	98	19	245	0
24	05:00 pm	0.6765	1.23	22.939	11.562	101	21	252.5	0
Average(24 hrs)		**1.1219**	**1.2454**	**7.3**	**12.0908**	**108**	**16.5417**	**270**	**0**
PEQS		**10**	**40**	**80**	**120**	**150**	**35**	**500**	**1.5**

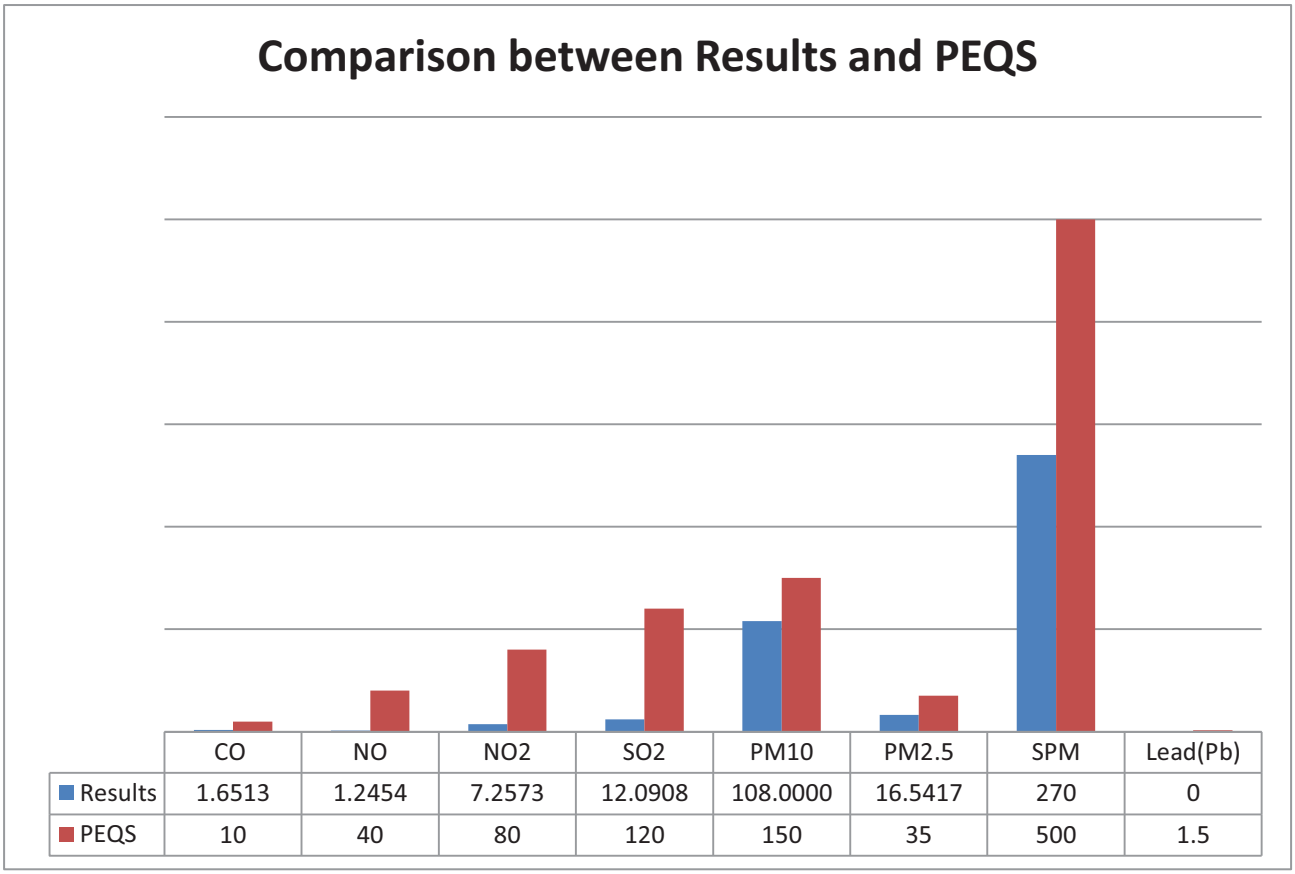


Figure 3-3: Comparison of Ambient Air Results with PEQS

S. No.	Time	O_3	VOC	CO_2
	Hours	ppm	ppm	ppm
1	**12:00 pm**	30	0	325
2	**12:10 pm**	32		
3	**12:20 pm**	34		
4	**12:30 pm**	35		
5	**12:40 pm**	33		

6	**12:50 pm**	33		
7	**1:00 pm**	32		
Average(1 hr)		**32.7**	**0**	**325**
PEQS		**130**	**NO GUIDELINE VALUE SET**	**NO GUIDELINE VALUE SET**

3.1.4 KurrarTalokar Site

Table 3-2-4: Ambient Air Quality Monitoring Results

S. No.	Time	CO	NO	NO_2	SO_2	PM10	PM2.5	SPM	Lead (Pb)
	Hours	mg/m³	µg/m³	µg/m³	µg/m³	µg/m3	µg/m3	µg/m3	µg/m3
1	6:00 pm	0.3813	3.69	10.353	9.024	79	19	197.5	0
2	7:00 pm	1.1808	3.567	30.45	9.024	94	17	235	0
3	8:00 pm	0.9717	1.722	30.044	9.588	75	21	187.5	0
4	9:00 pm	0.738	1.599	28.014	9.588	76	19	190	0
5	10:00 pm	0.5781	1.353	22.736	11.28	93	26	232.5	0
6	11:00 pm	0.615	3.444	8.729	10.998	100	10	250	0
7	12:00 pm	1.0578	1.353	16.24	11.28	54	18	135	0
8	01:00 pm	1.1685	1.107	0.203	10.998	52	16	130	0
9	02:00 am	1.0824	0.984	2.436	10.998	50	10	125	0
10	03:00 am	1.1193	1.107	1.624	11.28	55	12	137.5	0
11	04:00 am	1.1685	1.107	0.203	10.998	52	11	130	0
12	05:00 am	1.0332	0.369	1.421	11.28	54	13	135	0
13	06:00 am	1.0455	0.738	1.218	11.28	55	10	137.5	0
14	07:00 am	1.0332	1.107	0.812	11.28	51	10	127.5	0
15	08:00 am	1.0947	1.353	2.233	10.998	52	9	130	0
16	09:00 am	1.1439	0.492	4.669	11.562	56	11	140	0

17	10:00 am	1.3776	1.23	13.398	12.126	53	13	132.5	0
18	11:00 am	0.9594	1.107	8.729	10.998	76	11	190	0
19	12:00 am	0.9963	1.107	10.962	11.844	84	11	210	0
20	01:00 am	1.1931	1.23	2.436	12.126	95	9	237.5	0
21	02:00 pm	1.1562	1.353	3.248	10.434	111	16	277.5	0
22	03:00 pm	1.23	1.968	1.827	8.46	105	16	262.5	0
23	04:00 pm	1.1193	1.353	3.451	7.05	117	13	292.5	0
24	05:00 pm	1.2423	1.353	1.827	6.486	101	12	252.5	0
Average(24 hrs)		1.0286	1.4914	8.6360	10.4575	74.5833	13.8750	185.6	0
PEQS		10	40	80	120	150	35	500	1.5

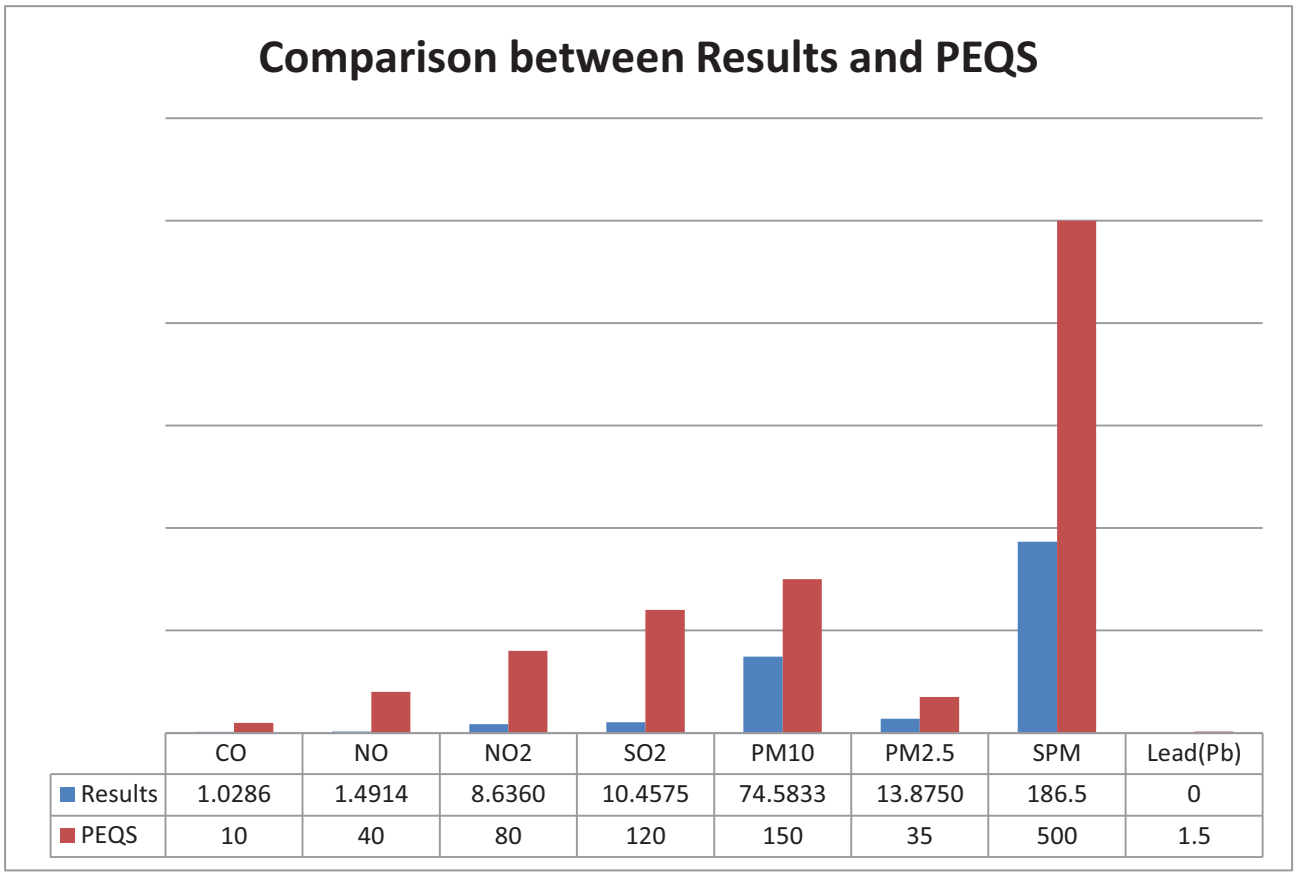


Figure 3-4: Comparison of Ambient Air Results with PEQS

S. No.	Time	O_3	VOC	CO_2
	Hours	ppm	ppm	ppm
1	12:00 pm	33	0	321
2	12:10 pm	35		
3	12:20 pm	41		
4	12:30 pm	36		
5	12:40 pm	35		
6	12:50 pm	31		
7	1:00 pm	35		
Average(1 hr)		35.1	0	321
PEQS		130	NO GUIDELINE VALUE SET	NO GUIDELINE VALUE SET

3.1.5 DudhiThal Construction Camp # 3

Table 3-3-5: Ambient Air Quality Monitoring Results

S. No.	Time	CO	NO	NO_2	SO_2	PM10	PM2.5	SPM	Lead (Pb)
	Hours	mg/m^3	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	µg/m3	µg/m3	µg/m3	µg/m3
1	4:15 pm	0.7	2.3	5.6	7.6	125	15	300.0	0.3
2	5:15 pm	0.8	2.1	5.9	9.7	120	25	287.5	0.1
3	6:15 pm	0.8	2.4	5.3	10.2	115	18	300.0	0.4
4	7:15 pm	0.7	2.4	4.4	10.0	120	20	287.5	0.5
5	8:15 pm	1.1	3.0	4.1	10.0	115	10	322.5	0.6
6	9:15 pm	1.1	2.9	4.3	10.0	129	13	300.0	0
7	10:15 pm	1.4	2.2	3.8	6.3	120	15	317.5	0
8	11:15 pm	0.7	2.0	3.1	5.2	127	10	310.0	0
9	12:15 am	1.0	1.8	3.6	11.0	124	08	262.5	0

10	1:15 am	0.8	1.8	1.8	10.5	105	12	257.5	0
11	2:15 am	0.8	1.3	1.5	10.2	103	07	275.0	0
12	3:15 am	0.8	1.5	1.0	10.2	110	10	250.0	0
13	4:15 am	0.9	2.4	1.4	10.5	100	09	327.5	0
14	5:15 am	0.7	2.8	2.5	10.7	131	07	250.0	0
15	6:15 am	1.5	1.7	2.9	10.7	100	08	287.5	0
16	7:15 am	0.8	2.1	3.8	10.5	115	13	275.0	0.2
17	8:15 am	0.8	3.6	4.1	10.2	110	15	302.5	0.8
18	9:15 am	0.9	5.8	4.3	9.7	121	20	307.5	0.1
19	10:15 am	3.3	3.5	3.6	8.9	123	17	315.0	0.3
20	11:15 am	0.7	3.9	1.7	7.3	126	15	300.0	0.2
21	12:15 pm	0.7	2.7	4.5	7.9	120	21	295.0	0.2
22	1:15 pm	0.7	2.4	4.8	8.6	118	14	290.0	0.3
23	2:15 pm	0.8	3.9	3.5	7.9	116	15	330.0	0.1
24	3:15 pm	0.1	3.6	3.2	8.9	132	13	300.0	0.4
Average(24 hrs)		1.0	2.7	3.5	9.3	118.33	13.75	294.3	0.18
PEQS		10	40	80	120	150	35	500	1.5

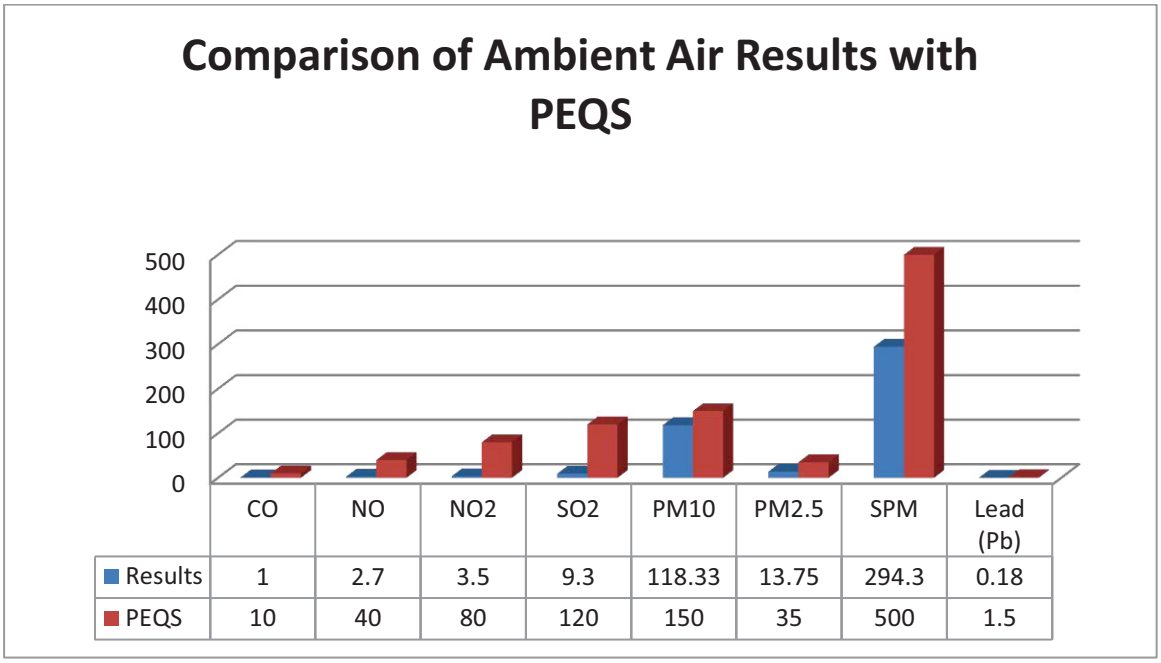


Figure 3-5: Comparison of Ambient Air Results with PEQS

S. No.	Time	O_3	VOC	CO_2
	Hours	ppm	ppm	ppm
1	12:00 pm	31	0.3	326
2	12:10 pm	34		
3	12:20 pm	32		
4	12:30 pm	32		
5	12:40 pm	34		
6	12:50 pm	35		
7	1:00 pm	32		
Average(1 hr)		**32.85**	**0.3**	**326**
PEQS		**130**	**NO GUIDELINE VALUE SET**	**NO GUIDELINE VALUE SET**

Note: The high value of VOC at Dudhi Thal site is due to the Lime Kiln.

3.1.6 RaiShahr

Table 3-4-6: Ambient Air Quality Monitoring Results

S. No.	Time	CO	NO	NO_2	SO_2	PM10	PM2.5	SPM	Lead (Pb)
	Hours	mg/m³	µg/m³	µg/m³	µg/m³	µg/m3	µg/m3	µg/m3	µg/m3
1	4:30 pm	0.9	2.6	3.9	8.4	130	26	325	0
2	5:30 pm	0.8	0.4	3.6	9.7	136	20	340	0
3	6:30 pm	0.8	2.4	2.8	10.2	130	31	325	0
4	7:30 pm	0.8	1.5	3.0	10.2	127	27	317.5	0
5	8:30 pm	0.9	2.4	2.3	10.5	120	29	300	0
6	9:30 pm	0.8	1.1	2.1	10.2	128	22	320	0
7	10:30 pm	0.8	3.1	0.8	10.2	125	24	312.5	0
8	11:30 pm	0.8	4.3	0.8	10.5	117	19	292.5	0
9	12:30 am	0.7	5.4	3.6	10.5	110	13	275	0
10	1:30 am	0.7	6.8	1.7	10.5	115	16	287.5	0
11	2:30 am	0.8	7.0	0.8	10.0	110	20	275	0
12	3:30 am	0.4	8.4	0.4	10.2	103	24	257.5	0
13	4:30 am	0.4	4.3	4.5	10.5	115	21	287.5	0
14	5:30 am	0.4	2.6	3.2	10.5	120	28	300	0
15	6:30 am	0.8	5.9	2.1	10.2	118	24	295	0
16	7:30 am	0.8	11.4	1.5	10.7	120	21	300	0
17	8:30 am	0.7	5.6	0.6	10.7	115	20	287.5	0
18	9:30 am	0.5	4.9	1.7	10.2	130	20	325	0
19	10:30 am	0.6	0.5	2.1	10.0	131	16	327.5	0
20	11:30 am	0.6	3.1	1.1	9.7	128	20	320	0
21	12:30 pm	0.5	2.1	2.6	9.4	126	20	315	0

22	1:30 pm	0.6	2.9	2.3	8.9	135	23	337.5	0
23	2:30 pm	0.7	2.6	3.2	9.4	129	25	322.5	0
24	3:30 pm	0.1	5.4	1.5	7.3	132	20	330	0
Average(24 hrs)		0.7	4.0	2.2	9.9	122.91	22.05	307.2	0
PEQS		10	40	80	120	150	35	500	1.5

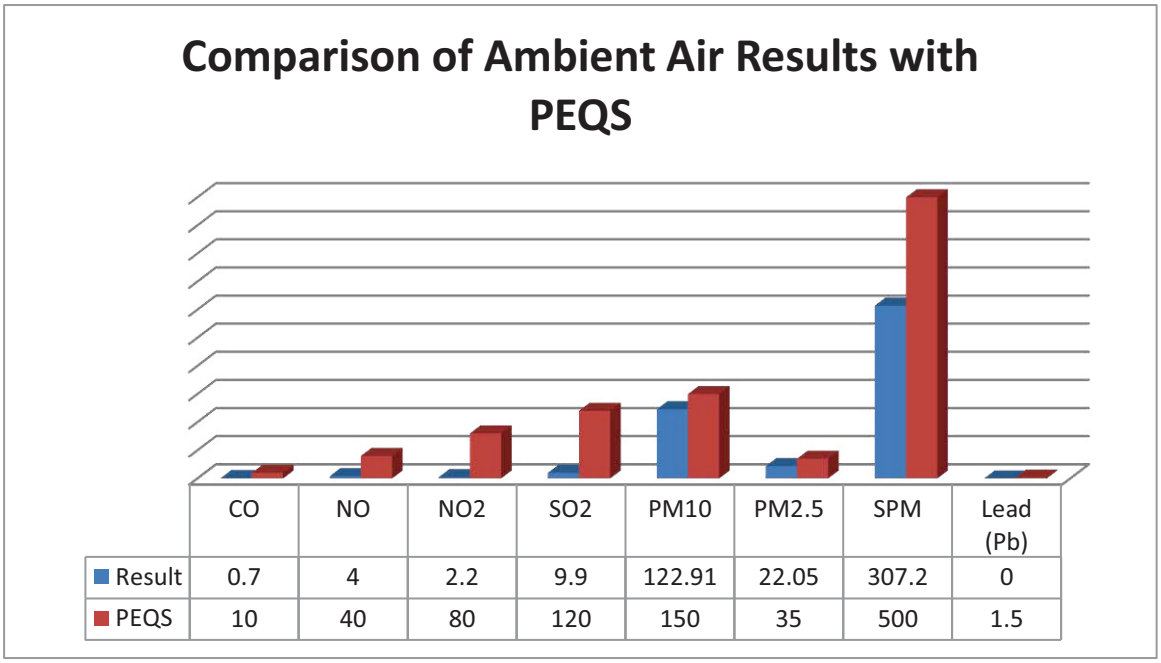


Figure 3-6: Comparison of Ambient Air Results with PEQS

S. No.	Time	O_3	VOC	CO_2
	Hours	ppm	ppm	ppm
1	12:00 pm	35	0	320
2	12:10 pm	33		
3	12:20 pm	32		
4	12:30 pm	30		
5	12:40 pm	32		
6	12:50 pm	32		
7	1:00 pm	31		
Average(1 hr)		**32.85**	**0**	**320**
PEQS		**130**	**NO GUIDELINE**	**NO GUIDELINE**

		VALUE SET	VALUE SET

3.1.7 Saroba

Table 3-5-7: Ambient Air Quality Monitoring Results

S. No.	Time	CO	NO	NO_2	SO_2	PM10	PM2.5	SPM	Lead (Pb)
	Hours	mg/m³	µg/m³	µg/m³	µg/m³	µg/m3	µg/m3	µg/m3	0
1	4:30 pm	0.1	1.2	1.22	0.3	110	30	275	0
2	5:30 pm	0.7	1.8	1.34	9.7	116	20	290	0
3	6:30 pm	0.6	1.2	1.11	10.2	111	17	277.5	0
4	7:30 pm	0.9	1.4	1.56	10.7	110	19	275	0
5	8:30 pm	0.6	1.3	1.87	10.7	110	11	275	0
6	9:30 pm	0.5	1.6	1.53	11.0	106	10	265	0
7	10:30 pm	0.5	1.2	1.23	10.7	111	30	277.5	0
8	11:30 pm	0.5	1.6	1.82	11.0	110	17	275	0
9	12:30 am	0.6	1.4	1.92	10.5	107	10	267.5	0
10	1:30 am	0.4	1.4	2.10	11.0	119	13	297.5	0
11	2:30 am	0.6	1.5	2.68	10.7	107	16	267.5	0
12	3:30 am	0.6	1.3	4.45	10.7	110	11	275	0
13	4:30 am	0.5	1.3	1.22	10.7	117	10	292.5	0
14	5:30 am	0.4	1.2	1.67	11.0	116	30	290	0
15	6:30 am	0.5	1.6	3.45	10.7	113	13	282.5	0
16	7:30 am	0.6	1.3	2.18	10.5	110	13	275	0
17	8:30 am	0.8	1.2	1.65	10.5	121	13	302.5	0
18	9:30 am	0.6	1.5	2.45	3.1	125	17	312.5	0
19	10:30 am	2.1	1.7	1.67	7.9	110	14	275	0
20	11:30 am	0.7	2.0	1.43	8.1	101	20	252.5	0

21	12:30 pm	0.5	1.9	1.76	10.7	127	30	317.5	0
22	1:30 pm	0.6	1.5	1.69	8.6	125	13	312.5	0
23	2:30 pm	0.7	1.8	1.23	10.5	119	13	297.5	0
24	3:30 pm	0.5	1.4	2.53	11.0	118	18	275	0
Average(24 hrs)		0.63	1.5	1.91	9.62	113.70	14.5	283.8	0
PEQS		10	40	80	120	150	35	500	1.5

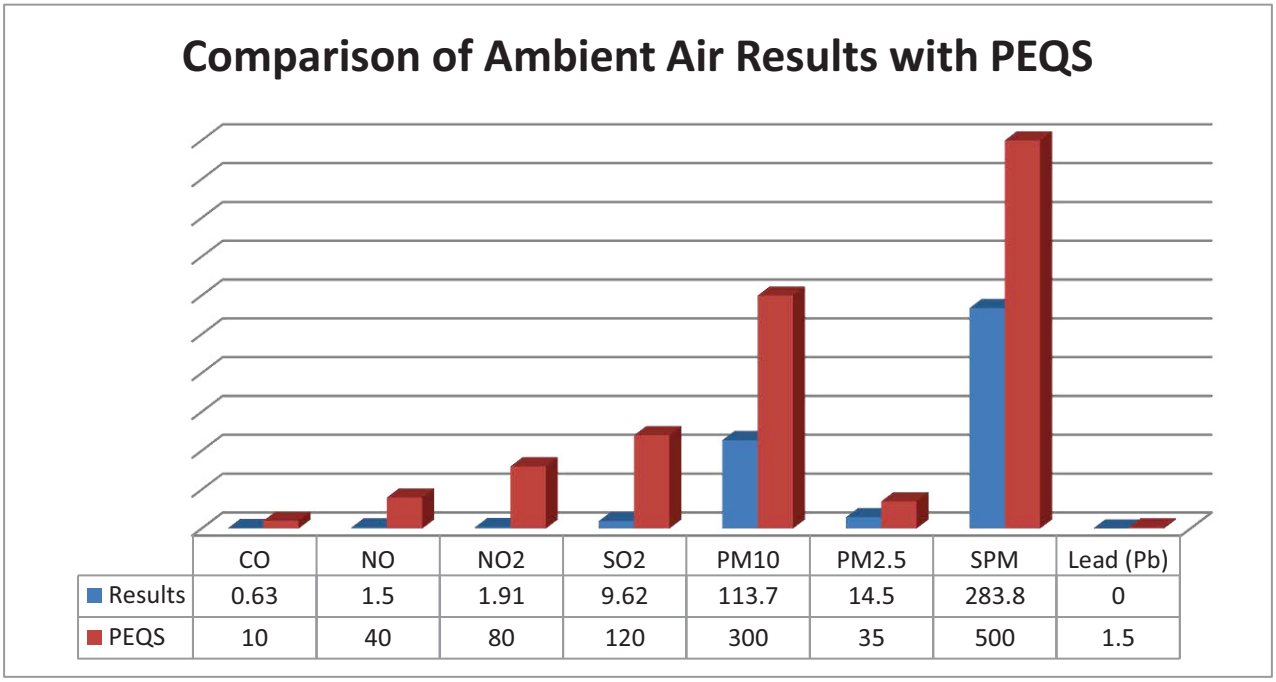


Figure 3-7: Comparison of Ambient Air Results with PEQS

S. No.	Time	O_3	VOC	CO_2
	Hours	ppm	ppm	ppm
1	**12:00 pm**	46	0	338
2	**12:10 pm**	48		
3	**12:20 pm**	41		
4	**12:30 pm**	43		
5	**12:40 pm**	44		
6	**12:50 pm**	38		
7	**1:00 pm**	36		

Average(1 hr)	**42.2**	**0**	**338**
PEQS	**130**	**NO GUIDELINE VALUE SET**	**NO GUIDELINE VALUE SET**

3.1.8 Pind Dadan Khan Site

Table 3-6-8: Ambient Air Quality Monitoring Results

S. No.	Time	CO	NO	NO_2	SO_2	PM10	PM2.5	SPM	Lead (Pb)
	Hours	mg/m³	µg/m³	µg/m³	µg/m³	µg/m3	µg/m3	µg/m3	µg/m3
1	4:00 pm	0.03	0.6	0.1	6.8	90	07	225	0.4
2	5:00 pm	0.02	2.3	2.4	7.1	98	10	245	0.4
3	6:00 pm	0.09	3.1	3.1	8.4	88	13	220	0.5
4	7:00 pm	0.02	2.9	2.9	9.2	80	11	200	0.3
5	8:00 pm	0.62	3.1	4.0	11.8	85	07	212.5	0.6
6	9:00 pm	0.34	4.0	4.4	9.7	79	09	197.5	0.4
7	10:00 pm	0.25	1.9	1.5	10.0	91	07	227.5	0.2
8	11:00 pm	0.01	1.4	2.0	10.7	90	06	225	0.2
9	12:00 am	0.05	1.1	4.0	10.5	91	09	227.5	0.3
10	1:00 am	0.07	1.0	3.6	10.2	89	08	222.5	0.2
11	2:00 am	0.17	2.0	3.0	11.0	78	11	195	0.3
12	3:00 am	0.29	1.5	3.5	10.7	85	10	212.5	0.3
13	4:00 am	0.30	2.6	3.9	10.5	80	11	200	0.2
14	5:00 am	0.21	3.8	4.0	11.5	85	09	212.5	0.3
15	6:00 am	0.64	2.3	4.5	13.1	79	08	197.5	0.3
16	7:00 am	0.58	2.0	3.4	9.7	78	11	195	0.5
17	8:00 am	0.23	0.4	3.5	8.1	86	12	215	0.4
18	9:00 am	0.09	0.6	2.9	9.4	81	14	202.5	0.5

19	10:00 am	0.15	1.5	2.3	7.3	82	12	205	0.7
20	11:00 am	0.08	3.0	0.4	6.8	86	13	215	0.4
21	12:00 pm	0.03	2.6	1.4	6.8	89	12	222.5	0.5
22	1:00 pm	0.06	3.4	2.6	2.6	85	11	212.5	0.3
23	2:00 pm	0.09	1.5	2.8	3.7	80	14	200	0.5
24	3:00 pm	0.08	2.9	3.3	4.7	90	10	225	0.4
Average(24 hrs)		0.19	2.1	2.9	8.8	85.20	10.20	213	0.37
PEQS		10	40	80	120	150	35	500	1.5

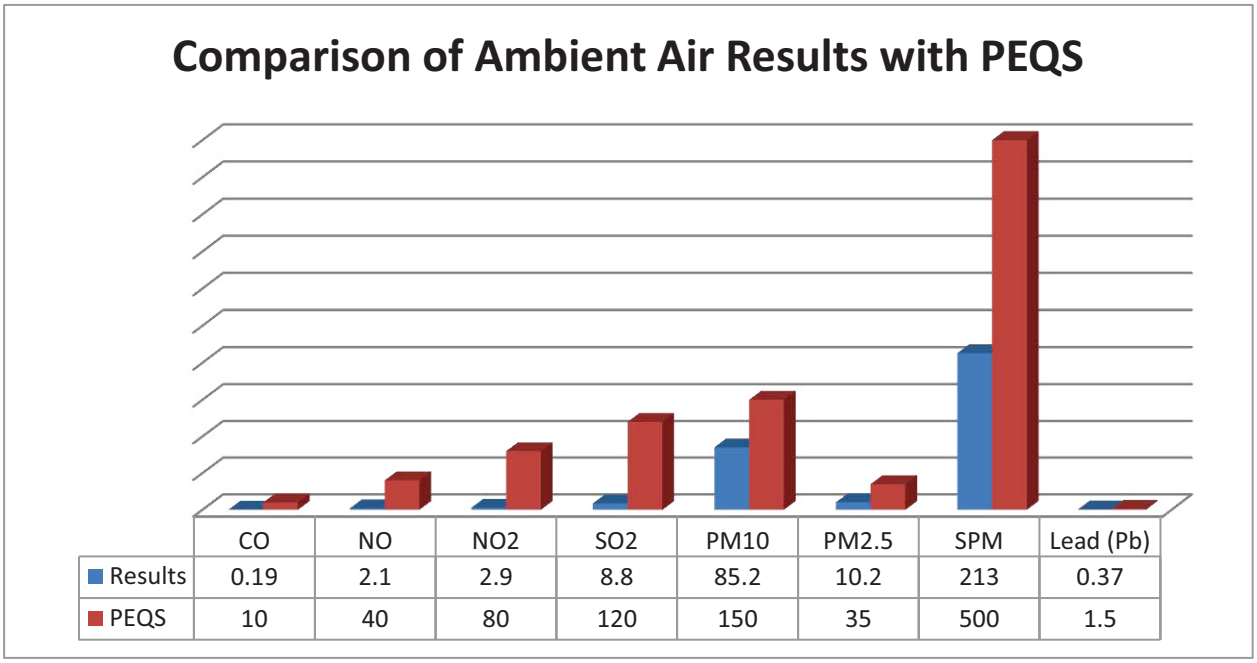


Figure 3-8: Comparison of Ambient Air Results with PEQS

S. No.	Time	O_3	VOC	CO_2
	Hours	ppm	ppm	ppm
1	12:00 pm	57	0	363
2	12:10 pm	61		
3	12:20 pm	60		
4	12:30 pm	59		
5	12:40 pm	54		

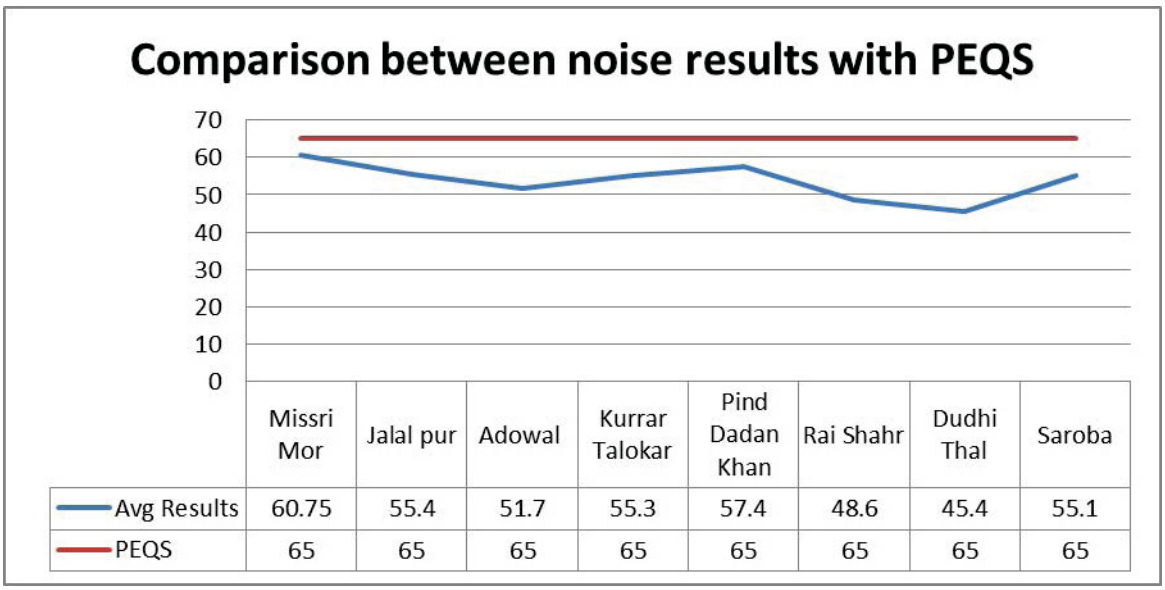
6	**12:50 pm**	59		
7	**1:00 pm**	57		
Average(1 hr)		**58.1**	**0**	**363**
PEQS		**130**	**NO GUIDELINE VALUE SET**	**NO GUIDELINE VALUE SET**

3.2 Noise Level Monitoring

The noise levels were determined at the identified location. The results of the noise measurement arepresented below:

Table 3-7-1: Noise Level Monitoring Results

S. NO	Location	Min (dbA)	Max (dbA)	Avg (dbA)
1	Missri Mor	57.8	63.7	60.75
2	Jalal Pur Shareef	53.2	57.6	55.4
3	Adowal	48.5	54.9	51.7
4	Kurrar Talokar	52.7	57.8	55.3
5	Pind Dadan Khan	55.3	59.5	57.4
6	Rai Shahr	46.8	50.3	48.6
7	Dhudi Thal	43.6	47.2	45.4
8	Sroba	52.4	57.8	55.1



3.3 Weather Conditions Monitoring

Wind speed and other weather conditions were measured on the site. The weather data is presented below:

3.3.1 MissriMor Construction Camp #1 (near Rasool Barrage Check Post)

Table 3-3-1: Weather Monitoring Results

S. No.	Time	Humidity	Wind speed	Temp	Wind Direction
	Hours	%	m/sec	°C	—
1	6:00 pm	42	1.7	16.8	SE
2	7:00 pm	42	2.7	16.7	E
3	8:00 pm	43	3.4	15.9	E
4	9:00 pm	44	0.3	14.9	SE
5	10:00 pm	46	0.0	14.4	W
6	11:00 pm	66	0.7	10.6	SW
7	12:00 pm	72	0.3	10.2	W
8	01:00 pm	68	0.0	10.8	SW
9	02:00 am	74	0.3	10.3	SW
10	03:00 am	75	0.3	10.0	SW
11	04:00 am	75	0.3	9.8	SW
12	05:00 am	75	0.7	10.1	W
13	06:00 am	73	0.3	10.0	N
14	07:00 am	73	0.3	10.2	N
15	08:00 am	75	1.0	10.2	SE
16	09:00 am	60	1.7	12.5	S
17	10:00 am	56	1.4	14.2	NW
18	11:00 am	63	0.7	14.8	E

19	12:00 am	52	1.4	16.2	NE
20	01:00 am	45	1.4	18.1	NW
21	02:00 pm	50	1.0	18.0	W
22	03:00 pm	58	1.3	17.2	N
23	04:00 pm	51	1.0	17.3	W
24	05:00 pm	53	0.3	15.7	SW
Average(24 hrs)		**59.625**	**0.9375**	**13.5375**	--

Monitoring during day time Monitoring during night time

3.3.2 Jalal PurShareef

Table 3-3-2: Weather Monitoring Results

S. No.	Time	Humidity	Wind speed	Temp	Wind Direction
	Hours	%	m/sec	°C	—
1	6:00 pm	62	3.7	15.2	NE
2	7:00 pm	48	5.8	16.5	SE
3	8:00 pm	64	3.1	15.0	SW
4	9:00 pm	71	1.7	13.9	NW
5	10:00 pm	76	1.7	13.6	S
6	11:00 pm	86	0.3	12.09	SW
7	12:00 pm	85	0.3	11.8	SW
8	01:00 pm	85	1.7	11.9	NE
9	02:00 am	84	1.0	11.3	N
10	03:00 am	85	1.3	11.0	N
11	04:00 am	86	1.0	10.8	N
12	05:00 am	81	1.4	12.0	SE

13	06:00 am	82	1.7	13.3	E
14	07:00 am	84	2.4	10.7	E
15	08:00 am	78	2.0	11.6	E
16	09:00 am	69	2.1	13.4	E
17	10:00 am	64	3.1	15.6	E
18	11:00 am	56	1.7	20.8	S
19	12:00 am	51	1.4	21.5	S
20	01:00 am	38	1.4	24.2	S
21	02:00 pm	47	1.4	22.9	W
22	03:00 pm	47	2.7	21.6	NE
23	04:00 pm	54	2.7	19.3	NE
24	05:00 pm	57	1.7	28.8	N
Average(24 hrs)		**67.70833**	**1.970833**	**15.28292**	--

3.3.3 Adowal

Table 3-3-3: Weather Monitoring Results

S. No.	Time	Humidity	Wind speed	Temp	Wind Direction
	Hours	%	m/sec	°C	—
1	7:00 pm	70	0.7	15.6	SW
2	8:00 pm	85	0.0	12.8	S
3	9:00 pm	96	0.7	11.0	S
4	10:00 pm	98	0.0	9.4	SW
5	11:00 pm	95	0.3	10.2	NE
6	12:00 pm	90	0.7	10.8	N
7	01:00 pm	91	0.7	10.5	N
8	02:00 am	90	0.3	10.2	W
9	03:00 am	97	1.0	7.2	NE
10	04:00 am	98	1.2	7.0	N
11	05:00 am	99	1.4	7.1	N
12	06:00 am	98	2.0	7.2	NE
13	07:00 am	98	0.7	6.3	NW
14	08:00 am	99	0.7	8.6	NE
15	09:00 am	82	0.3	13.7	N
16	10:00 am	91	0.0	12:0	NE
17	11:00 am	73	1.0	16.8	E
18	12:00 am	79	1.4	16.7	S
19	01:00 am	77	0.7	16.9	NW
20	02:00 pm	72	1.0	17.0	N
21	03:00 pm	80	1.0	16.3	W

22	04:00 pm	88	0.0	15.5	NW
23	05:00 pm	93	0.0	14.6	N
24	06:00 pm	98	1.0	13.6	NW
Average(24 hrs)		86.70833	0.729167	11.6125	--

3.3.4 KurrarTalokar

Table 3-3-4: Weather Monitoring Results

S. No.	Time	Humidity	Wind speed	Temp	Wind Direction
	Hours	%	m/sec	°C	—
1	02:30 pm	50	2.4	24	W
2	03:30 pm	49	1.4	24.5	W
3	04:30 pm	58	1.7	21.4	W
4	05:30 pm	66	1.0	19.0	SW
5	06:30 pm	74	1.0	17.4	SW
6	07:30 pm	67	1.4	16.7	SW
7	08:30 pm	68	0.3	16.1	W
8	09:30 pm	71	0.7	14.8	SE
9	10:30 pm	73	0.7	14.6	S
10	11:30 pm	73	0.7	14.1	SW
11	12:30 am	73	0.7	13.3	W
12	01:30 am	75	0.6	13.0	W
13	02:30 am	76	0.3	12.7	SW
14	03:30 am	77	0.3	12.4	SW
15	04:30 am	77	0.7	10.5	E
16	05:30 am	78	0.7	9.9	E
17	06:30 am	82	0.7	9.7	E
18	07:30 am	85	0.7	9.6	W
19	08:30 am	78	0.2	14.9	W
20	09:30 am	53	1.4	18.5	E
21	10:30 am	40	2.0	19.2	E

22	11:30 am	28	0.7	22.2	SW
23	12:30 pm	35	0.7	23.3	W
24	01:30 pm	38	0.2	24.9	NE
Average(24 hrs)		64.5	0.945833	16.19167	--

3.3.5 DudhiThal

Table 3-3-5: Weather Monitoring Results

S. No.	Time	Humidity	Wind speed	Temp	Wind Direction
	Hours	%	m/sec	°C	—
1	4:15 pm	33	2.0	20.1	S
2	5:15 pm	38	3.1	24.3	W
3	6:15 pm	59	4.4	23.9	SW
4	7:15 pm	74	1.7	22.4	NW
5	8:15 pm	73	1.7	18.1	S
6	9:15 pm	73	2.0	15.8	SW
7	10:15 pm	75	1.0	14.0	SW
8	11:15 pm	78	1.0	13.8	SW
9	12:15 am	80	0.3	12.7	SW
10	1:15 am	76	2.4	12.9	SW
11	2:15 am	74	0.7	11.4	S
12	3:15 am	78	0.7	11.1	W
13	4:15 am	75	0.3	11.3	W
14	5:15 am	78	1.4	11.9	SW
15	6:15 am	88	1.3	11.7	W
16	7:15 am	89	1.4	10.2	W

17	8:15 am	89	0.0	9.6	SW
18	9:15 am	84	0.0	8.4	W
19	10:15 am	65	1.4	16.3	NE
20	11:15 am	48	0.7	20.5	W
21	12:15 pm	41	0.7	25.9	W
22	1:15 pm	33	2.0	24.4	W
23	2:15 pm	40	2.7	24.9	W
24	3:15 pm	34	1.4	25.9	SW
Average(24 hrs)		65.6	1.4	16.7	---

3.3.6 RaiShahr

Table 3-3-6: Weather Monitoring Results

S. No.	Time	Humidity	Wind speed	Temp	Wind Direction
	Hours	%	m/sec	°C	—
1	4:20 pm	48	1.0	24.3	N
2	5:20 pm	69	2.7	19.2	N
3	6:20 pm	85	0.3	15.9	NW
4	7:20 pm	79	0.7	15.2	W
5	8:20 pm	78	0.7	14.1	W
6	9:20 pm	78	0.7	13.9	W
7	10:20 pm	79	0.7	13.5	NW
8	11:20 pm	81	0.5	13.1	N
9	12:20 am	80	0.5	12.8	N
10	1:20 am	82	0.4	12.4	NW
11	2:20 am	83	0.5	12.1	NW

12	3:20 am	76	0.3	11.7	N
13	4:20 am	72	0.3	11.4	N
14	5:20 am	74	0.5	11.1	N
15	6:20 am	75	1.7	11.9	NW
16	7:20 am	72	1.7	15.2	NW
17	8:20 am	63	1.7	17.0	NE
18	9:20 am	34	2.4	20.7	SW
19	10:20 am	34	2.5	21.5	SW
20	11:20 am	28	2.0	23.9	E
21	12:20 pm	33	4.8	22.2	W
22	1:20 pm	32	5.1	22.9	SW
23	2:20 pm	36	5.4	23.1	SW
24	3:20 pm	46	1.2	25.7	N
Average(24 hrs)		63.2	1.6	16.9	---

3.3.7 Saroba

Table 3-3-7: Weather Monitoring Results

S. No.	Time	Humidity	Wind speed	Temp	Wind Direction
	Hours	%	m/sec	°C	—
1	4:30 pm	38	1.7	25.7	NW
2	5:30 pm	45	1.4	22.4	NW
3	6:30 pm	72	2.0	17.6	SW
4	7:30 pm	80	0.0	14.0	NE
5	8:30 pm	81	0.1	12.1	NE
6	9:30 pm	82	0.0	10.1	NE

7	10:30 pm	90	1.0	9.2	N
8	11:30 pm	83	1.0	9.3	NW
9	12:30 am	79	0.0	8.6	N
10	1:30 am	82	0.7	8.0	NW
11	2:30 am	87	1.0	7.3	NW
12	3:30 am	87	0.7	6.5	NW
13	4:30 am	80	0.3	5.9	NE
14	5:30 am	81	0.0	5.4	NE
30	6:30 am	81	0.7	4.6	NE
16	7:30 am	87	0.0	7.6	NE
17	8:30 am	69	1.0	11.7	E
18	9:30 am	54	1.7	16.4	E
19	10:30 am	36	1.7	23.1	S
20	11:30 am	34	1.7	24.1	S
21	12:30 pm	26	1.7	24.6	W
22	1:30 pm	23	1.0	24.6	SE
23	2:30 pm	24	1.3	24.3	E
24	3:30 pm	24	1.0	24.0	SE
Average(24 hrs)		63.5	0.9	14.5	---

3.3.8 PindDadan Khan

S. No.	Time	Humidity	Wind speed	Temp	Wind Direction
	Hours	%	m/sec	°C	—
1	4:00 pm	41	2.0	24.8	S
2	5:00 pm	50	1.0	23.6	S
3	6:00 pm	66	1.3	23.1	S
4	7:00 pm	91	0.0	14.0	W
5	8:00 pm	95	.03	12.9	E
6	9:00 pm	97	0.7	12.6	W
7	10:00 pm	93	1.0	12.9	N
8	11:00 pm	93	0.7	12.7	N
9	12:00 am	75	1.5	13.3	N
10	1:00 am	73	2.0	14.7	N
11	2:00 am	58	1.8	15.1	E
12	3:00 am	58	2.8	16.0	SE
13	4:00 am	57	1.8	16.5	NE
14	5:00 am	65	1.4	15.4	N
15	6:00 am	67	1.0	15.9	NE
16	7:00 am	71	1.0	10.2	NE
17	8:00 am	74	1.7	10.6	E
18	9:00 am	79	0.3	11.7	E
19	10:00 am	64	0.3	15.4	S
20	11:00 am	64	1.4	18.7	SE
21	12:00 pm	46	1.4	23.5	E

22	1:00 pm	44	2.0	23.7	SE
23	2:00 pm	35	2.0	24.8	S
24	3:00 pm	36	2.0	24.3	S
Average(24 hrs)		66.3	1.3	16.9	---

3.4 Water Analysis

3.4.1 Ground Water Quality Analysis:

3.4.1.1 Near Sahotra, Category-1 Site (32° 34' 02", 73° 00' 38")

Sample was taken from the source specified by client. The ground water sample was taken from the hand pump at near Sahotra, Category-1 site.

Table 3-4-1: Ground Water Quality Analysis Results

Sr. No.	Parameter	Unit	Result	PEQS
1	Temperature	^{0}C	21.3	----
2	pH	--	7.13	6.5-8.5
3	Total Dissolved Solids (TDS)	mg/l	1519	1000
4	Total Suspended Solids (TSS)	mg/l	06	---
5	Chloride	mg/l	292	250
6	Fluoride	mg/l	0.54	1.5
7	Taste	Object./unobj.	Object.	Unobject
8	Odour	Object./unobj.	Object.	Unobject.
9	Colour	TCU	0	15
10	Iron	mg/l	0.14	0.3
11	Sodium	mg/l	214	200
12	Nitrate (as NO_3^-)	mg/l	18.4	50
13	Nitrite (as NO_2^-)	mg/l	BDL	3
14	Ammonia	mg/l	0	1.5
15	Hydrogen Sulphide (H_2S)	mg/l	BDL	0.05
16	Sulphate	mg/l	264	250
17	Lead	mg/l	BDL	0.10
18	Total Hardness as $CaCO_3$	mg/l	484	500
19	Turbidity	NTU	0	5
20	Zinc	mg/l	0.84	3
21	Manganese	mg/l	BDL	0.1
22	Benzene	mg/l	BDL	10-120
23	Aluminum	mg/l	BDL	0.2
24	Molybdenum	mg/l	BDL	0.070

Sr. No.	Parameter	Unit	Result	PEQS
25	Chromium	mg/l	0.02	0.050
26	Cadmium	mg/l	BDL	0.003
27	Boron	mg/l	BDL	0.300
28	Barium	mg/l	BDL	0.700
29	Antimony	mg/l	BDL	0.005
30	Arsenic	mg/l	BDL	0.010
31	Cyanide	mg/l	BDL	0.070
32	Mercury	mg/l	BDL	0.001
33	Nickel	mg/l	BDL	0.020
34	Total Coliform	Number/100ml	16	0/100 ml
35	E. Coli	Number/100ml	04	0/100 ml
36	Conductivity	µS/cm	2142	--
37	Bicarbonate (as HCO_3^-)	mg/l	198	--
38	Iodine	mg/l	0.2	--
39	Magnesium (Mg)	mg/l	82	--
40	Calcium as (Ca)	mg/l	156	--
41	Phosphate	mg/l	BDL	--
42	Potassium	mg/l	4.8	--
43	SAR Iodine	mg/l	2.52	--
44	Selenium	mg/l	BDL	0.01
45	Copper	mg/l	BDL	2
46	Residual Chlorine	mg/l	BDL	--
47	Phenolic Compounds	mg/l	BDL	0.002

BDL= Below Detection Limit

Conclusion:

Results of the tests performed on the sample indicate that ground water has high TDS, TSS, Chlorides, Sulphates, sodium and bacterial contamination. Ground water has objectionable taste and odour.

3.4.1.2 Dhok Noora Near Bugga Sharif, Category-1 Site (32° 26' 45", 72° 42' 29")

Sample was taken from the source specified by client. The ground water sample was taken from the hand pump at Dhok Noora near Bugga Sharif, Category-1 site.

Table 3-4-2: Ground Water Quality Analysis Results

Sr. No.	Parameter	Unit	Result	PEQS
1	Temperature	^{0}C	22.5	----
2	pH	--	6.86	6.5-8.5
3	Total Dissolved Solids (TDS)	mg/l	1291	1000
4	Total Suspended Solids (TSS)	mg/l	BDL	---
5	Chloride	mg/l	298	250
6	Fluoride	mg/l	0.22	1.5
7	Taste	Object./unobj.	Object.	Unobject.
8	Odour	Object./unobj.	Unobject.	Unobject.
9	Colour	TCU	0	15
10	Iron	mg/l	0.05	0.3
11	Sodium	mg/l	198	200
12	Nitrate (as NO_3^-)	mg/l	10.5	50
13	Nitrite (as NO_2^-)	mg/l	BDL	3
14	Ammonia	mg/l	0	1.5
15	Hydrogen Sulphide (H_2S)	mg/l	BDL	0.05
16	Sulphate	mg/l	245	250
17	Lead	mg/l	BDL	0.10
18	Total Hardness as $CaCO_3$	mg/l	452	500
19	Turbidity	NTU	0	5
20	Zinc	mg/l	0.21	3
21	Manganese	mg/l	BDL	0.1
22	Benzene	mg/l	BDL	10-120
23	Aluminum	mg/l	BDL	0.2
24	Molybdenum	mg/l	BDL	0.070
25	Chromium	mg/l	0.02	0.050
26	Cadmium	mg/l	BDL	0.003
27	Boron	mg/l	BDL	0.300

Sr. No.	Parameter	Unit	Result	PEQS
28	Barium	mg/l	BDL	0.700
29	Antimony	mg/l	BDL	0.005
30	Arsenic	mg/l	0.003	0.010
31	Cyanide	mg/l	BDL	0.070
32	Mercury	mg/l	BDL	0.001
33	Nickel	mg/l	BDL	0.020
34	Total Coliform	Number/100ml	0	0/100 ml
35	E. Coli	Number/100ml	0	0/100 ml
36	Conductivity	µS/cm	1545	--
37	Bicarbonate (as HCO_3^-)	mg/l	176	--
38	Iodine	mg/l	0.2	--
39	Magnesium (Mg)	mg/l	74	--
40	Calcium as (Ca)	mg/l	142	--
41	Phosphate	mg/l	BDL	--
42	Potassium	mg/l	4.5	--
43	SAR Iodine	mg/l	3.36	--
44	Selenium	mg/l	BDL	0.01
45	Copper	mg/l	BDL	2
46	Residual Chlorine	mg/l	BDL	--
47	Phenolic Compounds	mg/l	BDL	0.002

BDL= Below Detection Limit

Conclusion:

Results of the tests performed on the sample indicate that ground water has high TDS, Chlorides and sodium which is at the maximum level. Ground water has objectionable taste.

3.4.1.3 Dewanpur, Category-1 Site (32° 37' 21", 73° 16' 17")

Sample was taken from the source specified by client. The ground water sample was taken directly from the hand pump at Dewanpur, Category-1 site.

Table 3-4-3: Ground Water Quality Analysis Results

Sr. No.	Parameter	Unit	Result	PEQS
1	Temperature	^{0}C	20.5	----
2	pH	--	9.6	6.5-8.5
3	Total Dissolved Solids (TDS)	mg/l	144	1000
4	Total Suspended Solids (TSS)	mg/l	BDL	---
5	Chloride	mg/l	34	250
6	Fluoride	mg/l	0.04	1.5
7	Taste	Object./unobj.	Unobject.	Unobject
8	Odour	Object./unobj.	Unobject.	Unobject.
9	Colour	TCU	0	15
10	Iron	mg/l	0.05	0.3
11	Sodium	mg/l	22	200
12	Nitrate (as NO_3^-)	mg/l	3.5	50
13	Nitrite (as NO_2^-)	mg/l	BDL	3
14	Ammonia	mg/l	0	1.5
15	Hydrogen Sulphide (H_2S)	mg/l	BDL	0.05
16	Sulphate	mg/l	24	250
17	Lead	mg/l	BDL	0.10
18	Total Hardness as $CaCO_3$	mg/l	52	500
19	Turbidity	NTU	0	5
20	Zinc	mg/l	0.12	3
21	Manganese	mg/l	BDL	0.1
22	Benzene	mg/l	BDL	10-120
23	Aluminum	mg/l	BDL	0.2
24	Molybdenum	mg/l	BDL	0.070
25	Chromium	mg/l	0.02	0.050
26	Cadmium	mg/l	BDL	0.003
27	Boron	mg/l	BDL	0.300

Sr. No.	Parameter	Unit	Result	PEQS
28	Barium	mg/l	BDL	0.700
29	Antimony	mg/l	BDL	0.005
30	Arsenic	mg/l	BDL	0.010
31	Cyanide	mg/l	BDL	0.070
32	Mercury	mg/l	BDL	0.001
33	Nickel	mg/l	BDL	0.020
34	Total Coliform	Number/100ml	02	0/100 ml
35	E. Coli	Number/100ml	0	0/100 ml
36	Conductivity	µS/cm	188	--
37	Bicarbonate (as HCO_3^-)	mg/l	12	--
38	Iodine	mg/l	BDL	--
39	Magnesium (Mg)	mg/l	7	--
40	Calcium as (Ca)	mg/l	21	--
41	Phosphate	mg/l	BDL	--
42	Potassium	mg/l	3.2	--
43	SAR Iodine	mEq/l	1.06	--
44	Selenium	mg/l	BDL	0.01
45	Copper	mg/l	BDL	2
46	Residual Chlorine	mg/l	BDL	--
47	Phenolic Compounds	mg/l	BDL	0.002

BDL= Below Detection Limit

Conclusion:

Results of the tests performed on the sample indicate that all values are well below the PEQS limits except Total Coliform which is high.

3.4.1.4 Shah Kamir, Category-1 Site (32° 39' 38", 73° 26' 23")

Sample was taken from the source specified by client. The ground water sample was taken from hand pump at Shah Kamir, Category-1 site.

Table 3-4-4: Ground Water Quality Analysis Results

Sr. No.	Parameter	Unit	Result	PEQS
1	Temperature	^{0}C	22.0	----
2	pH	--	7.56	6.5-8.5
3	Total Dissolved Solids (TDS)	mg/l	399	1000
4	Total Suspended Solids (TSS)	mg/l	BDL	---
5	Chloride	mg/l	84	250
6	Fluoride	mg/l	0.18	1.5
7	Taste	Object./unobj.	Unobject.	Unobject.
8	Odour	Object./unobj.	Unobject.	Unobject.
9	Colour	TCU	0	15
10	Iron	mg/l	0.09	0.3
11	Sodium	mg/l	68	200
12	Nitrate (as NO_3^-)	mg/l	16.3	50
13	Nitrite (as NO_2^-)	mg/l	BDL	3
14	Ammonia	mg/l	0	1.5
15	Hydrogen Sulphide (H_2S)	mg/l	BDL	0.05
16	Sulphate	mg/l	62	250
17	Lead	mg/l	BDL	0.10
18	Total Hardness as $CaCO_3$	mg/l	142	500
19	Turbidity	NTU	0	5
20	Zinc	mg/l	0.19	3
21	Manganese	mg/l	BDL	0.1
22	Benzene	mg/l	BDL	10-120
23	Aluminum	mg/l	BDL	0.2
24	Molybdenum	mg/l	BDL	0.070
25	Chromium	mg/l	0.02	0.050
26	Cadmium	mg/l	BDL	0.003
27	Boron	mg/l	BDL	0.300

Sr. No.	Parameter	Unit	Result	PEQS
28	Barium	mg/l	BDL	0.700
29	Antimony	mg/l	BDL	0.005
30	Arsenic	mg/l	0.003	0.010
31	Cyanide	mg/l	BDL	0.070
32	Mercury	mg/l	BDL	0.001
33	Nickel	mg/l	BDL	0.020
34	Total Coliform	Number/100ml	0	0/100 ml
35	E. Coli	Number/100ml	0	0/100 ml
36	Conductivity	µS/cm	528	--
37	Bicarbonate (as HCO_3^-)	mg/l	34	--
38	Iodine	mg/l	0.03	--
39	Magnesium (Mg)	mg/l	28	--
40	Calcium as (Ca)	mg/l	56	--
41	Phosphate	mg/l	BDL	--
42	Potassium	mg/l	4.1	--
43	SAR Iodine	mEq/l	1.85	--
44	Selenium	mg/l	BDL	0.01
45	Copper	mg/l	BDL	2
46	Residual Chlorine	mg/l	BDL	--
47	Phenolic Compounds	mg/l	BDL	0.002

BDL= Below Detection Limit

Conclusion:

Results of the tests performed on the sample indicate that all values are well below the PEQS limits.

3.4.1.5 Chak Mujahid, Category-2 Site (32° 39' 30", 73° 14' 26")

Sample was taken from the source specified by client. The ground water sample was taken directly from the tube well at Chak Mujahid, Category-2 site.

Table 3-4-5: Ground Water Quality Analysis Results

Sr. No.	Parameter	Unit	Result	PEQS
1	Temperature	^{0}C	20.5	----
2	pH	--	6.8	6.5-8.5
3	Total Dissolved Solids (TDS)	mg/l	699	1000
4	Total Suspended Solids (TSS)	mg/l	BDL	---
5	Chloride	mg/l	118	250
6	Fluoride	mg/l	0.22	1.5
7	Taste	Object./unobj.	Unobject.	Unobject
8	Odour	Object./unobj.	Unobject.	Unobject.
9	Colour	TCU	0	15
10	Iron	mg/l	0.04	0.3
11	Sodium	mg/l	82	200
12	Nitrate (as NO_3^-)	mg/l	7.1	50
13	Nitrite (as NO_2^-)	mg/l	BDL	3
14	Ammonia	mg/l	0	1.5
15	Hydrogen Sulphide (H_2S)	mg/l	BDL	0.05
16	Sulphate	mg/l	102	250
17	Lead	mg/l	BDL	0.10
18	Total Hardness as $CaCO_3$	mg/l	238	500
19	Turbidity	NTU	0	5
20	Zinc	mg/l	0.24	3
21	Manganese	mg/l	BDL	0.1
22	Benzene	mg/l	BDL	10-120
23	Aluminum	mg/l	BDL	0.2
24	Molybdenum	mg/l	BDL	0.070
25	Chromium	mg/l	0.03	0.050
26	Cadmium	mg/l	BDL	0.003
27	Boron	mg/l	BDL	0.300

Sr. No.	Parameter	Unit	Result	PEQS
28	Barium	mg/l	BDL	0.700
29	Antimony	mg/l	BDL	0.005
30	Arsenic	mg/l	BDL	0.010
31	Cyanide	mg/l	BDL	0.070
32	Mercury	mg/l	BDL	0.001
33	Nickel	mg/l	BDL	0.020
34	Total Coliform	Number/100ml	0	0/100 ml
35	E. Coli	Number/100ml	0	0/100 ml
36	Conductivity	µS/cm	980	--
37	Bicarbonate (as HCO_3^-)	mg/l	76	--
38	Iodine	mg/l	0.4	--
39	Magnesium (Mg)	mg/l	48	--
40	Calcium as (Ca)	mg/l	85	--
41	Phosphate	mg/l	BDL	--
42	Potassium	mg/l	3.1	--
43	SAR Iodine	mEq/l	1.76	--
44	Selenium	mg/l	BDL	0.01
45	Copper	mg/l	BDL	2
46	Residual Chlorine	mg/l	BDL	--
47	Phenolic Compounds	mg/l	BDL	0.002

BDL= Below Detection Limit

Conclusion:

Results of the tests performed on the sample indicate that all values are below the PEQS limits.

3.4.1.6 Dhok Wenis, Category-2 Site (32° 36' 40", 72° 59' 07")

Sample was taken from the source specified by client. The ground water sample was taken from the tube well at Dhok Wenis, Category-2 site.

Table 3-4-6: Ground Water Quality Analysis Results

Sr. No.	Parameter	Unit	Result	PEQS
1	Temperature	^{0}C	21.3	----
2	pH	--	7.24	6.5-8.5
3	Total Dissolved Solids (TDS)	mg/l	1523	1000
4	Total Suspended Solids (TSS)	mg/l	BDL	---
5	Chloride	mg/l	310	250
6	Fluoride	mg/l	0.18	1.5
7	Taste	Object./unobj.	Object.	Unobject.
8	Odour	Object./unobj.	Unobject.	Unobject.
9	Colour	TCU	0	15
10	Iron	mg/l	0.03	0.3
11	Sodium	mg/l	228	200
12	Nitrate (as NO_3^-)	mg/l	10.5	50
13	Nitrite (as NO_2^-)	mg/l	BDL	3
14	Ammonia	mg/l	0	1.5
15	Hydrogen Sulphide (H_2S)	mg/l	BDL	0.05
16	Sulphate	mg/l	278	250
17	Lead	mg/l	BDL	0.10
18	Total Hardness as $CaCO_3$	mg/l	490	500
19	Turbidity	NTU	0	5
20	Zinc	mg/l	0.18	3
21	Manganese	mg/l	BDL	0.1
22	Benzene	mg/l	BDL	10-120
23	Aluminum	mg/l	BDL	0.2
24	Molybdenum	mg/l	BDL	0.070
25	Chromium	mg/l	0.02	0.050
26	Cadmium	mg/l	BDL	0.003
27	Boron	mg/l	BDL	0.300

Sr. No.	Parameter	Unit	Result	PEQS
28	Barium	mg/l	BDL	0.700
29	Antimony	mg/l	BDL	0.005
30	Arsenic	mg/l	0.002	0.010
31	Cyanide	mg/l	BDL	0.070
32	Mercury	mg/l	BDL	0.001
33	Nickel	mg/l	BDL	0.020
34	Total Coliform	Number/100ml	06	0/100 ml
35	E. Coli	Number/100ml	0	0/100 ml
36	Conductivity	µS/cm	2054	--
37	Bicarbonate (as HCO_3^-)	mg/l	210	--
38	Iodine	mg/l	0.6	--
39	Magnesium (Mg)	mg/l	104	--
40	Calcium as (Ca)	mg/l	165	--
41	Phosphate	mg/l	BDL	--
42	Potassium	mg/l	5.1	--
43	SAR Iodine	mg/l	3.41	--
44	Selenium	mg/l	BDL	0.01
45	Copper	mg/l	BDL	2
46	Residual Chlorine	mg/l	BDL	--
47	Phenolic Compounds	mg/l	BDL	0.002

BDL= Below Detection Limit

Conclusion:

Results of the tests performed on the sample indicate that ground water has high TDS, Chlorides, Sulphates, sodium and Total Coliform. Ground water has objectionable taste.

3.4.1.7 Talokar Kurar, Category-2 Site (32° 28' 23", 72° 29' 53")

Sample was taken from the source specified by client. The ground water sample was taken directly from the tube well at Talokar Kurar, Category-2 site.

Table 3-4-7: Ground Water Quality Analysis Results

Sr. No.	Parameter	Unit	Result	PEQS
1	Temperature	^{0}C	22.0	----
2	pH	--	7.34	6.5-8.5
3	Total Dissolved Solids (TDS)	mg/l	1417	1000
4	Total Suspended Solids (TSS)	mg/l	03	---
5	Chloride	mg/l	264	250
6	Fluoride	mg/l	0.31	1.5
7	Taste	Object./unobj.	Object.	Unobject.
8	Odour	Object./unobj.	Unobject.	Unobject.
9	Colour	TCU	0	15
10	Iron	mg/l	0.12	0.3
11	Sodium	mg/l	195	200
12	Nitrate (as NO_3^-)	mg/l	12.4	50
13	Nitrite (as NO_2^-)	mg/l	BDL	3
14	Ammonia	mg/l	0	1.5
15	Hydrogen Sulphide (H_2S)	mg/l	BDL	0.05
16	Sulphate	mg/l	284	250
17	Lead	mg/l	BDL	0.10
18	Total Hardness as $CaCO_3$	mg/l	482	500
19	Turbidity	NTU	1	5
20	Zinc	mg/l	0.31	3
21	Manganese	mg/l	BDL	0.1
22	Benzene	mg/l	BDL	10-120
23	Aluminum	mg/l	BDL	0.2
24	Molybdenum	mg/l	BDL	0.070
25	Chromium	mg/l	0.02	0.050
26	Cadmium	mg/l	BDL	0.003
27	Boron	mg/l	BDL	0.300

Sr. No.	Parameter	Unit	Result	PEQS
28	Barium	mg/l	BDL	0.700
29	Antimony	mg/l	BDL	0.005
30	Arsenic	mg/l	0.01	0.010
31	Cyanide	mg/l	BDL	0.070
32	Mercury	mg/l	BDL	0.001
33	Nickel	mg/l	BDL	0.020
34	Total Coliform	Number/100ml	10	0/100 ml
35	E. Coli	Number/100ml	0	0/100 ml
36	Conductivity	µS/cm	1874	--
37	Bicarbonate (as HCO_3^-)	mg/l	164	--
38	Iodine	mg/l	0.3	--
39	Magnesium (Mg)	mg/l	124	--
40	Calcium as (Ca)	mg/l	198	--
41	Phosphate	mg/l	BDL	--
42	Potassium	mg/l	3.8	--
43	SAR Iodine	mg/l	2.67	--
44	Selenium	mg/l	BDL	0.01
45	Copper	mg/l	BDL	2
46	Residual Chlorine	mg/l	BDL	--
47	Phenolic Compounds	mg/l	BDL	0.002

BDL= Below Detection Limit

Conclusion:

Results of the tests performed on the sample indicate that ground water has high TDS, TSS, Chlorides, Sulphates and high Total Coliform. Ground water has objectionable taste.

3.4.1.8 Jalalpur Sharif, Category-2 Site (32° 39' 18", 73° 24' 45")

Sample was taken from the source specified by client. The ground water sample was taken from tube well at Jalalpur Sharif, Category-2 site.

Table 3-4-8: Ground Water Quality Analysis Results

Sr. No.	Parameter	Unit	Result	PEQS
1	Temperature	^{0}C	23.0	----
2	pH	--	7.51	6.5-8.5
3	Total Dissolved Solids (TDS)	mg/l	333	1000
4	Total Suspended Solids (TSS)	mg/l	06	---
5	Chloride	mg/l	78	250
6	Fluoride	mg/l	0.21	1.5
7	Taste	Object./unobj.	Unobject.	Unobject.
8	Odour	Object./unobj.	Unobject.	Unobject.
9	Colour	TCU	0	15
10	Iron	mg/l	0.1	0.3
11	Sodium	mg/l	48	200
12	Nitrate (as NO_3^-)	mg/l	14.6	50
13	Nitrite (as NO_2^-)	mg/l	BDL	3
14	Ammonia	mg/l	0	1.5
15	Hydrogen Sulphide (H_2S)	mg/l	BDL	0.05
16	Sulphate	mg/l	51	250
17	Lead	mg/l	BDL	0.10
18	Total Hardness as $CaCO_3$	mg/l	132	500
19	Turbidity	NTU	0	5
20	Zinc	mg/l	0.38	3
21	Manganese	mg/l	BDL	0.1
22	Benzene	mg/l	BDL	10-120
23	Aluminum	mg/l	BDL	0.2
24	Molybdenum	mg/l	BDL	0.070
25	Chromium	mg/l	0.01	0.050
26	Cadmium	mg/l	BDL	0.003

Sr. No.	Parameter	Unit	Result	PEQS
27	Boron	mg/l	BDL	0.300
28	Barium	mg/l	BDL	0.700
29	Antimony	mg/l	BDL	0.005
30	Arsenic	mg/l	0.001	0.010
31	Cyanide	mg/l	BDL	0.070
32	Mercury	mg/l	BDL	0.001
33	Nickel	mg/l	BDL	0.020
34	Total Coliform	Number/100ml	0	0/100 ml
35	E. Coli	Number/100ml	0	0/100 ml
36	Conductivity	µS/cm	486	--
37	Bicarbonate (as HCO_3^-)	mg/l	32	--
38	Iodine	mg/l	0.04	--
39	Magnesium (Mg)	mg/l	24	--
40	Calcium as (Ca)	mg/l	49	--
41	Phosphate	mg/l	BDL	--
42	Potassium	mg/l	3.2	--
43	SAR Iodine	mEq/l	1.4	--
44	Selenium	mg/l	BDL	0.01
45	Copper	mg/l	BDL	2
46	Residual Chlorine	mg/l	BDL	--
47	Phenolic Compounds	mg/l	BDL	0.002

BDL = Below Detection Limit

Conclusion:

Results of the tests performed on the sample indicate that all values are well below the PEQS limits except TSS which is high.

3.4.1.9 Sahowal, Category-3 Site (32° 40' 13", 73° 09' 25")

Sample was taken from the source specified by client. The ground water sample was taken from hand pump at Sahowal, Category-3 site.

Table 3-4-9: Ground Water Quality Analysis Results

Sr. No.	Parameter	Unit	Result	PEQS
1	Temperature	^{0}C	21.0	----
2	pH	--	6.97	6.5-8.5
3	Total Dissolved Solids (TDS)	mg/l	1684	1000
4	Total Suspended Solids (TSS)	mg/l	18	---
5	Chloride	mg/l	374	250
6	Fluoride	mg/l	0.41	1.5
7	Taste	Object./unobj.	Object.	Unobject
8	Odour	Object./unobj.	Object.	Unobject.
9	Colour	TCU	0	15
10	Iron	mg/l	0.23	0.3
11	Sodium	mg/l	172	200
12	Nitrate (as NO_3^-)	mg/l	31.9	50
13	Nitrite (as NO_2^-)	mg/l	BDL	3
14	Ammonia	mg/l	0	1.5
15	Hydrogen Sulphide (H_2S)	mg/l	BDL	0.05
16	Sulphate	mg/l	306	250
17	Lead	mg/l	BDL	0.10
18	Total Hardness as $CaCO_3$	mg/l	525	500
19	Turbidity	NTU	0	5
20	Zinc	mg/l	0.82	3
21	Manganese	mg/l	BDL	0.1
22	Benzene	mg/l	BDL	10-120
23	Aluminum	mg/l	BDL	0.2
24	Molybdenum	mg/l	BDL	0.070
25	Chromium	mg/l	0.03	0.050
26	Cadmium	mg/l	BDL	0.003

Sr. No.	Parameter	Unit	Result	PEQS
27	Boron	mg/l	BDL	0.300
28	Barium	mg/l	BDL	0.700
29	Antimony	mg/l	BDL	0.005
30	Arsenic	mg/l	0.006	0.010
31	Cyanide	mg/l	BDL	0.070
32	Mercury	mg/l	BDL	0.001
33	Nickel	mg/l	BDL	0.020
34	Total Coliform	Number/100ml	15	0/100 ml
35	E. Coli	Number/100ml	02	0/100 ml
36	Conductivity	µS/cm	2380	--
37	Bicarbonate (as HCO_3^-)	mg/l	242	--
38	Iodine	mg/l	0.5	--
39	Magnesium (Mg)	mg/l	104	--
40	Calcium as (Ca)	mg/l	196	--
41	Phosphate	mg/l	BDL	--
42	Potassium	mg/l	5.2	--
43	SAR Iodine	mEq/l	2.47	--
44	Selenium	mg/l	BDL	0.01
45	Copper	mg/l	BDL	2
46	Residual Chlorine	mg/l	BDL	--
47	Phenolic Compounds	mg/l	BDL	0.002

BDL= Below Detection Limit

Conclusion:

Results of the tests performed on the sample indicate that ground water has very high TDS, TSS, Chlorides, Sulphates, Total Hardness, Total Coliform and E. Coli. Ground water has objectionable taste and odour.

3.4.1.10 Islam Garh, Khewra ICI, Category-3 Site (32° 37' 30", 73° 01' 02")

Sample was taken from the source specified by client. The ground water sample was taken from directly the machine bore at Islam Garh, Khewra ICI, Category-3 site.

Table 3-4-10: Ground Water Quality Analysis Results

Sr. No.	Parameter	Unit	Result	PEQS
1	Temperature	^{0}C	20.1	----
2	pH	--	6.74	6.5-8.5
3	Total Dissolved Solids (TDS)	mg/l	2130	1000
4	Total Suspended Solids (TSS)	mg/l	42	---
5	Chloride	mg/l	416	250
6	Fluoride	mg/l	0.62	1.5
7	Taste	Object./unobj.	Object.	Unobject
8	Odour	Object./unobj.	Unobject.	Unobject.
9	Colour	TCU	0	15
10	Iron	mg/l	0.18	0.3
11	Sodium	mg/l	314	200
12	Nitrate (as NO_3^-)	mg/l	20.5	50
13	Nitrite (as NO_2^-)	mg/l	BDL	3
14	Ammonia	mg/l	0	1.5
15	Hydrogen Sulphide (H_2S)	mg/l	BDL	0.05
16	Sulphate	mg/l	476	250
17	Lead	mg/l	BDL	0.10
18	Total Hardness as $CaCO_3$	mg/l	652	500
19	Turbidity	NTU	0	5
20	Zinc	mg/l	0.42	3
21	Manganese	mg/l	BDL	0.1
22	Benzene	mg/l	BDL	10-120
23	Aluminum	mg/l	BDL	0.2
24	Molybdenum	mg/l	BDL	0.070
25	Chromium	mg/l	0.03	0.050
26	Cadmium	mg/l	BDL	0.003
27	Boron	mg/l	0.01	0.300

Sr. No.	Parameter	Unit	Result	PEQS
28	Barium	mg/l	BDL	0.700
29	Antimony	mg/l	BDL	0.005
30	Arsenic	mg/l	0.005	0.010
31	Cyanide	mg/l	BDL	0.070
32	Mercury	mg/l	BDL	0.001
33	Nickel	mg/l	BDL	0.020
34	Total Coliform	Number/100ml	08	0/100 ml
35	E. Coli	Number/100ml	0	0/100 ml
36	Conductivity	µS/cm	1592	--
37	Bicarbonate (as HCO_3^-)	mg/l	297	--
38	Iodine	mg/l	1.1	--
39	Magnesium (Mg)	mg/l	142	--
40	Calcium as (Ca)	mg/l	256	--
41	Phosphate	mg/l	BDL	--
42	Potassium	mg/l	5.6	--
43	SAR Iodine	mg/l	3.9	--
44	Selenium	mg/l	BDL	0.01
45	Copper	mg/l	BDL	2
46	Residual Chlorine	mg/l	BDL	--
47	Phenolic Compounds	mg/l	BDL	0.002

BDL= Below Detection Limit

Conclusion:

Results of the tests performed on the sample indicate that ground water has very high TDS, TSS, Chlorides, Sulphates, Sodium, Total Hardness, and Total Coliform. Ground water has objectionable taste.

3.4.1.11 Chakri Karam Khan, Category-3 Site (32° 40' 51", 73° 21' 07")

Sample was taken from the source specified by client. The ground water sample was taken from the hand pump at Chakri Karam Khan, Category-3 site.

Table 3-4-11: Ground Water Quality Analysis Results

Sr. No.	Parameter	Unit	Result	PEQS
1	Temperature	^{0}C	21.1	----
2	pH	--	7.47	6.5-8.5
3	Total Dissolved Solids (TDS)	mg/l	738	1000
4	Total Suspended Solids (TSS)	mg/l	09	---
5	Chloride	mg/l	168	250
6	Fluoride	mg/l	0.17	1.5
7	Taste	Object./unobj.	Unobject.	Unobject
8	Odour	Object./unobj.	Unobject.	Unobject.
9	Colour	TCU	0	15
10	Iron	mg/l	0.14	0.3
11	Sodium	mg/l	106	200
12	Nitrate (as NO_3^-)	mg/l	18.4	50
13	Nitrite (as NO_2^-)	mg/l	BDL	3
14	Ammonia	mg/l	0	1.5
15	Hydrogen Sulphide (H_2S)	mg/l	BDL	0.05
16	Sulphate	mg/l	152	250
17	Lead	mg/l	BDL	0.10
18	Total Hardness as $CaCO_3$	mg/l	254	500
19	Turbidity	NTU	0	5
20	Zinc	mg/l	0.31	3
21	Manganese	mg/l	BDL	0.1
22	Benzene	mg/l	BDL	10-120
23	Aluminum	mg/l	BDL	0.2
24	Molybdenum	mg/l	BDL	0.070
25	Chromium	mg/l	0.02	0.050
26	Cadmium	mg/l	BDL	0.003
27	Boron	mg/l	BDL	0.300

Sr. No.	Parameter	Unit	Result	PEQS
28	Barium	mg/l	BDL	0.700
29	Antimony	mg/l	BDL	0.005
30	Arsenic	mg/l	0.005	0.010
31	Cyanide	mg/l	BDL	0.070
32	Mercury	mg/l	BDL	0.001
33	Nickel	mg/l	BDL	0.020
34	Total Coliform	Number/100ml	05	0/100 ml
35	E. Coli	Number/100ml	0	0/100 ml
36	Conductivity	µS/cm	1040	--
37	Bicarbonate (as HCO_3^-)	mg/l	84	--
38	Iodine	mg/l	0.05	--
39	Magnesium (Mg)	mg/l	69	--
40	Calcium as (Ca)	mg/l	126	--
41	Phosphate	mg/l	BDL	--
42	Potassium	mg/l	3.4	--
43	SAR Iodine	mEq/l	1.82	--
44	Selenium	mg/l	BDL	0.01
45	Copper	mg/l	BDL	2
46	Residual Chlorine	mg/l	BDL	--
47	Phenolic Compounds	mg/l	BDL	0.002

BDL= Below Detection Limit

Conclusion:

Results of the tests performed on the sample indicate that all values are below the PEQS limits except TSS and Total Coliform which are high.

3.4.1.12 Construction Camp# 1, Misri Mor, Rasool Barrage, Category-4 Site (32° 41' 49", 73° 30' 28")

Sample was taken from the source specified by client. The ground water sample was taken directly from the machine bore at Construction Camp# 1, Misri Mor, Rasool Barrage, Category-4 site.

Table 3-4-12: Ground Water Quality Analysis Results

Sr. No.	Parameter	Unit	Result	PEQS
1	Temperature	^{0}C	22.5	----
2	pH	--	7.47	6.5-8.5
3	Total Dissolved Solids (TDS)	mg/l	743	1000
4	Total Suspended Solids (TSS)	mg/l	BDL	---
5	Chloride	mg/l	174	250
6	Fluoride	mg/l	0.25	1.5
7	Taste	Object./unobj.	Unobject.	Unobject
8	Odour	Object./unobj.	Unobject.	Unobject.
9	Colour	TCU	0	15
10	Iron	mg/l	0.05	0.3
11	Sodium	mg/l	98	200
12	Nitrate (as NO_3^-)	mg/l	6.2	50
13	Nitrite (as NO_2^-)	mg/l	BDL	3
14	Ammonia	mg/l	0	1.5
15	Hydrogen Sulphide (H_2S)	mg/l	BDL	0.05
16	Sulphate	mg/l	108	250
17	Lead	mg/l	BDL	0.10
18	Total Hardness as $CaCO_3$	mg/l	227	500
19	Turbidity	NTU	0	5
20	Zinc	mg/l	0.21	3
21	Manganese	mg/l	BDL	0.1
22	Benzene	mg/l	BDL	10-120
23	Aluminum	mg/l	BDL	0.2
24	Molybdenum	mg/l	BDL	0.070
25	Chromium	mg/l	0.02	0.050

Sr. No.	Parameter	Unit	Result	PEQS
26	Cadmium	mg/l	BDL	0.003
27	Boron	mg/l	BDL	0.300
28	Barium	mg/l	BDL	0.700
29	Antimony	mg/l	BDL	0.005
30	Arsenic	mg/l	0.004	0.010
31	Cyanide	mg/l	BDL	0.070
32	Mercury	mg/l	BDL	0.001
33	Nickel	mg/l	BDL	0.020
34	Total Coliform	Number/100ml	0	0/100 ml
35	E. Coli	Number/100ml	0	0/100 ml
36	Conductivity	µS/cm	1052	--
37	Bicarbonate (as HCO_3^-)	mg/l	106	--
38	Iodine	mg/l	0.06	--
39	Magnesium (Mg)	mg/l	40	--
40	Calcium as (Ca)	mg/l	78	--
41	Phosphate	mg/l	BDL	--
42	Potassium	mg/l	3.8	--
43	SAR Iodine	mEq/l	1.81	--
44	Selenium	mg/l	BDL	0.01
45	Copper	mg/l	BDL	2
46	Residual Chlorine	mg/l	BDL	--
47	Phenolic Compounds	mg/l	BDL	0.002

BDL= Below Detection Limit

Conclusion:

Results of the tests performed on the sample indicate that all values are below the PEQS limits.

3.4.1.13 Construction Camp# 2, Pind Dadan Khan, Category-4 Site (32° 36' 08", 73° 02' 04")

Sample was taken from the source specified by client. The ground water sample was taken from the hand pump at Construction Camp# 2, Pind Dadan Khan, Category-4 site.

Table 3-4-13: Ground Water Quality Analysis Results

Sr. No.	Parameter	Unit	Result	PEQS
1	Temperature	^{0}C	20.9	----
2	pH	--	6.94	6.5-8.5
3	Total Dissolved Solids (TDS)	mg/l	1490	1000
4	Total Suspended Solids (TSS)	mg/l	20	---
5	Chloride	mg/l	242	250
6	Fluoride	mg/l	0.36	1.5
7	Taste	Object./unobj.	Object.	Unobject
8	Odour	Object./unobj.	Object.	Unobject.
9	Colour	TCU	0	15
10	Iron	mg/l	0.09	0.3
11	Sodium	mg/l	212	200
12	Nitrate (as NO_3^-)	mg/l	18.4	50
13	Nitrite (as NO_2^-)	mg/l	BDL	3
14	Ammonia	mg/l	0	1.5
15	Hydrogen Sulphide (H_2S)	mg/l	BDL	0.05
16	Sulphate	mg/l	264	250
17	Lead	mg/l	BDL	0.10
18	Total Hardness as $CaCO_3$	mg/l	465	500
19	Turbidity	NTU	0	5
20	Zinc	mg/l	0.18	3
21	Manganese	mg/l	BDL	0.1
22	Benzene	mg/l	BDL	10-120
23	Aluminum	mg/l	BDL	0.2
24	Molybdenum	mg/l	BDL	0.070
25	Chromium	mg/l	0.02	0.050
26	Cadmium	mg/l	BDL	0.003

Sr. No.	Parameter	Unit	Result	PEQS
27	Boron	mg/l	BDL	0.300
28	Barium	mg/l	BDL	0.700
29	Antimony	mg/l	BDL	0.005
30	Arsenic	mg/l	0.002	0.010
31	Cyanide	mg/l	BDL	0.070
32	Mercury	mg/l	BDL	0.001
33	Nickel	mg/l	BDL	0.020
34	Total Coliform	Number/100ml	15	0/100 ml
35	E. Coli	Number/100ml	02	0/100 ml
36	Conductivity	µS/cm	1854	--
37	Bicarbonate (as HCO_3^-)	mg/l	156	--
38	Iodine	mg/l	0.72	--
39	Magnesium (Mg)	mg/l	134	--
40	Calcium as (Ca)	mg/l	210	--
41	Phosphate	mg/l	BDL	--
42	Potassium	mg/l	2.9	--
43	SAR Iodine	mg/l	2.81	--
44	Selenium	mg/l	BDL	0.01
45	Copper	mg/l	BDL	2
46	Residual Chlorine	mg/l	BDL	--
47	Phenolic Compounds	mg/l	BDL	0.002

BDL= Below Detection Limit

Conclusion:

Results of the tests performed on the sample indicate that ground water has very high TDS, TSS, Sulphates, Sodium, Total Coliform and E. Coli. Ground water has objectionable taste and odour.

3.4.1.14 Rawal, Category-5 Site (32° 43' 00", 73° 11' 35")

Sample was taken from the source specified by client. The ground water sample was taken from the natural stream at Rawal, Category-5 site.

Table 3-4-14: Ground Water Quality Analysis Results

Sr. No.	Parameter	Unit	Result	PEQS
1	Temperature	^{0}C	21.1	----
2	pH	--	7.77	6.5-8.5
3	Total Dissolved Solids (TDS)	mg/l	861	1000
4	Total Suspended Solids (TSS)	mg/l	16	---
5	Chloride	mg/l	184	250
6	Fluoride	mg/l	0.32	1.5
7	Taste	Object./unobj.	Object.	Unobject
8	Odour	Object./unobj.	Unobject.	Unobject.
9	Colour	TCU	0	15
10	Iron	mg/l	0.14	0.3
11	Sodium	mg/l	136	200
12	Nitrate (as NO_3^-)	mg/l	15.1	50
13	Nitrite (as NO_2^-)	mg/l	BDL	3
14	Ammonia	mg/l	0	1.5
15	Hydrogen Sulphide (H_2S)	mg/l	BDL	0.05
16	Sulphate	mg/l	148	250
17	Lead	mg/l	BDL	0.10
18	Total Hardness as $CaCO_3$	mg/l	284	500
19	Turbidity	NTU	0	5
20	Zinc	mg/l	0.24	3
21	Manganese	mg/l	BDL	0.1
22	Benzene	mg/l	BDL	10-120
23	Aluminum	mg/l	BDL	0.2
24	Molybdenum	mg/l	BDL	0.070
25	Chromium	mg/l	0.03	0.050
26	Cadmium	mg/l	BDL	0.003
27	Boron	mg/l	BDL	0.300

Sr. No.	Parameter	Unit	Result	PEQS
28	Barium	mg/l	BDL	0.700
29	Antimony	mg/l	BDL	0.005
30	Arsenic	mg/l	0.002	0.010
31	Cyanide	mg/l	BDL	0.070
32	Mercury	mg/l	BDL	0.001
33	Nickel	mg/l	BDL	0.020
34	Total Coliform	Number/100ml	04	0/100 ml
35	E. Coli	Number/100ml	0	0/100 ml
36	Conductivity	µS/cm	1224	--
37	Bicarbonate (as HCO_3^-)	mg/l	110	--
38	Iodine	mg/l	0.4	--
39	Magnesium (Mg)	mg/l	46	--
40	Calcium as (Ca)	mg/l	84	--
41	Phosphate	mg/l	BDL	--
42	Potassium	mg/l	3.5	--
43	SAR Iodine	mEq/l	2.95	--
44	Selenium	mg/l	BDL	0.01
45	Copper	mg/l	BDL	2
46	Residual Chlorine	mg/l	BDL	--
47	Phenolic Compounds	mg/l	BDL	0.002

BDL= Below Detection Limit

Conclusion:

Results of the tests performed on the sample indicate that ground water has high TSS and Total Coliform. Ground water has objectionable taste.

3.4.1.15 Baghanwala, Category-5 Site (32° 42' 29", 73° 13' 56")

Sample was taken from the source specified by client. The ground water sample was taken from natural stream at Baghanwala, Catergory-5 site.

Table 3-4-15: Ground Water Quality Analysis Results

Sr. No.	Parameter	Unit	Result	PEQS
1	Temperature	^{0}C	20.9	----
2	pH	--	7.23	6.5-8.5
3	Total Dissolved Solids (TDS)	mg/l	351	1000
4	Total Suspended Solids (TSS)	mg/l	12	---
5	Chloride	mg/l	68	250
6	Fluoride	mg/l	0.18	1.5
7	Taste	Object./unobj.	Unobject.	Unobject
8	Odour	Object./unobj.	Unobject.	Unobject.
9	Colour	TCU	0	15
10	Iron	mg/l	0.14	0.3
11	Sodium	mg/l	46	200
12	Nitrate (as NO_3^-)	mg/l	14.6	50
13	Nitrite (as NO_2^-)	mg/l	BDL	3
14	Ammonia	mg/l	0	1.5
15	Hydrogen Sulphide (H_2S)	mg/l	BDL	0.05
16	Sulphate	mg/l	75	250
17	Lead	mg/l	BDL	0.10
18	Total Hardness as $CaCO_3$	mg/l	116	500
19	Turbidity	NTU	0	5
20	Zinc	mg/l	0.21	3
21	Manganese	mg/l	BDL	0.1
22	Benzene	mg/l	BDL	10-120
23	Aluminum	mg/l	BDL	0.2
24	Molybdenum	mg/l	BDL	0.070
25	Chromium	mg/l	0.02	0.050
26	Cadmium	mg/l	BDL	0.003

Sr. No.	Parameter	Unit	Result	PEQS
27	Boron	mg/l	BDL	0.300
28	Barium	mg/l	BDL	0.700
29	Antimony	mg/l	BDL	0.005
30	Arsenic	mg/l	0.01	0.010
31	Cyanide	mg/l	BDL	0.070
32	Mercury	mg/l	BDL	0.001
33	Nickel	mg/l	BDL	0.020
34	Total Coliform	Number/100ml	02	0/100 ml
35	E. Coli	Number/100ml	0	0/100 ml
36	Conductivity	µS/cm	514	--
37	Bicarbonate (as HCO_3^-)	mg/l	52	--
38	Iodine	mg/l	0.01	--
39	Magnesium (Mg)	mg/l	35	--
40	Calcium as (Ca)	mg/l	68	--
41	Phosphate	mg/l	BDL	--
42	Potassium	mg/l	3.2	--
43	SAR Iodine	mEq/l	0.64	--
44	Selenium	mg/l	BDL	0.01
45	Copper	mg/l	BDL	2
46	Residual Chlorine	mg/l	BDL	--
47	Phenolic Compounds	mg/l	BDL	0.002

BDL= Below Detection Limit

Conclusion:

Results of the tests performed on the sample indicate that ground water has high TSS and Total Coliform values.

3.4.2 Surface Water Quality Analysis:

3.4.2.1 Rai Shahr (32° 28' 36", 72° 46' 00")

Sample was taken from the source specified by client. The surface water sample was taken from open area near Rai Shahr site.

Table 3-5-1: Surface Water Quality Analysis Results

Sr. No.	Parameter	Unit	Result	FAO Standards
1	Temperature	^0C	27.5	--
2	pH	---	6.84	6.5-8.4
3	Chemical Oxygen Demand **(COD)**	mg/l	78	--
4	Biochemical Oxygen Demand **(BOD_5)**	mg/l	32	--
5	Total Dissolved Solids **(TDS)**	mg/l	2220	2000
6	Total Suspended Solids **(TSS)**	mg/l	124	--
7	Oil & Grease	mg/l	BDL	--
8	Chromium **(Hexa & Trivalent)**	mg/l	0.24	0.1
9	Sulphate **(SO_4^{2-})**	mg/l	397	--
10	Iron **(Fe^{2+})**	mg/l	1.41	5.0
11	Chlorine **(Cl_2)** Free	mg/l	0.04	--
12	Fluoride **(F^-)**	mg/l	2.62	1.0
13	Chloride	mg/l	478	355
14	Ammonia **(NH_3)**	mg/l	8.4	--
15	Cadmium	mg/l	0.02	0.01
16	Lead	mg/l	BDL	5.0
17	Arsenic	mg/l	0.009	0.1
18	Copper	mg/l	0.34	0.2
19	Barium	mg/l	BDL	--
20	Selenium	mg/l	0.01	0.02
21	Silver	mg/l	BDL	--
22	Pesticides	mg/l	0.12	--
23	Manganese	mg/l	BDL	0.2
24	Zinc	mg/l	2.42	2.0
25	Nickel	mg/l	BDL	0.2

Sr. No.	Parameter	Unit	Result	FAO Standards
26	Boron	mg/l	BDL	0.7
27	Mercury	mg/l	BDL	--
28	Total Toxic Metals	mg/l	0.27	--
29	Sulphide **(S^{-2})**	mg/l	BDL	--
30	An Ionic Detergent as MBAS	mg/l	BDL	--
31	Phenolic Compounds	mg/l	BDL	---
32	Cyanide	mg/l	BDL	--
33	Dissolved Oxygen	mg/l	1.6	--
34	Aluminum	mg/l	BDL	5.0
35	Antimony	mg/l	BDL	--
36	Turbidity	mg/l	0	--
37	Nutrient as (K)	mg/l	0.01	--
38	Nutrient as (N)	mg/l	0.008	--
39	Nutrient as (P)	mg/l	0.009	--
40	Total Coliform	MPN/100 ml	48	--
41	Fecal Coliform	MPN/100 ml	20	--

BDL= Below Detection Limit

3.4.2.2 Head Rasool Barrage (32° 41' 21", 73° 30' 50")

Sample was taken from the source specified by client. The surface water sample was taken from pond at Head Rasool Barrage site.

Table 3-5-2: Surface Water Quality Analysis Results

Sr. No.	Parameter	Unit	Result	FAO Standards
1	Temperature	^0C	18.5	--
2	pH	---	8.44	6.5-8.4
3	Chemical Oxygen Demand **(COD)**	mg/l	30	--
4	Biochemical Oxygen Demand **(BOD_5)**	mg/l	18	--
5	Total Dissolved Solids **(TDS)**	mg/l	438	2000
6	Total Suspended Solids **(TSS)**	mg/l	62	--
7	Oil & Grease	mg/l	BDL	--
8	Chromium **(Hexa & Trivalent)**	mg/l	0.28	0.1
9	Sulphate **(SO_4^{2-})**	mg/l	108	--
10	Iron **(Fe^{2+})**	mg/l	1.14	5.0
11	Chlorine **(Cl_2)** Free	mg/l	0.02	--
12	Fluoride **(F^-)**	mg/l	0.84	1.0
13	Chloride	mg/l	174	355
14	Ammonia **(NH_3)**	mg/l	7.1	--
15	Cadmium	mg/l	BDL	0.01
16	Lead	mg/l	BDL	5.0
17	Arsenic	mg/l	0.01	0.1
18	Copper	mg/l	0.31	0.2
19	Barium	mg/l	BDL	--
20	Selenium	mg/l	BDL	0.02
21	Silver	mg/l	BDL	--
22	Pesticides	mg/l	0.1	--
23	Manganese	mg/l	BDL	0.2
24	Zinc	mg/l	1.72	2.0
25	Nickel	mg/l	BDL	0.2
26	Boron	mg/l	BDL	0.7
27	Mercury	mg/l	BDL	--

Sr. No.	Parameter	Unit	Result	FAO Standards
28	Total Toxic Metals	mg/l	0.29	--
29	Sulphide **(S^{-2})**	mg/l	BDL	--
30	An Ionic Detergent as MBAS	mg/l	BDL	--
31	Phenolic Compounds	mg/l	BDL	---
32	Cyanide	mg/l	0.03	--
33	Dissolved Oxygen	mg/l	1.5	--
34	Aluminum	mg/l	BDL	5.0
35	Antimony	mg/l	BDL	--
36	Turbidity	mg/l	0	--
37	Nutrient as (K)	mg/l	0.05	--
38	Nutrient as (N)	mg/l	0.01	--
39	Nutrient as (P)	mg/l	0.008	--
40	Total Coliform	MPN/100 ml	28	--
41	Fecal Coliform	MPN/100 ml	12	--

BDL= Below Detection Limit

3.4.2.3 Jalalpur Sharif (32° 39' 19", 73° 24' 34")

Sample was taken from the source specified by client. The surface water sample was taken from the open area near Jalalpur Sharif site.

Table 3-5-3: Surface Water Quality Analysis Results

Sr. No.	Parameter	Unit	Result	FAO Standards
1	Temperature	^0C	26.5	--
2	pH	---	6.96	6.5-8.4
3	Chemical Oxygen Demand **(COD)**	mg/l	64	--
4	Biochemical Oxygen Demand **(BOD_5)**	mg/l	30	--
5	Total Dissolved Solids **(TDS)**	mg/l	1235	2000
6	Total Suspended Solids **(TSS)**	mg/l	104	--
7	Oil & Grease	mg/l	04	--
8	Chromium **(Hexa & Trivalent)**	mg/l	0.38	0.1
9	Sulphate **(SO_4^{2-})**	mg/l	254	--
10	Iron **(Fe^{2+})**	mg/l	1.21	5.0
11	Chlorine **(Cl_2)** Free	mg/l	0.07	--
12	Fluoride **(F^-)**	mg/l	2.46	1.0
13	Chloride	mg/l	384	355
14	Ammonia **(NH_3)**	mg/l	10.4	--
15	Cadmium	mg/l	0.02	0.01
16	Lead	mg/l	BDL	5.0
17	Arsenic	mg/l	0.02	0.1
18	Copper	mg/l	1.62	0.2
19	Barium	mg/l	BDL	--
20	Selenium	mg/l	BDL	0.02
21	Silver	mg/l	BDL	--
22	Pesticides	mg/l	0.14	--
23	Manganese	mg/l	BDL	0.2
24	Zinc	mg/l	1.21	2.0
25	Nickel	mg/l	BDL	0.2
26	Boron	mg/l	BDL	0.7
27	Mercury	mg/l	BDL	--

Sr. No.	Parameter	Unit	Result	FAO Standards
28	Total Toxic Metals	mg/l	0.42	--
29	Sulphide **(S^{-2})**	mg/l	BDL	--
30	An Ionic Detergent as MBAS	mg/l	BDL	--
31	Phenolic Compounds	mg/l	BDL	---
32	Cyanide	mg/l	0.02	--
33	Dissolved Oxygen	mg/l	4.2	--
34	Aluminum	mg/l	BDL	5.0
35	Antimony	mg/l	BDL	--
36	Turbidity	mg/l	3	--
37	Nutrient as (K)	mg/l	0.05	--
38	Nutrient as (N)	mg/l	0.04	--
39	Nutrient as (P)	mg/l	0.02	--
40	Total Coliform	MPN/100 ml	86	--
41	Fecal Coliform	MPN/100 ml	42	--

BDL= Below Detection Limit

3.4.3 Wastewater Quality Analysis

3.4.3.1 Chakri Karam Khan (32° 40' 52", 73° 21' 06")

Sample was taken from the source specified by client. The wastewater sample was taken from open area near Chakri Karam Khan site.

Table 3-6-1: Wastewater Quality Analysis Results

Sr. No.	Parameter	Unit	Result	PEQS
1	Temperature	^0C	29.0	40
2	pH	---	8.02	6-9
3	Chemical Oxygen Demand **(COD)**	mg/l	138	150
4	Biochemical Oxygen Demand **(BOD_5)**	mg/l	62	80
5	Total Dissolved Solids **(TDS)**	mg/l	1124	3500
6	Total Suspended Solids **(TSS)**	mg/l	148	200
7	Oil & Grease	mg/l	4.2	10
8	Chromium **(Hexa & Trivalent)**	mg/l	0.32	1.0
9	Sulphate **(SO_4^{2-})**	mg/l	286	600
10	Iron **(Fe^{2+})**	mg/l	2.8	8
11	Chlorine **(Cl_2)** Free	mg/l	0.12	1.0
12	Fluoride **(F^-)**	mg/l	2.1	10
13	Chloride	mg/l	384	1000
14	Ammonia **(NH_3)**	mg/l	19.5	40
15	Cadmium	mg/l	0.01	0.1
16	Lead	mg/l	BDL	0.5
17	Arsenic	mg/l	0.21	1.0
18	Copper	mg/l	0.48	1.0
19	Barium	mg/l	BDL	1.5
20	Selenium	mg/l	BDL	0.5
21	Silver	mg/l	BDL	1.0
22	Pesticides	mg/l	0.09	0.15
23	Manganese	mg/l	BDL	1.5
24	Zinc	mg/l	2.2	5.0
25	Nickel	mg/l	BDL	1.0

Sr. No.	Parameter	Unit	Result	PEQS
26	Boron	mg/l	BDL	6.0
27	Mercury	mg/l	BDL	0.01
28	Total Toxic Metals	mg/l	0.54	2.0
29	Sulphide **(S^{-2})**	mg/l	BDL	1.0
30	An Ionic Detergent as MBAS	mg/l	BDL	20
31	Phenolic Compounds	mg/l	BDL	0.1
32	Cyanide	mg/l	BDL	1.0
33	Dissolved Oxygen	mg/l	5.5	--
34	Aluminum	mg/l	BDL	--
35	Antimony	mg/l	BDL	--
36	Turbidity	mg/l	4	--
37	Nutrient as (K)	mg/l	0.02	--
38	Nutrient as (N)	mg/l	0.009	--
39	Nutrient as (P)	mg/l	0.02	--
40	Total Coliform	MPN/100 ml	192	--
41	Fecal Coliform	MPN/100 ml	128	--

BDL= Below Detection Limit

Conclusion:

Results of the tests performed on the sample indicate that all the values are below the PEQS limits.

3.4.3.2 ICI Soda Ash Khewra (32° 37' 20", 73° 01' 14")

Sample was taken from the source specified by client. The wastewater sample was taken from pond near ICI Soda Ash Khewra site.

Table 3-6-2: Wastewater Quality Analysis Results

Sr. No.	Parameter	Unit	Result	PEQS
1	Temperature	^0C	27.5	40
2	pH	---	7.20	6-9
3	Chemical Oxygen Demand **(COD)**	mg/l	93	150
4	Biochemical Oxygen Demand **(BOD_5)**	mg/l	42	80
5	Total Dissolved Solids **(TDS)**	mg/l	984	3500
6	Total Suspended Solids **(TSS)**	mg/l	72	200
7	Oil & Grease	mg/l	BDL	10
8	Chromium **(Hexa & Trivalent)**	mg/l	0.28	1.0
9	Sulphate **(SO_4^{2-})**	mg/l	246	600
10	Iron **(Fe^{2+})**	mg/l	1.62	8
11	Chlorine **(Cl_2)** Free	mg/l	0.05	1.0
12	Fluoride **(F^-)**	mg/l	2.24	10
13	Chloride	mg/l	358	1000
14	Ammonia **(NH_3)**	mg/l	18.4	40
15	Cadmium	mg/l	0.02	0.1
16	Lead	mg/l	BDL	0.5
17	Arsenic	mg/l	0.14	1.0
18	Copper	mg/l	0.24	1.0
19	Barium	mg/l	BDL	1.5
20	Selenium	mg/l	BDL	0.5
21	Silver	mg/l	BDL	1.0
22	Pesticides	mg/l	0.06	0.15
23	Manganese	mg/l	BDL	1.5
24	Zinc	mg/l	2.5	5.0
25	Nickel	mg/l	BDL	1.0
26	Boron	mg/l	BDL	6.0
27	Mercury	mg/l	BDL	0.01

Sr. No.	Parameter	Unit	Result	PEQS
28	Total Toxic Metals	mg/l	0.44	2.0
29	Sulphide **(S^{-2})**	mg/l	BDL	1.0
30	An Ionic Detergent as MBAS	mg/l	BDL	20
31	Phenolic Compounds	mg/l	BDL	0.1
32	Cyanide	mg/l	0.08	1.0
33	Dissolved Oxygen	mg/l	3.2	--
34	Aluminum	mg/l	BDL	--
35	Antimony	mg/l	BDL	--
36	Turbidity	mg/l	2	--
37	Nutrient as (K)	mg/l	0.009	--
38	Nutrient as (N)	mg/l	0.02	--
39	Nutrient as (P)	mg/l	0.04	--
40	Total Coliform	MPN/100 ml	142	--
41	Fecal Coliform	MPN/100 ml	62	--

BDL= Below Detection Limit

Conclusion:

Results of the tests performed on the sample indicate that all the values are below the PEQS limits.

3.4.3.3 Sahowal (32° 40' 15", 73° 09' 22")

Sample was taken from the source specified by client. The wastewater sample was taken from open area near Sahowal site.

Table 3-6-3: Wastewater Quality Analysis Results

Sr. No.	Parameter	Unit	Result	PEQS
1	Temperature	^0C	29.0	40
2	pH	---	7.42	6-9
3	Chemical Oxygen Demand **(COD)**	mg/l	130	150
4	Biochemical Oxygen Demand **(BOD_5)**	mg/l	76	80
5	Total Dissolved Solids **(TDS)**	mg/l	680	3500
6	Total Suspended Solids **(TSS)**	mg/l	74	200
7	Oil & Grease	mg/l	2.5	10
8	Chromium **(Hexa & Trivalent)**	mg/l	0.18	1.0
9	Sulphate **(SO_4^{2-})**	mg/l	136	600
10	Iron **(Fe^{2+})**	mg/l	2.45	8
11	Chlorine **(Cl_2)** Free	mg/l	0.15	1.0
12	Fluoride **(F^-)**	mg/l	3.2	10
13	Chloride	mg/l	218	1000
14	Ammonia **(NH_3)**	mg/l	12.5	40
15	Cadmium	mg/l	0.02	0.1
16	Lead	mg/l	BDL	0.5
17	Arsenic	mg/l	0.02	1.0
18	Copper	mg/l	0.34	1.0
19	Barium	mg/l	BDL	1.5
20	Selenium	mg/l	0.01	0.5
21	Silver	mg/l	BDL	1.0
22	Pesticides	mg/l	0.02	0.15
23	Manganese	mg/l	BDL	1.5
24	Zinc	mg/l	2.8	5.0
25	Nickel	mg/l	BDL	1.0
26	Boron	mg/l	BDL	6.0
27	Mercury	mg/l	BDL	0.01

Sr. No.	Parameter	Unit	Result	PEQS
28	Total Toxic Metals	mg/l	0.23	2.0
29	Sulphide **(S^{-2})**	mg/l	BDL	1.0
30	An Ionic Detergent as MBAS	mg/l	BDL	20
31	Phenolic Compounds	mg/l	BDL	0.1
32	Cyanide	mg/l	BDL	1.0
33	Dissolved Oxygen	mg/l	3.4	--
34	Aluminum	mg/l	BDL	--
35	Antimony	mg/l	BDL	--
36	Turbidity	mg/l	3	--
37	Nutrient as (K)	mg/l	0	--
38	Nutrient as (N)	mg/l	0.01	--
39	Nutrient as (P)	mg/l	0.04	--
40	Total Coliform	MPN/100 ml	152	--
41	Fecal Coliform	MPN/100 ml	84	--

BDL= Below Detection Limit

Conclusion:

Results of the tests performed on the sample indicate that all the values are below the PEQS limits.

ANNEXURE – I

PEQS

ANNEXURE – II

PHOTO LOG

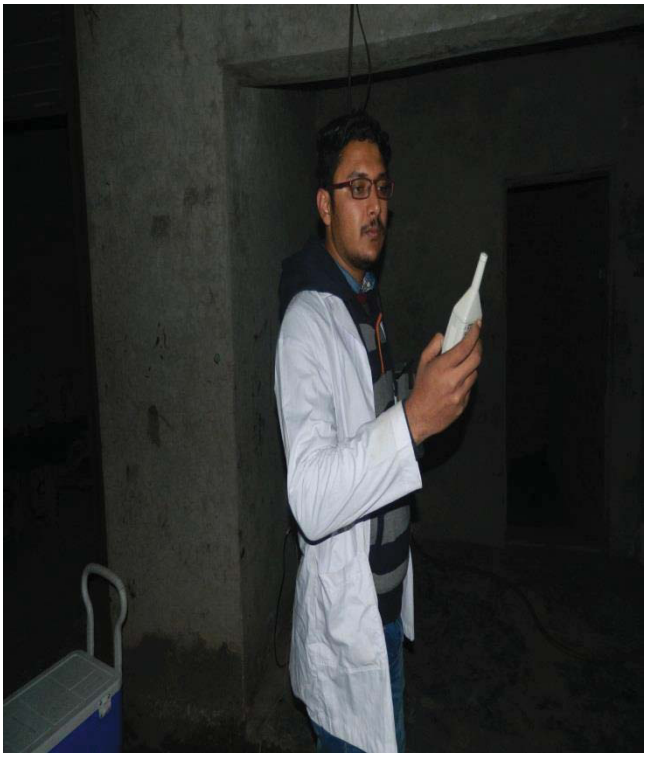


Fig1: Noise Level Monitoring at Dudhi Thal Site

Fig2: Ambient Air Monitoring at Dudhi Thal Site

Fig3: Taking Co-ordinates at DhudiThal Site

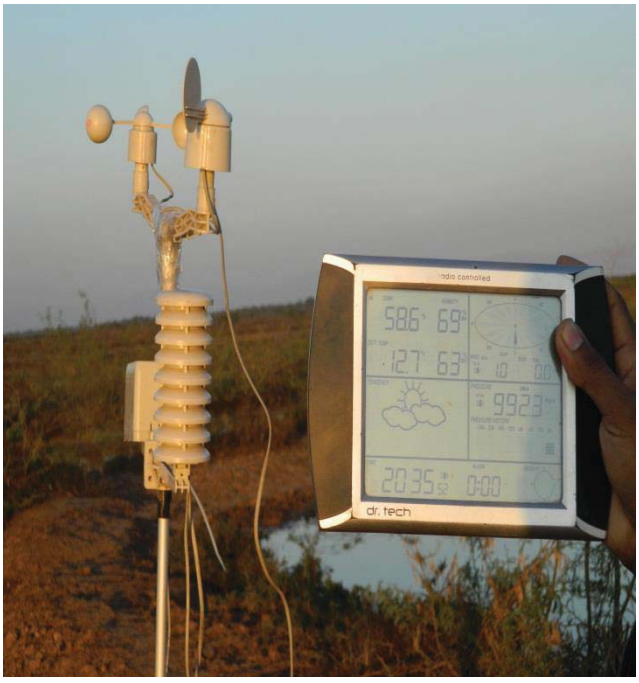


Fig4: Weather Station Monitoring at DhudiThal Site

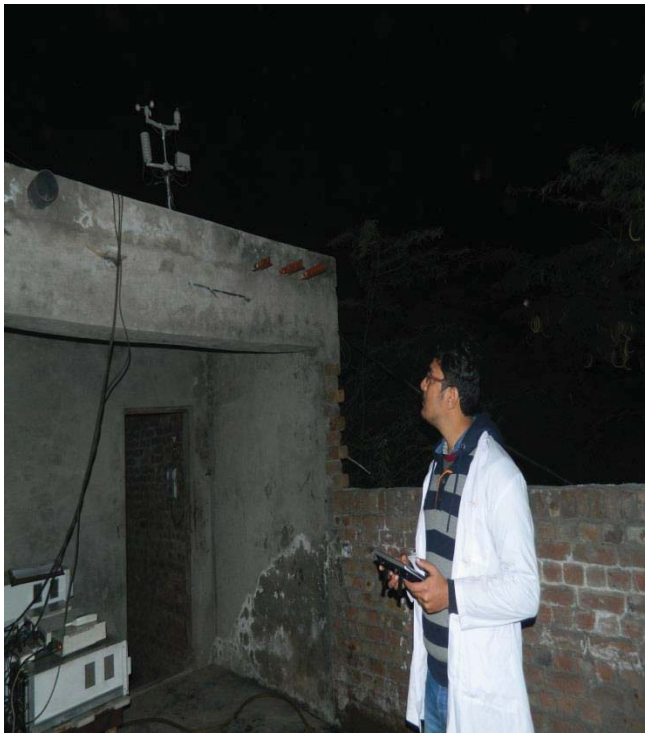


Fig5: Weather Station Monitoring at Jalalpur Site

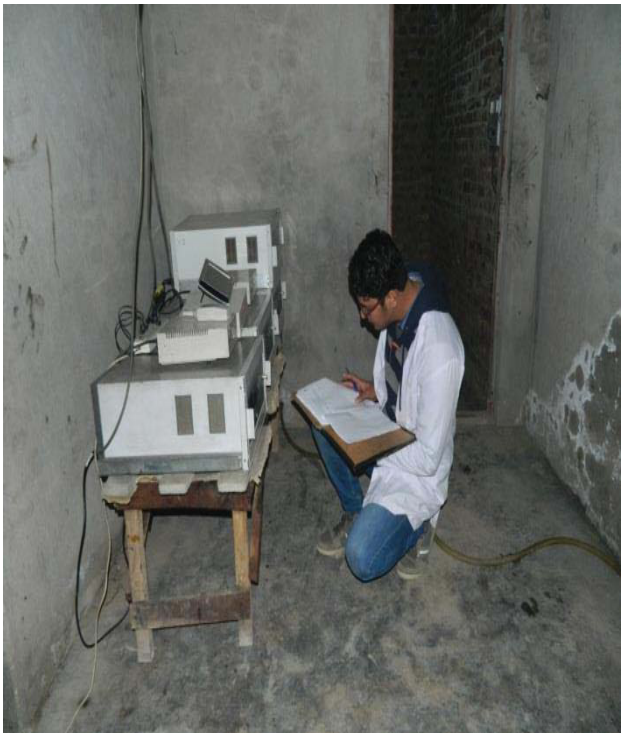


Fig6: Ambient Air Monitoring at Jalalpur site

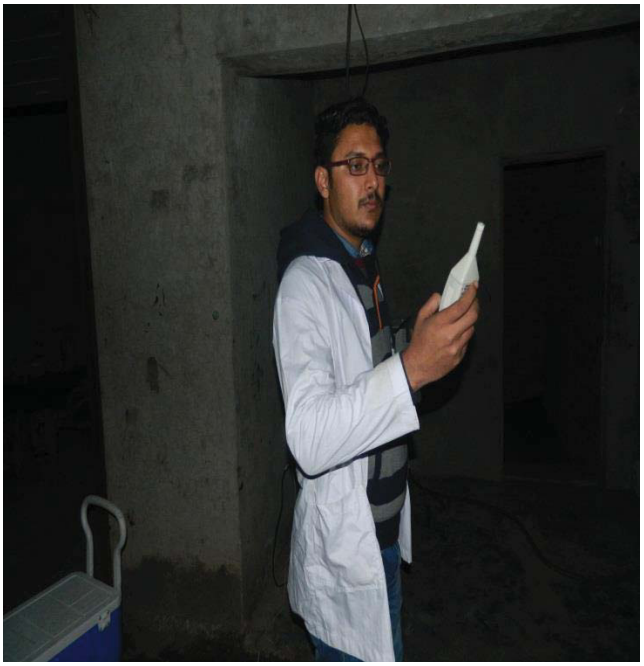


Fig7: Noise Level Monitoring (Night) at Jalalpur Site

Fig8: Ambient Air Monitoring Adowal Site

Fig9: Noise level monitoring at Adowal Site

Fig10: Taking Co-ordinates at Adowal Site

Fig11: Ambient Air Monitoring at Tilokar Site

Fig12: Weather Station Monitoring at Tilokar Site

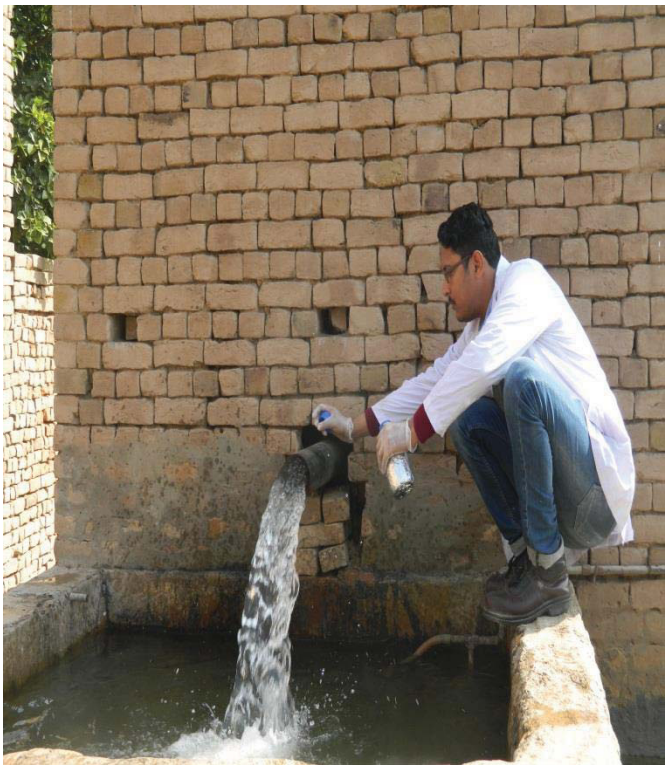


Fig13: Groung water sampling at Tilokar Site

Fig14: Waste water sampling at ICI Kheora

Fig15: Noise Level Monitoring (Night) at Tilokar Site

Fig16: Taking Co-ordinates at Tilokar Site