Environmental Impact Assessment for Coal Transshipment Project at Berth 3 & 4 of Port Qasim Karachi Sindh for HUANG FUYUN PORT & SHIPPING PVT LTD
Environmental Impact Assessment
of
Coal Transshipment Project at Berth 3 & 4
Port Qasim Karachi Sindh for
Huaneng Fuyun Port & Shipping (Pvt) Ltd

Final Report

August, 2016
This report discusses the Environmental Impact Assessment of the proposed Coal Transshipment Project at Berth 3 & 4 of Port Qasim. The proposed project is basically transformation of existing berth 3 & 4 of Port Qasim into one of the most advanced and specialized coal handlings/transshipment berths. The annual ship unloading capacity after development of the proposed project is expected to meet about (2000t/h x 16h x315 D = 1008x 104t/year) considering one ship on berth with following specifications:

<table>
<thead>
<tr>
<th>Ship type:</th>
<th>30000t self-unloading ship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working days per year</td>
<td>315</td>
</tr>
<tr>
<td>Working shift</td>
<td>3 shift per day, 8h/shift, (One shift for maintenance).</td>
</tr>
</tbody>
</table>

**NEED OF THE PROJECT**

The energy concerns of the country are now assuming serious and terrible proportions possessing to the fact that the country has been distressed by energy crisis for about half a decade thus a major bottleneck in economic development and progress. It is important to note that the internal stability of any country is highly dependent on its economic well-being, which is directly dependent upon energy resources and proper management of them. The current energy deficit has resulted in reduced efficiency of several industrial units hence rendering a large number of people unemployed the current energy deficit not only resulted in unemployment but the malfunctioning energy sector had resulted in a 4 percent loss in the GDP annually (Solutions for Energy Crisis in Pakistan, Vol II, 2014). In this regard Government of Pakistan has taken some tangible steps and is currently engaged in development of power projects, across the country. The proposed project is dedicated to support the domestic energy demand in Pakistan.
by coal supply from Berth 3 & 4 of Port Qasim all the way towards the 2 X 660 MW Coal-fired power plants at Sahiwal.

**PROPOSED PROJECT SITE MAP**

The proposed project is located at Port Qasim. The project site map has been presented in figure below:
PROJECT DESCRIPTION

Scope and Design of The Proposed Project includes:

- Demolition and Clearing of Existing Shed and other structures on the Berths;
- Repair/Renovation of the Quay Wall Structure and Yard Pavement;
- Construction of office building, Control Tower, Generator House and workshops;
- Provision and Installation Of Coal Unloading Hoppers, Conveyor Belts and Re-Claimers;
- Construction of Storage Yard

All the conveyor belts will be covered to prevent coal dust dispersion, only conveyor belt 1 and 3 referred to as BC 1 and 3 will be uncovered to handle the coal. The capacity of the storage yard will be determined based on system conveying capacity between the operating time difference of ship unloading and wagon loading. The annual operation day quantity of wagon loading is temporarily determined as 315 days/year. Considering the time difference between ship unloading and wagon loading, some material needs to be transferred to storage yard. Due to limited area of storage yard, the design volume of storage yard is about 200,000 tons. The coal pile height will be about 15 m while on the other hand the storage yard will be enclosed by 18 m high boundary walls in order to prevent coal dust dispersion and to lower down the wind speed. Schematic layout of the coal transshipment process is presented below and a simplified simulation model of the proposed project is presented in figure on the next page.

SCHEMATIC LAYOUT OF THE COAL TRANSSHIPMENT PROCESS
SIMULATION MODEL OF THE PROPOSED PROJECT
LEGISLATIVE REQUIREMENT

The proposed project falls under the project category of Schedule II: “Ports and Harbor Development” as per the guidelines issued by the Sindh Environmental Protection Agency (SEPA) under the Sindh Environmental Protection Act 2014 (SEPA, 2014). According to these guidelines, project under this category require an EIA to be conducted at planning stage.

ENVIRONMENTAL BASELINE

The project area lies in the jurisdiction of Bin Qasim Industrial Area, and several industrial activities takes place within the project vicinity. It is important to note that the proposed project will be developed onto the marginal wharf of Port Qasim i.e. berth 3 & 4 which is a high wind corridor therefore the level of air pollution within the project area was observed to be quite low. Only PM$_{10}$ concentrations were observed to be higher than prescribed SEQs limits at few monitoring locations. The aquifers present in the project area are mostly saline. The proposed project is being developed onto the existing land structure hence it is anticipated that the proposed project will not exhibit any long-term impact onto the topography. However, the proposed project is likely to impact the existing air quality of the proposed project area if suggested mitigation measures are not implemented properly. None of the floral and faunal species were identified to be threatened, vulnerable, critically endangered or near extinction according to IUCN red list or protected under CITES and or SIND WILDLIFE ORDINANCE. The mangroves within the proposed project area are in the control of Sindh Forest Department and Port Qasim Authority and are declared as "Protected Forests". The proposed project does not involve clearing of mangrove species. Only 10-15 terrestrial trees need to be cleared near the existing railway line which will be replanted by the ratio of 1:5.

SOCIAL BASELINE

A large number of laborers are working on existing berths of Port Qasim. These laborers are working under the labor union of Port Qasim. The laborer union of Port Qasim is very active having a proper union structure, such as collective bargaining agents, these agents are responsible for representing the issues of labor and raise voices in case of injustice. Additionally it is important to note that the proposed project area also sustains a variety of industries and to look after the industrial issues there is a fully functional association referred to as Bin Qasim Association of trade and Industry (BQATI). As the proposed project area lies under the jurisdiction of Port Qasim Authority (PQA) so most of the works and issues related to the areas are being solved by the PQA.

The prominent landmarks near the project area include:

- Pakistan Steel Mills
• Quaid e Azam Park
• Famous Shrine of Hazrat Hassan Shah Bukhari at Russian Beach

The consultation and scoping meetings were also carried out in the project area to disseminate information about the project and its expected impact on the primary and secondary stakeholders. Chapter 7 of this report clearly describes the issues raised by the stakeholders during different consultation meetings.

<table>
<thead>
<tr>
<th>S. No</th>
<th>Stakeholder Consulted</th>
<th>Contact Person/Representative</th>
</tr>
</thead>
</table>
| LIST OF PRIMARY STAKEHOLDERS  
(Hotel, Shops And Community)  |
| 1     | Dock Laborers                               | Senior Laborer: Mr Ibrahim                     |
| 2     | Dilawaer Hotel at Berth 4                   | Hotel Owner                                    |
| 3     | Chaundary Javed Hotel at Berth 4             | Hotel Manager                                  |
| 4     | Quetta Arafat Hotel at Berth 4              | Hotel Representative                           |
| 5     | Bin Qasim Handicraft Store at Berth 4        | Shop Owner: Mr. Mehmood Ghaznavi              |
| 6     | Rehri Goth Community                        | Community Head: Mr. Omar                      |
| LIST OF PRIMARY STAKEHOLDERS  
(INDUSTRIES)                   |
| 1     | DP World                                    | Site Manager HSE: Capt. Farrukh Husnain       |
| 2     | Pakistan House International Limited         | Manager: Mr. Aslam M.s Baggia                 |
| 3     | Mujahid Oil Refinary                        | General Manager: Mr. Khalid Warraich          |
| 4     | Mujahid Oil Refinary                        | Manager Terminal: Syed Qaiser Raza            |
| 5     | A.Puri Terminal                             | Manager: Ishrat Hussain                       |
| 6     | MaPak edible oils                           | Chief Engineer: M.Hamdullah                   |
| 7     | Terminal One Limited                        | Terminal Manager: Johar Abbas                 |
| 8     | Kashif Basit Trading                        | Terminal Operation Manager: Syed Bilal Jilani  |
IMPACT MITIGATION

The mitigations for the impacts identified are summarized in the Environmental Management Plan (EMP).

<table>
<thead>
<tr>
<th>No.</th>
<th>Stakeholder</th>
<th>Contact Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Feroz Son Tank Terminal</td>
<td>Manager: Shahid Ali Khan</td>
</tr>
<tr>
<td>10</td>
<td>Bulk Oil Terminal</td>
<td>Terminal Manager: M. Fareed Khan</td>
</tr>
<tr>
<td>11</td>
<td>Hamza Tank Terminal</td>
<td>General Manager: Tariq Shafi</td>
</tr>
</tbody>
</table>

LIST OF SECONDARY STAKEHOLDERS
(INSTITUTIONS, GOVERNMENTAL DEPARTMENTS, NGOs, UNIONS & ASSOCIATIONS)

<table>
<thead>
<tr>
<th>No.</th>
<th>Stakeholder</th>
<th>Contact Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sindh Environmental Protection Agency</td>
<td>Director General: Mr. Naeem Mughal</td>
</tr>
<tr>
<td>1</td>
<td>Port Qasim Authority</td>
<td>Director General: Mr. Shabir Qazi</td>
</tr>
<tr>
<td>3</td>
<td>Pakistan Railways</td>
<td>Divisional Engineer-III: Ghulam Qadir Mahesar</td>
</tr>
<tr>
<td>4</td>
<td>Environment and Safety Department &amp; Marine Pollution Control Centre PQA</td>
<td>Deputy Manager E&amp;S: Mr. Sham Lal Sharma</td>
</tr>
<tr>
<td>5</td>
<td>Marine Fisheries</td>
<td>Director General: Mr. Israr Ahmed</td>
</tr>
<tr>
<td>6</td>
<td>Coastal Development Authority</td>
<td>Representative</td>
</tr>
<tr>
<td>7</td>
<td>Bin Qasim Association of Trade and Industry</td>
<td>General Secretary: Mr. Abdur Rehman Ismail</td>
</tr>
<tr>
<td>8</td>
<td>Worker Union of Port Qasim</td>
<td>General Secretary: Mr. Hussain Badsha</td>
</tr>
<tr>
<td>9</td>
<td>International Union for Conserving Nature (IUCN)</td>
<td>NRM Coordinator: Mr. Ghulam Qadir Shah</td>
</tr>
<tr>
<td>10</td>
<td>WWF, Karachi Pakistan</td>
<td>Technical Director: Mr. Muazzam Ali Khan</td>
</tr>
</tbody>
</table>
CONCLUSION

The EIA of the proposed coal transshipment project has achieved the following goals:

- Identification of national and provincial environmental regulatory requirements that apply to the proposed project activities;
- Identification of the environmental features of the project area including the physical, biological and social disturbance and likely impact of the project on the environment;
- Recommendation of appropriate mitigation measures that the project developer will incorporate and ensure as per this EIA into the project to minimize the adverse environmental impacts.

After assessing the proposed project activities and investigating the project area, the environmental consultants, GEMS have concluded that:

"If the activities are undertaken as described in this report, and the recommended mitigation measures along with environmental management plan is adopted specifically for coal dust suppression the proposed project will not result in any long-term impacts on the local community as well as on the physical and biological environment of the project area. It can be concluded that the proposed coal transshipment project includes improved and modernized coal handling technologies which is much better than the current coal handling practices at Port Qasim."
# Environmental Management Plan

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Impact</th>
<th>Mitigation</th>
<th>Residual Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction Phase</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Air</strong></td>
<td>Chronic health effects</td>
<td>- Sprinkling of water</td>
<td>LOW</td>
</tr>
<tr>
<td></td>
<td>Reduced visibility in surrounding area</td>
<td>- Tuning of construction vehicles &amp; machines</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Breathing problem</td>
<td>- Dust masks for laborers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Irritation in eyes</td>
<td>- Monitoring of vehicular emission</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Monitoring of Ambient Air</td>
<td></td>
</tr>
<tr>
<td><strong>Noise</strong></td>
<td>Stress</td>
<td>- Maintenance of silencers</td>
<td>LOW</td>
</tr>
<tr>
<td></td>
<td>Hypertension</td>
<td>- Lubrication of construction vehicles &amp; machineries</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hearing loss</td>
<td>- Ear plugs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Headache</td>
<td>- Monitoring of Ambient Noise</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Monitoring of noise near construction machinery</td>
<td></td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td>Formation of heaps due to improper handling of construction residue</td>
<td>- Proper site leveling after construction</td>
<td>LOW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Proper handling and disposal of construction waste/residue</td>
<td></td>
</tr>
<tr>
<td><strong>Terrestrial Ecology</strong></td>
<td>A few number of trees may be cleared</td>
<td>- In case of cutting of trees, one plant should be replaced by 1:5</td>
<td>Medium</td>
</tr>
</tbody>
</table>
## Executive Summary

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Impact</th>
<th>Mitigation</th>
<th>Residual Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aquatic Ecology</strong></td>
<td>Alteration in sediment composition due to dredging</td>
<td>- Frequent dredging of sediments from intake and outlet water discharge channel to be avoided during the Summer Monsoon period.</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Changes in diversity of benthic community</td>
<td></td>
<td>Medium</td>
</tr>
</tbody>
</table>
| **Water use**                 | Wastage and misuse of water                                            | - Avoid unnecessary use of water
- Prevent leakages                                                                                                                     | Medium          |
| **Surface water**             | Seawater contamination by oil spillage from construction vehicles and equipment | - Careful use of heavy machineries and equipment to prevent leakages and spills                                                                                                                             | Medium          |
| **Social Environment**        | Conflicts between laborers/project developers and nearby industries   | - Specify time scale for construction activities
- Conflict resolution by taking the relevant stakeholders into confidence by addressing their grievance and concerns by proper mitigations                                                                 | Medium          |
| **Roads and networks**        | Traffic congestion due to frequent and unscheduled mobilization of construction equipment and vehicles | - Trained drivers and operators to drive the construction vehicles
- Obey traffic and safety rules/precautions
- Signs and reflectors must be boarded for driver's visibility at night                                                                 | Medium          |
## Executive Summary

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Impact</th>
<th>Mitigation</th>
<th>Residual Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Health and Safety</strong></td>
<td>Lack of awareness among general laborers about safety may lead to accidents</td>
<td>- Safety symbols and instructions will be boarded at work sites &lt;br&gt; - Trained personnel will be appointed for the specific work &lt;br&gt; - General laborers working on other berths will not be allowed to access the construction area &lt;br&gt; - Appropriate PPEs must be used for technical work</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Unskilled and untrained workers might cause harm to themselves and others</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Construction works may include many risks and hazards that may lead to severe injuries</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operational Phase</strong></td>
<td>Chronic health effects &lt;br&gt; Reduced visibility on roads &lt;br&gt; Contamination of food grade items by coal dust dispersion &lt;br&gt; Reduces photosynthetic rate of mangrove species and other plants due to coal dust accumulation</td>
<td>- Plantation of dense canopy trees across the railway line &lt;br&gt; - Water sprinkling at the coal storage yard and uncovered conveyor belts &lt;br&gt; - Minimize coal drop heights &lt;br&gt; - Keep coal loads below the freeboard of the train wagons. &lt;br&gt; - Cover transfer wagons by porous covering material or any suitable binding agent to reduce the probability of coal dust dispersion</td>
<td>Medium</td>
</tr>
<tr>
<td>Aspect</td>
<td>Impact</td>
<td>Mitigation</td>
<td>Residual Impact</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Noise</td>
<td>Stress</td>
<td>- Maintenance of silencers</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Hypertension</td>
<td>- Lubrication of construction vehicles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hearing loss</td>
<td>- Ear plugs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Headache</td>
<td>- Monitoring of Ambient Noise</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Monitoring of noise near construction machinery</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Surface water</td>
<td>Seawater contamination by oil spillage from arriving ships, coal wastewater and leachate</td>
<td>- Oil Booms to be used in case of severe spills</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Wastewater treatment plant</td>
<td></td>
</tr>
<tr>
<td>Soil</td>
<td>Contamination of soil due to spillage and leakages from construction machineries and equipment’s</td>
<td>- Careful use of heavy machineries and equipment to prevent leakages</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Reduce soil productivity due to contamination</td>
<td>- Malfunctioning machineries should be kept away from exposed soil area and maintained at an designated workshop having impermeable floors</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Plantation of dense canopy trees</td>
<td></td>
</tr>
<tr>
<td>Terrrestrial Ecology</td>
<td>Reduces photosynthetic rate of plants due to coal dust accumulation</td>
<td>- Water sprinkling at the coal storage yard and uncovered conveyor belts</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Minimize coal drop heights</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Keep coal loads below the freeboard of the train wagons.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Cover transfer wagons by porous covering material or any</td>
<td></td>
</tr>
</tbody>
</table>
### Executive Summary

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Impact</th>
<th>Mitigation</th>
</tr>
</thead>
</table>
| Aquatic Ecology       | Reduction in plankton species due to the wastewater discharge and from vessels propeller, bow waves. Mortality of fish egg associated with spillage of oily waste. The mangroves of the project area are also likely to be adversely affected in the long run by dispersion of coal dust particles. | suitable binding agent to reduce the probability of coal dust dispersion  
- Ensure proper treatment of diseased plants  
- Extra precautionary measure against spill must be taken during the breeding and spawning period of fish and shrimp (June, July) in the creek  
- Re plantation of mangrove species by engaging local communities with the ratio of 1:5 in case if the existing population is declining |
| Social Environment    | Conflicts between project developer and nearby industries              | Conflict resolution by taking the relevant stakeholders into confidence by addressing their grievance and concerns by proper mitigations |
| Roads and networks    | Traffic congestion due to frequent mobilization of construction equipment | Trained drivers and operators to drive the construction vehicles |

<table>
<thead>
<tr>
<th>Residual Impact</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatic Ecology</td>
<td></td>
<td></td>
<td>Medium</td>
</tr>
<tr>
<td>Social Environment</td>
<td></td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Roads and networks</td>
<td></td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Aspect</td>
<td>Impact</td>
<td>Mitigation</td>
<td>Residual Impact</td>
</tr>
<tr>
<td>--------</td>
<td>--------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>and vehicles</td>
<td>- Obey traffic and safety rules/precautions</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Signs and reflectors must be boarded for driver's visibility at night</td>
<td></td>
</tr>
<tr>
<td>Health and Safety</td>
<td>Lack of awareness among general laborers about safety may lead to accidents</td>
<td>Safety symbols and instructions will be boarded at work sites</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trained personnel will be appointed for the specific work</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>General laborers working on other berths will not be allowed to access the project area</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Appropriate PPEs must be used for technical work</td>
<td></td>
</tr>
</tbody>
</table>
LIST OF CONTENTS

EXECUTIVE SUMMARY

1.0 INTRODUCTION

1.1 BACKGROUND INFORMATION 1-1
1.2 PROJECT AREA 1-1
1.3 CATEGORIZATION OF THE PROPOSED PROJECT 1-3
1.4 PRONPONENT’S INTRODUCTION 1-3
1.5 PURPOSE OF THE STUDY 1-3
1.6 SCOPE OF THE STUDY 1-4
1.7 APPROACH AND METHODOLOGY 1-4
   1.7.1 Scoping 1-4
   1.7.2 Baseline Studies 1-4
   1.7.3 Impact Assessment 1-5
   1.7.4 Documentation 1-6
1.8 EIA STUDY TEAM 1-7

2.0 PROJECT DESCRIPTION

2.1 LOCATION OF THE PROPOSED PROJECT 2-1
2.2 NEED AND SIGNIFICANCE OF THE PROPOSED PROJECT 2-1
2.3 BRIEF DESCRIPTION & SCHEDULE OF THE PROPOSED PROJECT 2-9
2.4 TECHNICAL DESCRIPTION OF THE PROPOSED PROJECT 2-10
2.5 REPAIR/RENOVATION OF THE QUAY WALL STRUCTURE AND YARD PAVEMENT 2-11
2.6 CONSTRUCTION OF OFFICE BUILDING, CONTROL TOWER, GENERATOR HOUSE AND WORKSHOPS 2-11
2.7 PROVISION AND INSTALLATION OF COAL UNLOADING HOPPERS, CONVEYOR BELTS AND RE-CLAIMERS 2-13
   2.7.1 Mobile Hoppers Details 2-13
   2.7.2 Conveyor Belt Details 2-13
   2.7.3 Re-Claimers 2-17
   2.7.4 Re-Claimers Capacity Details 2-18
   2.7.5 Train Loading Capacity Details 2-18
2.8 BC 1-5 CONVEYOR STEEL TRESTLE 2-18
2.9 TRANSFER TOWER AND LOADING STATION 2-19
2.10 STORAGE YARD 2-19
   2.10.1 Storage Yard Capacity Details 2-20
2.11 CENTRALIZED CONTROL ROOM 2-20
2.12 SHIPING PROCESS INTRODUCTION 2-20
2.13 SUMMARY OF THE ENTIRE DEVELOPMENT 2-20
   2.13.1 Shipping System 2-20
   2.13.2 Wharf System 2-21
2.13.3 Yard Convey and Storing System 2-21
2.13.4 Generator Set 2-21
2.13.5 Control System 2-21
2.13.6 Water Supply and Drainage System 2-21
2.13.7 Management System 2-21
2.13.8 System Operational Process 2-21

2.14 ENVIRONMENTAL HEALTH AND SAFETY CONSIDERATIONS IN THE DESIGN PHASE 2-22
2.14.1 Wind Proof Dust Suppression Shield 2-22
2.14.2 Washing and Fire Fighting 2-24
2.14.3 Coal Suppression 2-24

3.0 INSTITUTIONAL, LEGISLATION AND POLICY FRAMEWORK

3.1 NATIONAL ENVIRONMENTAL POLICY, LEGISLATION AND GUIDELINES 3-2
3.1.1 National Conservation Strategy (NCS) 3-2
3.1.2 Sindh Environmental Protection Act 2014 3-3
3.1.3 Approval from Sindh Environment Protection Agency 3-3
3.1.4 Sindh Environmental Protection Agency Review of IEE and EIA Regulations, 2014 3-5
3.1.5 The Sindh Environmental Quality Standards 3-5
3.1.6 Land Acquisition Act, 1894 3-5
3.1.7 Port Qasim Authority Act, 1973 3-6
3.1.8 Pakistan Penal Code (1860) 3-6
3.1.9 The Antiquities Act, 1975 3-7
3.1.10 The Factories Act, 1934 3-7
3.1.11 Hazardous Substance Rules, 2014 3-7
3.1.12 Sindh Wildlife Protection (Amendment) Act 2008 3-8
3.1.13 Sindh Forest Act (2012) 3-8
3.1.14 Sindh Fisheries Ordinance (1980) 3-8
3.1.15 Highways Safety Ordinance, 2000 3-8

3.2 NATIONAL AND INTERNATIONAL GUIDELINES OR STANDARDS 3-9
3.2.1 The Pakistan Environmental Assessment Procedures, 1997 3-9
3.2.2 World Bank Guidelines on Environment 3-9
3.2.3 OSHA Standards Health Safety 3-10

3.3 OBLIGATION UNDER INTERNATIONAL TREATIES 3-10
3.3.1 London Dumping Convention 1972 3-10
3.3.2 United Nation Convention on Law of the Sea (UNCLOS-82) 3-11

4.0 PHYSICAL ENVIRONMENT

4.1 TOPOGRAPHY OF THE PROJECT AREA 4-1
4.2 LAND COVER & LAND USE OF KARACHI AND OF THE PROJECT AREA 4-3
## 5.0 BIOLGICAL ENVIRONMENT

<table>
<thead>
<tr>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1 HABITAT</td>
</tr>
<tr>
<td>5.2 FLORA OF THE PROJECT AREA</td>
</tr>
<tr>
<td>5.2.1 Flora of the Project Area</td>
</tr>
<tr>
<td>5.2.2 Conservation Status</td>
</tr>
<tr>
<td>5.3 FAUNA OF THE PROJECT AREA</td>
</tr>
<tr>
<td>5.3.1 Avifauna of the Project Area</td>
</tr>
<tr>
<td>5.3.2 Terrestrial Fauna of the Project Area</td>
</tr>
<tr>
<td>5.3.3 Marine Benthic Invertebrates</td>
</tr>
<tr>
<td>5.3.4 Benthic Fish Community</td>
</tr>
<tr>
<td>5.3.5 Pelagic Fish Community</td>
</tr>
<tr>
<td>5.3.6 Marine Mammals, Turtle and Endangered Species</td>
</tr>
<tr>
<td>5.3.7 CONCLUSION</td>
</tr>
</tbody>
</table>

## 6.0 SOCIO-ECONOMIC & CULTURAL ENVIRONMENT

<table>
<thead>
<tr>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1 SCOPE AND METHODOLOGY</td>
</tr>
<tr>
<td>6.1.1 Tools for Data Collection</td>
</tr>
<tr>
<td>6.2 PROJECT LOCATION AND ADMINISTRATIVE SETUP</td>
</tr>
<tr>
<td>6.3 ENTRY AND EXIT POINT</td>
</tr>
<tr>
<td>6.4 DEMOGRAPHICS</td>
</tr>
<tr>
<td>6.5 NETWORKING AND BUSINESS ACTIVITIES</td>
</tr>
<tr>
<td>6.6 LIVELIHOOD</td>
</tr>
<tr>
<td>6.6.1 The Fishing Communities of the Proposed Project Area</td>
</tr>
<tr>
<td>6.6.2 The Non Fishing (Lower Class Communities)</td>
</tr>
<tr>
<td>6.6.3 The Non Fishing (Middle &amp; Higher Class Communities)</td>
</tr>
<tr>
<td>6.7 LEADERSHIP DYNAMICS</td>
</tr>
<tr>
<td>6.8 EDUCATION</td>
</tr>
<tr>
<td>6.9 HEALTH</td>
</tr>
<tr>
<td>6.10 CULTURE, ETHNICITY AND RELIGION</td>
</tr>
<tr>
<td>6.11 RECREATIONAL AREAS</td>
</tr>
</tbody>
</table>
7.0 STAKEHOLDER CONSULTATION

7.1 OBJECTIVES OF PUBLIC CONSULTATION AND SCOPING MEETINGS 7-1
7.2 METHODOLOGY ADOPTED FOR CONSULTATION MEETINGS 7-3
7.3 STAKEHOLDER CONSULTATION OUTCOMES 7-4
   7.3.1 Primary Stakeholder Consultations Outcomes & Findings 7-4
   7.3.2 Views of Industrial Representatives of Bin Qasim Industrial Area 7-6
   7.3.3 Key Informant Interviews Outcomes 7-7
   7.3.4 Secondary Stakeholder Consultations Outcomes & Findings 7-9

8.0 ALTERNATIVES

8.1 PROJECT SITE ALTERNATIVES ANALYSIS 8-1
   8.1.1 Analysis of Karachi Port for Transshipment of Coal to Sahiwal 8-2
   8.1.2 Analysis of Port Qasim for Transshipment of Coal to Sahiwal 8-2
8.2 PROJECT TECHNOLOGY ALTERNATIVES ANALYSIS 8-4

9.0 ENVIRONMENTAL IMPACTS AND MITIGATIONS

9.1 INTRODUCTION 9-1
9.2 IMPACT ASSESSMENT METHODOLOGY 9-2
   9.2.1 Definition of the Criteria for Determining Significance 9-2
9.3 ENVIRONMENTAL IMPACTS ASSOCIATED WITH CONSTRUCTION AND OPERATIONAL ACTIVITIES 9-4
   9.3.1 Impact on Physical Resources 9-4
   9.3.2 Impact on Environmental Resources 9-7
   9.3.3 Impact on Ecological Resources 9-13
   9.3.4 Impact on Human Environment 9-16
   9.3.5 Socio Economics 9-18
   9.3.6 Waste Disposal 9-19

10.0 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

10.1 PURPOSE AND OBJECTIVES 10-1
10.2 APPROACH 10-1

11.0 CONCLUSION
ANNEXURE

I- Chemical Analysis Reports
   a) Sea Water
   b) Drinking Water

II- Microbiological Analysis Report
   a) Drinking Water

III- Ambient Air Quality Reports
   a) Sampling Point-1
   b) Sampling Point-2
   c) Sampling Point-3
   d) Sampling Point-4
   e) Sampling Point-5
   f) Sampling Point-6
   g) Sampling Point-7

IV- Air Dispersion Modeling Report

V- List of References
# LIST OF EXHIBITS

## Chapter: 1 INTRODUCTION

**Exhibit 1.1:** Proposed Project Site Map  

## Chapter: 2 PROJECT DESCRIPTION

**Exhibit 2.1:** Proposed Project Location Map  
**Exhibit 2.2:** Existing Railway Track Route from Karachi to Sahiwal  
**Exhibit 2.3:** Chaudary Javed Hotel to Be Dismantled At Berth 4  
**Exhibit 2.4:** Store House to Be Demolished At Berth 4  
**Exhibit 2.5:** Model Simulation for the Construction of Office, Control Tower, Generator House and Workshops.  
**Exhibit 2.6:** Mobile Hoppers Layout  
**Exhibit 2.7:** Flow Diagram of Belt Conveyor Material Transfer Process  
**Exhibit 2.8:** Conveyor Belts Simulation Model  
**Exhibit 2.9:** Simulation Model of the Bucket Stacker-Reclaimer  
**Exhibit 2.10:** Layout of the Bucket Stacker-Reclaimer  
**Exhibit 2.11:** Conveyor Steel Trestle  
**Exhibit 2.12:** Steel Transfer Tower  
**Exhibit 2.13:** Rapid Loading Station  
**Exhibit 2.14:** Airflow diagram of wind or dust control net  
**Exhibit 2.15:** Simulation Model of Wind Proof Shield  
**Exhibit 2.16:** Represents Sample of Wind Proof Plates Accordingly
Chapter: 4  PHYSICAL ENVIRONMENT

Exhibit 4.1:  The Topographic Elevation Map of the proposed Project Area  4-2
Exhibit 4.2:  Graphical Representation of Land Cover Pattern of Karachi  4-3
Exhibit 4.3:  Graphical Representation of the Land Cover Pattern of the Proposed Project Area  4-4
Exhibit 4.4:  Land use Pattern in Close Proximity of the Proposed Project Area  4-5
Exhibit 4.5:  Geology of Proposed Project Area  4-6
Exhibit 4.6:  Tectonics Map of Pakistan  4-7
Exhibit 4.7:  Tectonics of Southern Pakistan  4-8
Exhibit 4.8:  Earthquake Density of Pakistan  4-8
Exhibit 4.9:  Seismic Hazard Map of Pakistan  4-9
Exhibit 4.10:  Historical Tsunamis Generated In the Region (Up To 1945)  4-10
Exhibit 4.11:  Mean Maximum and Minimum Temperature of the Proposed Project Area  4-11
Exhibit 4.12:  Maximum Precipitation (%)  4-12
Exhibit 4.13:  Relative Humidity  4-13
Exhibit 4.14:  Average Wind Speed  4-14
Exhibit 4.15:  Average Wind Directions  4-14
Exhibit 4.16:  Ambient Air Monitoring Points in the Study Area  4-15
Exhibit 4.17:  Ambient Air Quality Monitoring Results of the Project Area  4-16
Exhibit 18:  Drinking Water Chemical Analysis Report  4-18
Exhibit 19:  Drinking Water Microbial Analysis Report  4-19
Exhibit 20:  Sea Water Analysis Report  4-19
Exhibit 21:  Deep Sea Wave Data, For the Southwest Monsoon Months (May to September) Applicable To Pakistan Coast  4-20
Chapter: 5  BIOLOGICAL ENVIRONMENT

Exhibit 5.1:  The Study Area Radius Map  5-3
Exhibit 5.2:  Survey Sampling Stations  5-4
Exhibit 5.3:  Persistent Mangroves with Forest Loss and Gain of Indus Delta from 1973 To 2010  5-6
Exhibit 5.4:  Total Mangrove Cover within the Study Area  5-9
Exhibit 5.5:  Floral Species Observed in PQA  5-11
Exhibit 5.6:  Avifaunal Species of the Project Area  5-14
Exhibit 5.7:  List of Identified Mammals of the Project Area  5-15
Exhibit 5.8:  Benthic Sediments/ Macrofauna Sampling Station Map  5-16
Exhibit 5.9:  Marine Benthic Invertebrate Fauna Observed at 2 Locations in Proximity  5-18
Exhibit 5.10:  Descriptive Statistics of Marine Benthic Fauna at the Sampled Locations  5-18
Exhibit 5.11:  Distribution of MBI at the Sampled Locations  5-19
Exhibit 5.12:  Shannon Weiner Biodiversity Index Calculated For the 2 Sampled Locations  5-20
Exhibit 5.13:  Pictorial Profile of the Biodiversity Survey Team  5-23

Chapter: 6  SOCIO-ECONOMIC & CULTURAL ENVIRONMENT

Exhibit 6.1:  Administrative Setup of the Proposed Project Area  6-2
Exhibit 6.2:  The Business Activities of the Project Area  6-4
Exhibit 6.3:  Pictorial Profile of the Fishing Communities nearby the Proposed Project Area  6-5
Exhibit 6.4:  Educational Facilities of the Proposed Project Area  6-8
Exhibit 6.5:  Health Care Facilities of the Proposed Project Area  6-9
Exhibit 6.6:  Spiritual Affiliations of the Proposed Project Area  6-10
Exhibit 6.7:  Socioeconomic Features of the Proposed Project Area  6-11
Chapter: 7 STAKEHOLDER CONSULTATION

Exhibit 7.1: List of Identified and Consulted Stakeholders 7-2

Chapter: 8 ALTERNATIVES

Exhibit 8.1: Annual Coal Consumption of Sahiwal Power Plants 8-1
Exhibit 8.2: The Current Allocated Terminals at PQA 8-2
Exhibit 8.3: Available Berths for Coal Transshipment Project 8-3
Exhibit 8.4: Recommended Alternative for Coal Dust suppression 8-4

Chapter: 9 ENVIRONMENTAL IMPACTS AND MITIGATIONS

Exhibit 9.1: Scoring Criteria for Impact Assessment Matrix 9-21
Exhibit 9.2: Impact Assessment Matrix 9-22

Chapter: 10 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

Exhibit 10.1: Environmental Management Plan 10-2
Exhibit 10.2: Environmental Monitoring Plan 10-8
1.1 BACKGROUND INFORMATION

This report discusses the Environmental and Socio-economic Impact Assessment of the proposed Coal Transshipment Project at Berth No 3 & 4 at Marginal Wharf of Karachi Port Qasim. The proposed project scope includes conversion of existing Berth No 3 & 4 into the most advanced specialized coal wharf. The Wharf will be used for unloading imported coal, stacking and supply to 2 X 660 MW Coal fired power plant at Sahiwal. However it is important to note that the main proposed design/project scope includes:

- Wharf repair including front wall and fenders
- Conveying system and loading system process
- Conveying equipment and loading station equipment
- Wind proof dust suppression
- Washing and firefighting system
- All civil works such as bulldozer store house, firefighting room, generator room and office building etc.

1.2 PROJECT AREA

The proposed project is located at Port Qasim. The site location map of the proposed project has been presented below as Exhibit 1.1.
Exhibit 1.1: Proposed Project Site Map
1.3 CATEGORIZATION OF THE PROPOSED PROJECT

The proposed project falls under the project category of Schedule II: “Ports and Harbor Development” as per the guidelines issued by the Sindh Environmental Protection Agency (SEPA) under the SEPA ACT, 2014. According to these guidelines, project under this category require an EIA to be conducted at planning stage.

1.4 PROPONENT’S INTRODUCTION

This proposed project will be developed by Huaneng Fuyun Port & Shipping Pvt. Ltd, this company is a joint venture of Huaneng Shandong Ruyi (Pakistan) Energy (Pvt.) limited (hereinafter HSRE) and Qingdao Old Captain Shipping Company limited (hereinafter OCSC). HSRE is the consortium company of Huaneng Shandong Power Generation Co., Ltd. and Shandong Ruyi Science Technology Group Co. It is the investor of Sahiwal 2x660MW Coal-fired Power Plant. OCSC is a professional maritime transport system supplier. Business sections include shipping, port terminal, ship-supporting, land transportation, ocean engineering.

1.5 PURPOSE OF THE STUDY

Purpose of this EIA study is to evaluate the proposed project activities against national and international standards and environmental guidelines, such as those of the International Finance Cooperation (IFC).

The specific objectives of this EIA are to:

- Assess the existing environmental conditions in the project area, including the identification of environmentally sensitive areas and receptors;

- Assess the various activities to identify their potential impacts on environment, evaluate these impacts, and determine their significance;

- Propose appropriate mitigation measures that can be incorporated into the rehabilitation plans of the project to minimize damaging effects or lasting negative consequences if identified during the environmental assessment;

- Assess the proposed activities and determine whether they comply with the relevant environmental regulations in Sindh;

- Prepare an EIA report for submission to the Sindh Environmental Protection Agency (SEPA).
1.6 **SCOPE OF THE STUDY**

For this EIA study, the scope of work is as under:

- Organization of physical, biological socioeconomic and cultural baseline of the proposed project area;
- Stakeholder consultations/scoping meetings
- Analysis of alternatives
- Project impact identification, prediction, and significance based on project activities.
- Identification and assessment of the workability of mitigation measures to offset or minimize negative project impacts on environment.

1.7 **APPROACH AND METHODOLOGY**

This EIA was performed in five main phases which are described below.

1.7.1 **Scoping**

The key activities of this phase included:

**Project Data Compilation**: A generic description of the proposed activities, within the project area relevant to environmental assessment, was compiled with the help of EPA Guidelines.

**Literature Review**: Secondary data on weather, soil, water resources, and wildlife vegetation was reviewed and compiled.

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

**Stakeholder Consultations/Scoping meetings**: Primary and secondary stakeholders were identified and a generic description of the proposed project was shared with them accordingly, to record their concerns and identify the potential environmental and social impacts of the proposed project.

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

1.7.2 **Baseline Studies**

Following the scoping exercise, the 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
• Public services
• Sites of archaeological or cultural importance.

The following specific studies were conducted as part of the EIA.

**Biodiversity Study:** Biodiversity experts conducted the biodiversity study, which consisted of a thorough literature review and field data collection. As part of the floral and faunal study, random sampling was conducted and the area’s floral and faunal species were documented. The diversity of avian, large and small mammals, and reptile species was determined. Information was collected on the species found in the area.

**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.

**Socioeconomic Study:** A Socioeconomic experts conducted socioeconomic and cultural study in the proposed project area. The study team through participatory technique collected data from the locals of the proposed project area. 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, employment, distribution of income, goods and services, public health, local religious and cultural values, and local customs, aspirations, and attitudes.

### 1.7.3 Impact Assessment

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

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

Wherever possible and applicable, the discussion covers the following aspects:

- The present baseline conditions;
1.7.4 Documentation

At the end of the assessment, an EIA report was prepared according to the relevant guidelines. This report includes the findings of the assessment, project impacts, and mitigation measures to be implemented during the execution of the proposed activities.

Components of this Report are:

Chapter: 1 Introduction
Chapter: 2 Project Description
Chapter: 3 Institutional, Legislation and policy framework
Chapter: 4 Physical Environment
Chapter: 5 Biological Environment
Chapter: 6 Socio-Economic and Cultural Environment
Chapter: 7 Alternatives
Chapter: 8 Environmental Impacts Assessment & Environmental Management Plans
Chapter: 9 Conclusion

• The change in environmental parameters likely to be effected by project related activities;
• Identification of potential impacts;
• Likelihood and significance of potential impacts;
• Mitigation measures to reduce impacts to as low as possible;
• 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 practice elsewhere has been referred to);
  o Implementation of mitigation measures (i.e., environmental management);
  o Determination of residual impacts;
  o Identification of controls and monitoring of residual impacts.
### 1.8 EIA STUDY TEAM

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Dr. Sami uz Zaman</td>
<td>Team Leader</td>
</tr>
<tr>
<td>2.</td>
<td>Dr. Syed Najam Khurshid</td>
<td>Technical Adviser</td>
</tr>
<tr>
<td>3.</td>
<td>Mr. Saleem uz Zaman</td>
<td>Project Manager</td>
</tr>
<tr>
<td>4.</td>
<td>Mr. Jibran Khalid</td>
<td>Project Coordinator</td>
</tr>
<tr>
<td>5.</td>
<td>Mr. Shahid Lutfi</td>
<td>EIA Expert/Study Advisor</td>
</tr>
<tr>
<td>6.</td>
<td>Dr. Shahid Amjad</td>
<td>Oceanographic/Marine Biology &amp; Impact Mitigation Expert</td>
</tr>
<tr>
<td>7.</td>
<td>Mr. Rafi ul Haq</td>
<td>Biodiversity Expert</td>
</tr>
<tr>
<td>8.</td>
<td>Mr. Zahid Raza</td>
<td>Coal Waste Management Expert</td>
</tr>
<tr>
<td>9.</td>
<td>Dr. Ishratullah Sidiqui</td>
<td>Air Quality Monitoring Expert</td>
</tr>
<tr>
<td>10.</td>
<td>Dr. M. Mansha</td>
<td>Air Dispersion Modeling Advisor</td>
</tr>
<tr>
<td>11.</td>
<td>Ms. Sadia Asghar</td>
<td>Air Dispersion Modeling Expert</td>
</tr>
<tr>
<td>12.</td>
<td>Mr. Hafiz Baseer Khan</td>
<td>Socioeconomic / Stakeholder Consultations Expert</td>
</tr>
<tr>
<td>14.</td>
<td>Eng. Kashif Noor</td>
<td>Environmental Engineer</td>
</tr>
<tr>
<td>15.</td>
<td>Mr. Ali Aslam</td>
<td>Environmental Monitoring Expert</td>
</tr>
<tr>
<td>16.</td>
<td>Mr. Abdul Basit Khan</td>
<td>Sr. Environmentalist</td>
</tr>
<tr>
<td>17.</td>
<td>Mr. Sikandar Ali</td>
<td>Environmentalist</td>
</tr>
<tr>
<td>18.</td>
<td>Mr. Karim Akbar</td>
<td>GIS/Mapping Expert</td>
</tr>
</tbody>
</table>
2.1 LOCATION OF THE PROPOSED PROJECT

The proposed project is located at the eastern side of Karachi Pakistan at its inland water, about 35 Kilometers from Karachi, at Berth 3 & 4 which lies in the jurisdiction of Port Qasim Authority. The project site location maps is presented below as Exhibit 2.1.

2.2 NEED AND SIGNIFICANCE OF THE PROPOSED PROJECT

The energy concerns of the country are now assuming serious and terrible proportions possessing to the fact that the country has been distressed by energy crisis for about half a decade thus a major bottleneck in economic development and progress. It is important to note that the internal stability of any country is highly dependent on its economic well-being, which is directly dependent upon energy resources and proper management of them. The current energy deficit has resulted in reduced efficiency of several industrial units hence rendering a large number of people unemployed the current energy deficit not only resulted in unemployment but the malfunctioning energy sector had resulted in a 4 percent loss in the GDP annually (Solutions for Energy Crisis in Pakistan, Vol II, 2014)\(^1\).

In this regard government of Pakistan has taken some tangible steps and is currently engaged in development of power projects, across the country. The proposed project is expected to support the domestic energy demand in Pakistan by coal supply from Berth 3 & 4 of Port Qasim all the way towards the 2 X 660 MW Coal fired power plants at Sahiwal. The existing railway track route from Karachi to Sahiwal is presented below as Exhibit 2.2.

---

Exhibit 2.1: Proposed Project Location Map
Exhibit 2.2: Existing Railway Track Route from Karachi to Sahiwal
Existing Route of Sahiwal Power Plant
2.3 BRIEF DESCRIPTION & SCHEDULE OF THE PROPOSED PROJECT

The proposed project is basically conversion of existing berth 3 & 4 of Port Qasim into the most advanced and specialized coal handlings/transshipment berths. The difference between current coal handling practices and the proposed project is presented below.

<table>
<thead>
<tr>
<th>Current Coal Handling Practices</th>
<th>Proposed Coal Handling Project</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Current Coal Handling Practices Image" /></td>
<td><img src="image2" alt="Proposed Coal Handling Project Image" /></td>
</tr>
</tbody>
</table>

The proposed project is expected to be operational soon after 10 to 12 months after receiving NOC (No Objection Certificate) from SEPA (Sindh Environmental Protection Agency).

The proposed project will be designed according to capacity the existing wharf capacity, and the details are as below:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Annual capacity:</strong></td>
<td>400 x 10^4t, 1500 x 10^4t (in future)</td>
</tr>
<tr>
<td><strong>Conveying material</strong></td>
<td>Coal</td>
</tr>
<tr>
<td><strong>Ship type:</strong></td>
<td>30000t self-unloading ship</td>
</tr>
<tr>
<td><strong>Ship preparing and mooring time:</strong></td>
<td>2000tons per hour (t/h)</td>
</tr>
<tr>
<td><strong>Working days per year</strong></td>
<td>315</td>
</tr>
<tr>
<td><strong>Working shift</strong></td>
<td>3 shift per day, 8h/shift, (One shift for maintenance).</td>
</tr>
</tbody>
</table>
Considering one ship is on berth, the annual ship unloading capacity will be:
2000 tons per hour (t/h) x 16h x315 D = 1008x 104tons /year

So, the proposed project can meet 400 dead weight tons (DWT) wharf capacity, and at the same time a reserve position on the wharf front wall, can add 1000t/h ship unloading in the future. The wharf annual capacity will be 3000 tons per hour (t/h) x 16hx 315D=1.512x 107tons/year (15.12 million tons per annum mpta)

2.4 TECHNICAL DESCRIPTION OF THE PROPOSED PROJECT

Scope and design of the proposed project includes:

2.4.1 Demolition and clearing of existing shed and other structures on the berths

At present there are few structures available at berth 3 & 4 which has to be dismantled/ demolished these structures includes existing store house and local hotel for dock laborers. Pictorial presentation of structures to be dismantled/ demolished are presented below as Exhibit 2.3 and Exhibit 2.4 respectively.

Exhibit 2.3: Chaudary Javed Hotel to Be Dismantled At Berth 4
Exhibit 2.4: Store House to Be Demolished At Berth 4

2.5 REPAIR/RENOVATION OF THE QUAY WALL STRUCTURE AND YARD PAVEMENT

At present wharf apron of berth 3 & 4 is damaged seriously, front wall and fender have to be repaired. Additionally it is important to note that the apron and deck of berth 3 & 4 is of asphalt which shall be renovated as well.

2.6 CONSTRUCTION OF OFFICE BUILDING, CONTROL TOWER, GENERATOR HOUSE AND WORKSHOPS

The construction works will mainly include:
- Fuel oil tank
- Generator room
- Power room
- Coal pusher station
- Warehouse
- Fire water pump house

Exhibit 2.5 represents the model simulation of the construction of office, control tower, generator house and workshops etc.
Exhibit 2.5: Model Simulation for the Construction of Office, Control Tower, Generator House and Workshops.
2.7 PROVISION AND INSTALLATION OF COAL UNLOADING HOPPERS, CONVEYOR BELTS AND RE-CLAIMERS

2.7.1 Mobile Hoppers Details:

Mobile hoppers will be arranged on dock belt conveyor BC-1 (Belt Conveyor 1) to receive materials discharged from the self-discharging ships. 4 Mobile hoppers with volume of 40 m^3 will be arranged on the dock to assist self-discharging ships and ship un-loader to discharge ships. Ship un-loaders will be equipped later. The Mobile hoppers will be capable of receiving materials from the ship crane grab buckets of self-discharging ships, with ship crane grab bucket volume of 24.8m3/bucket. In order to guarantee even material feeding of mobile hoppers, each of them will be equipped with one set of vibrator feeder beneath them with capacity adjustable between 500 to 1000 t/h(tons per hour). In this way, material discharged into the mobile hoppers will be evenly transferred onto the BC 1 (Belt Conveyor 1) through vibrator feeders.

Exhibit 2.6: Mobile Hoppers Layout

2.7.2 Conveyor Belt Details:

In this proposed project 5 conveyor belts are proposed having width B= 1800 mm, V =2.8 m/s, rated capacity of 2500 t/h (max capacity of 3000 t/h). According to field arrangement, these conveyor belts are numbered respectively as BC1, BC2, BC3, BC4 and BC5.

Where,
B= Breath
V= Velocity
BC= Belt Conveyor

BC1 will be arranged at the dock on the ground to receive materials from self-discharging ships. At the head part, it will be lifted up by steel trestle into machine...
room TT1 (Transfer Tower), where materials will be transferred onto BC2. Belt conveyor BC3 will be arranged at storage yard, with head at machine TT2 and tail at TT3. BC3 will be equipped with a 2-working-position telescopic head at the head part. Belt conveyor BC4 will be connected with TT2 and TT4, and can transfer materials from the dock or storage yard to TT4. Belt conveyor BC4 stretches out of storage yard across the road leading to the container wharf, so BC4 will be elevated by steel trestle. Belt conveyor BC5 will be connected with TT4 and the wagon loading building. It will be arranged above the wagon loading auxiliary railway and will be elevated or the whole length by steel trestle. Its head climbs to the top of the wagon loading building to feed materials for the loading building. Exhibit 2.7 is flow diagram of belt conveyor material transfer process.
Exhibit 2.7: Flow Diagram of Belt Conveyor Material Transfer Process
**Exhibit 2.8:** Conveyor Belts Simulation Model
2.7.3 Re-Claimers

The capacity of bucket wheel stacker-reclaimer will be selected in consistent with that of belt conveyor system; with rated capacity 2500 t/h, max capacity 3000t/h. Luffing angle of the tail carriage shall be variable. When the tail carriage lifts up, it feeds materials to cantilever belt conveyor; when it falls down, it received materials from cantilever belt conveyor. It also can run in reverse cooperating with the main belt conveyor to realize material stacking and reclaiming. Exhibit 2.9 is the simulation model of the bucket stacker-reclaimer and Exhibit 2.10 is the layout of the same.

Exhibit 2.9: Simulation Model of the Bucket Stacker-Reclaimer

Exhibit 2.10: Layout of the Bucket Stacker-Reclaimer
2.7.4 Re-Claimers Capacity Details

Considering the time difference, the system is to consist of stockpile and stacker/re-claimer. Stacker/re-claimer capacity conforms to system capacity which is 2500t/h (max 3000t/h). Stockpile capacity is 200 thousand tons, means 5 days' coal unloading quantity.

2.7.5 Train Loading Capacity Details

Current capacity of train loading station is max 5000t/h and depends on the conveyor feeding capacity and train outgoing capacity. Train loading operation is for 315 days/year, 16 hours/day. Conveyor feeding max capacity is 3000t/h. Whole train consisting of 40 units of 60-ton wagon. Fully loading one whole train will take 58 minutes. Train loading station will be designed for dual loading. One train can be loaded while another train is changing the track. It will increase the loading efficiency. In order to reach 15 million tons per annum, there will be 20 trains to be loaded per day it requires improved train system to meet the requirement.

2.8 BC 1-5 CONVEYOR STEEL TRESTLE

According to the proposed design there will be two rapid loading stations/systems which can work at the same time at the preliminary stage one rapid loading system will be used to railway 3, 4 and loading silo will reserve one loading station/system for railway 1, 2 and loading silo. Exhibit 2.11 illustrates conveyor steel trestle.

Exhibit 2.11: Conveyor Steel Trestle
2.9 TRANSFER TOWER AND LOADING STATION

Steel structure supporting frame, checkered plate on floor, one layer corrugated steel wall and roof with day lighting panel. Exhibit 2.13 Steel transfer tower and Exhibit 2.13 Rapid Loading Station

Exhibit 2.12: Steel Transfer Tower

Exhibit 2.13: Rapid Loading Station

2.10 STORAGE YARD

The capacity of storage yard is determined and is based on the operating time difference between ship unloading and wagon loading. The storage yard shall be accessible so that to directly load the wagon without coal falling onto ground. The equipment for the storage yard shall be selected from simple equipment with high efficiency and high performance cost ratio. Working system for operation in storage yard.
2.10.1 Storage Yard Capacity Details:

The capacity of the storage yard shall be determined based on system conveying capacity between the operating time difference of ship unloading and wagon loading. The annual operation day quantity of wagon loading is temporarily determined as 315 days/year. Considering the time difference between ship unloading and wagon loading, some material needs to be transferred to storage yard. Due to limited area of storage yard, the design volume of storage yard is about 200,000 tons. The storage yard is temporarily designed based on 5 days of ship unloading capacity, namely:

Days x 16 hoursx2500 t/h: =:200,000 tons.

2.11 CENTRALIZED CONTROL ROOM

This centralized control room will be capable of controlling the whole system from movable hoppers to material loading train terminal and reserve interface. It is divided into three flow paths:

- Discharge-loading flow
- Discharge-stacking flow
- Reclaim-loading flow

2.12 SHIPING PROCESS INTRODUCTION

Ocean shipping should be arrived to abyssal zone and transship on 30000t self-unloading ship, then conveying coal to the berth. Considering that there will be very little time left from the date of signing of Agreement for TOC to install a set of effective unloading system proponent intends to use another effective system to start the operation. The system includes several transfer vessels which will be equipped with heavy cranes (up to 100 metric tons) on board and capsize vessel. The transfer vessels will have the ability to discharge coal by her own heavy cranes from cape size vessel at outer anchorage and then transship the cargo to berth N0.3 & 4. In Exhibit 2.7 flow diagram of the entire process of belt conveyor material transfer has been shown previously.

2.13 SUMMARY OF THE ENTIRE DEVELOPMENT

2.13.1 Shipping System:

Ocean shipping (18xJ04t) cannot arrive at the wharf, it is to transship, so the 30,000t self-unloading ship can arrive at the wharf, there are four cranes in the ship, the ship unloading capacity: 2000t/h.
2.13.2 Wharf System:

There are four mobile hoppers to receive material from self-unloading ship, there is rated feeding equipment under the mobile hopper to ensure material is conveyed uniformly; at the same a space has been reserved for application in the future.

2.13.3 Yard Convey and Storing System:

The system includes mobile hoppers, conveyor systems and bucket stackers & reclaiming which can fulfill material unload, stack and reclaim. There is a windproof shield wall around the yard to reduce coal dust pollution effectively.

2.13.4 Generator Set:

Two working and one as standby, 300m³ oil tank for generator set and substation which ensures system normal operation.

2.13.5 Control System:

It is an intelligent control mode, all equipment can be controlled locally or by remote, and mutual switchover, remote control is fulfilled in centralized control room, to monitor all equipment and key position.

2.13.6 Water Supply and Drainage System:

It includes reservoir, pump room, slurry settling pond and there is auto-spraying system to suppress dust pollution.

2.13.7 Management System:

There are to be office building and maintenance workshop in field region. There are fencing wall and guard room for providing safe working environment.

2.13.8 System Operational Process

The operation of the system is designed for 3 kinds of operational process:

- Discharging Stacking Process
- Reclaiming-Loading Process
- Discharging-Loading Process
2.14 ENVIRONMENTAL HEALTH AND SAFETY CONSIDERATIONS IN THE DESIGN PHASE

2.14.1 Wind Proof Dust Suppression Shield

The wind proof dust suppression shield will be constructed by metal material after mechanical combination punching mold, pressing, plastic spraying. It is processed in certain geometric shape open hole ration and different hole shape combined windproof shield wall, make circulation of air through the wall from the outside and interference of air flow inside of shield wall to achieve weak wind inside when big wind on outer side of wall presents dust float in the sky. It has some advantages such as:

- High strength
- Good toughness
- Bending resistance
- Anti-aging
- Flame retardant
- Temperature resistant
- Acid and Alkali resistance

The mechanism of prevention is that it can control and improve the airflow field, which reduce the wind speed and turbulence intensity in the yard. As strong winds going through the net only small portion of winds reserved and the kinetic energy decreased into low speed flow. Meanwhile, winds that pass though will change from large scale and high strength vortex to small and weak swirling strength. The remaining low speed and weak turbulence intensity winds that across the yard tend to form low wind speed gradient, low wind speed curl, weak vortices and weak turbulence flow field which reduce dust quantity in lower yard dramatically. From the principle of aerodynamics, whenever winds go through the net two phenomena which contains separation and adhesion will occur behind the net. It forms upper and lower interference airflow that reduces wind speed and makes a great losses to the wind kinetic energy, turbulivity and vortex. It also reduces the shear stress and pressure on the material pile surface. Airflow diagram of wind or dust control net is presented below as Exhibit 2.14. Exhibit 2.15 is simulation model of wind proof shield and Exhibit 2.16 represents sample of wind proof plates accordingly.
Exhibit 2.14: Airflow diagram of wind or dust control net

Exhibit 2.15: Simulation Model of Wind Proof Shield
**Exhibit 2.16:** Represents Sample of Wind Proof Plates Accordingly

---

### 2.14.2 Washing and Fire Fighting

There will be washing facilities on loading station and bucket wheel stacker & reclaimed on coal yard. The washed wastewater will be conveyed to the settling pond through pumps, the waste water should be extracted to existing underground water system and the slush will be reclaimed at the regular intervals.

An independent fire water supply system will be installed which will be connected with port water supply system. Indoor fire hydrants will be installed in every transfer tower and fire separation curtains between transfer tower and trestle and outdoor fire hydrants in working area, sprinklers system will be installed in office buildings and gas firefighting system in key electrical equipment and water sprinkler system in diesel generator room.

### 2.14.3 Coal Suppression

In order to suppress coal and reduce probability of auto ignition, water spraying devices around coal yard and bucket stacker & reclaimer will be installed. Following mechanisms will be utilized to suppress the coal:

- The water auto-spraying will run when the bucket stacker works
- There will be alumina silicate fiber seal between chute pipes connection, two level seals before guiding chute and complex skirt seal system on both sides of skirt board
- There will be dust suppression device on head hopper of conveyor and exits of guide chute
- There will be front tilt idlers preventing roll running deviation

There will be water spray system around coal yard to keep humidity on the surface of the pile to prevent the dust float in the sky.
The EIA of the proposed project will be subjected to the pertinent legislative and regulatory requirements of the Government of Pakistan including State laws. The success of environmental assessment is a mean of ensuring that development projects are environmentally sound and sustainable depending upon the capability of regulatory institutions for environmental management. The institutional framework for decision-making and policy formulation in environmental and conservation issues is briefly described below. However it is important to note that departments such as Department of Environment, Climate change and Coastal Development, Forest and Wildlife department are newly formed departments of Government of Sindh and SEPA (Sindh Environmental Protection Agency) operated under these departments.

SEPA is basically monitoring and regulating agency with the following functions:

- Enforcement of PEPA, ACT 1997 till the approval of SEPA, ACT 2014
  Enforcement of NEQS and now enforcement of SEQS from 2016
- Implementation of Self-Monitoring and Reporting Tool (SMART)
- Review of EIAs and IEEs
- Providing advice to the government on issues related to environment
- Coordination of pollution prevention and abatement measures between government and non-governmental organizations
- Assistance to provincial and local governments in implementation of schemes for proper disposal of wastes to ensure compliance with SEQS
- Undertake measures to enhance awareness on environment among general public
- Conduct research and studies on different environmental issues
- Attend to public complaints on environmental issues.
- Carry out any other task related to environment assigned by the government.

It is important to note that SEPA will be responsible for the review and approval of EIA of the proposed project. This chapter of the report presents a synopsis of environmental policies, legislation and other guidelines which are described below that have relevance to the proposed project.
3.1 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. The following section presents a brief overview of the existing national policies, legislation and guidelines.

3.1.1 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 NCS in 2000 concluded that achievements under NCS have been primarily awareness raising and institutional building rather than actual improvement to environment and natural resources and that NCS was not designed and is not adequately focused as a national sustainable development strategy (Arthur. J., Hanson. et. al., Pakistan’s National Conservation Strategy Renewing, Commitment to Action., Report of the Mid-Term Review, 2000). 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 National Environmental Action Plan 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 for the people of Pakistan.

A National Environmental Policy has been approved by the Federal Cabinet in its meeting held during June 2005 (National. Environmental. Policy., GoP., 2005). This

1 https://www.iucn.org/downloads/pakistan_ncs_mid_review.pdf
2 http://www.mocc.gov.pk/gop/index.php?q=aHR0cDovLzE5Mi4xNjguNzAuMTM2L21vY2xjL3VzZXJmaWxlczEvZmlsZS9NT0MvTmF0aW9uYWxvbnZmc29ibWVudGFsaW55MjAxNzRuNSsuZGY%3D
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;
- Forestry;
- Biodiversity and Protected Areas;
- Climate Change and Ozone Depletion;
- Energy Efficiency and Renewable;
- Agriculture and Livestock;
- Multilateral Environmental Agreements.

3.1.2 Sindh Environmental Protection Act 2014

The Sindh Environmental Protection Act, 2014 (SEPA 2014) is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The SEPA 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 SEPA and adherence with (SEQS).

3.1.3 Approval from Sindh Environment Protection Agency

As per the 2014 Regulations, Proponent will submit an EIA report for their project activities to SEPA and seek approval on the same from the agency. Ten hard copies and 2 soft copies of the EIA report will be submitted to SEPA. It will then grant its decision on the EIA as per the rules and procedures set out in the 2014 Regulations. The following rules will apply:

- A fee is payable to SEPA for review of the EIA;
- The EIA submission is to be accompanied by an application in the format prescribed in Schedule V of the 2014 Regulations;
- SEPA is bound to conduct a preliminary scrutiny and reply within four weeks of the submission of the report a) confirming completeness, or b) asking for additional information, if needed;
• The proponent will publish a public notice in any English or Urdu national newspaper and in a local newspaper of general circulation in the area affected by the project. The public notice will mention the following:
  o The type of project;
  o The location of the project;
  o The name and address of the proponent;
  o The places at which the EIA can be accessed;
  o The date, time and place for public hearing of any comments on the project or its EIA;
• The date set for public hearing will not be earlier than fifteen (15) days from the date of publication of the public notice
• In the review process SEPA may consult a Committee of Experts, which maybe constituted on the request of the DG SEPA;
• On completion of the review process, the decision of SEPA will be communicated to the proponent in the form prescribed in Schedule V;
• Where an EIA is approved, SEPA can impose additional controls as part of the conditions of approval;
• SEPA is required to make every effort to complete the EIA review process within four months;
• The approval will remain valid for the project duration mentioned in the EIA but on the condition that the project commences within a period of three years from the date of approval. If the project is initiated after three years from approval date, the proponent will have to apply for an extension in the validity period. The SEPA on receiving such request grant extension (not exceeding 3 years at a time) or require the proponent to submit a fresh EIA if in the opinion of SEPA changes in baseline conditions or the project so warrant;
• After receiving approval from SEPA the proponent will acknowledge acceptance of the conditions of approval by executing an undertaking in the form prescribed in Schedule VI of the 2014 Regulations;
• The 2014 Regulations also require proponents to obtain from SEPA, after completion of the project, a confirmation that the requirements of the EIA and the conditions of approval have been duly complied with;
• The SEPA in granting the confirmation of compliance may impose any additional control regarding the environmental management of the project or the operation, as it deems necessary.
3.1.4 Sindh Environmental Protection Agency Review of IEE and EIA Regulations, 2014

The SEPA of IEE and EIA Regulations, 2014 (The 2014 Regulations) promulgated under SEPA 2014 were enforced on December 2014. The 2014 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 the SEPA in 2014.

The Regulation classifies projects based on expected degree of adverse environmental impacts and lists them in three 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 (www.ilo.org,2014)³.

This project falls under the following category:

Schedule II (EIA):

Category E Transport

“Ports and Harbor Development”

3.1.5 The Sindh Environmental Quality Standards

During the construction and post development phase of the project SEQS will be applied to all effluents, gaseous emissions and Noise generation. SEQS for municipal and industrial effluents, selected gaseous pollutants from industrial sources and motor vehicle exhaust and noise have been annexed as Annexure I of this report. (Library-SEPA⁴, 2016).

3.1.6 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.

⁴ Library, Sindh Environmental Protection Agency, 2016
### 3.1.7 Port Qasim Authority Act, 1973

This Act provides for the establishment of the Port Qasim Authority, defines its functions, powers and internal organization and lays down rules relative to management of and navigation in marine ports and inland waterways ports. The particular sections applicable to the Project are:

- **Section 71(B) (2)** No Owner, Agent or Master of a vessel, or any industry, manufacturing establishment, mill, factory or any kind, cargo handling company, terminal operator, etc., shall discharge any solid or liquid, waste, oily, noxious radioactive and hazardous substances, bilge discharges, residues and mixtures containing noxious solid and liquid wastes, de-blasting of un-washed cargo tanks and line washing, garbage, emission of any effluent or waste or air pollution or noise in any amount concentration or level in excess of the National Environmental Quality Standards, or standards, which may be specified, from time to time, by the Authority for Port limits.

- **Section 71(B) (3)** Any person contravening the provisions of sub-section (2) shall be liable to penalty as determined and notified by the authority from time to time for each contravention in addition to the charges for cleaning of the Port and removal of pollution therefrom.

- **Section 71 (C) (1)** No proponent of a project shall commence construction or operation unless he has filed with this Authority as initial environmental examination or, where the project is likely to cause an adverse environmental effect, an environment impact assessment, and has obtained from the authority approval in respect thereof.

- **Section 71 (C) (2)** The Authority shall: - (a) review the initial environmental examination and accord its approval, or required submission of an Environmental Impact Assessment by the proponent; or (b) review the Environmental Impact Assessment and accord its approval subject to such condition as it may deem fit to impose, or require that the Environment Impact Assessment be re-submitted after such modification as may be stipulated (pqa.gov.pk,2016)

### 3.1.8 Pakistan Penal Code (1860)

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

---

3.1.9 The Antiquities Act, 1975

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

Under the Act, the project proponents are obligated to:

- Ensure that no activity is undertaken in the proximity of a protected antiquity;
- Report to the Department of Archeology, Government of Pakistan, any archeological discovery made during the course of a project (pakistancode.gov.pk, 2005).

3.1.10 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 (pakistancode.gov.pk, 2005).

3.1.11 Hazardous Substance Rules, 2014

The Sindh Hazardous Substances Rules, 2014 are a set of rules derived from the Sindh Environmental Act, 2014 and are first of the very specific hazardous substances regulations brought into force in 2014 after the initial draft set of rules devised in 2003. They represent specific regulations with aspect of handling, storage and disposal of hazardous substances and issuing an approving license to the user or facility. The Schedule-I of the Rules enlists the hazardous substances that are under the scrutiny of the SEPA (sindhlaws.gov.pk, 2014).

Under its licensing terms, the Rules highlight particular components as follows:

- Employment of Qualified technical personnel;
- Packing and labelling;
- Conditions of Premises;
- Safety precautions;

---

7 http://pakistancode.gov.pk/english/UY2FqaJu1-apaUY2Fqa-bpuUY2Ft-sg-jiiiiiiiiiiiiii11358F
• Trainings;
• A comprehensive safety plan;
• Waste management Plan and
• Transporting of hazardous substances

3.1.12 Sindh Wildlife Protection (Amendment) Act 2008

The Sindh Wildlife Ordinance 1972 empowers the government to declare certain areas reserved for the protection of wildlife and to control activities within these areas. It also provides protection to endangered species of wildlife (faolex.fao.org, 2009)\textsuperscript{10}.

3.1.13 Sindh Forest Act (2012)

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 (sindhforests.gov.pk)\textsuperscript{11}.

3.1.14 Sindh Fisheries Ordinance (1980)

The sindh Fisheries Ordinance, 1980 regulates fishing in the public waters, including the coastal areas, of Sindh. It empowers the government of Sindh to issue licenses for fishing in pubic waters, put restriction on the type of equipment that can be used for fishing, restrict fishing in certain areas or of certain species of fish, regulate the onshore trade of fish catch, and regulate the fish processing industry. Article 8 of the Ordinance prohibits the discharge of wastewater to public waters without the consent of the Director Fisheries (cmsdata.iucn.org, 2000)\textsuperscript{12}.

3.1.15 Highways Safety Ordinance, 2000

This ordinance includes provisions for the licensing and registration of vehicles and construction equipment; maintenance of road vehicles; traffic control, offences, penalties and procedures; and the establishment of a police force for motorways and national highways charged with regulating and controlling traffic on the national highways, and keeping the highways clear of encroachments (nmph.gov.pk, 2000)\textsuperscript{13}.

\textsuperscript{10}http://faolex.fao.org/docs/pdf/pak116151.pdf
\textsuperscript{11}http://sindhforests.gov.pk/admin/MediaLibrary/The%20Sindh%20Forest%20Act%202012%20(Final%20Draft).pdf
3.2 NATIONAL AND INTERNATIONAL GUIDELINES OR STANDARDS

3.2.1 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 (NGOs) (environment.gov.pk, 1997). 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

3.2.2 World Bank Guidelines on Environment

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


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

The Sourcebook identifies a number of areas of concern, which should be addressed during impact assessment. It sets out guidelines for the determination of impacts, provides a checklist of tools to identify possible biodiversity issues and suggests possible mitigation measures. Possible development project impacts on

---

wild lands, wetlands, forests etc. are also identified and mitigation measures suggested.

### 3.2.3 OSHA Standards Health Safety

The Occupational Safety and Health Administration (OSHA) are issuing safety and health program management guidelines for use by employers to prevent occupational injuries and illnesses. The Occupational Safety and Health Act of 1970 (OSHA) representatives have noted a strong correlation between the application of sound management practices in the operation of safety and health programs and a low incidence of occupational injuries and illnesses. Where effective safety and health management is practiced, injury and illness rates are significantly less than rates at comparable worksites where safety and health management is weak or non-existent.

The Occupational Safety and Health Administration (OSHA) have concluded that effective management of worker safety and health protection is a decisive factor in reducing the extent and the severity of work-related injuries and illnesses. Effective management addresses all work-related hazards, including those potential hazards which could result from a change in worksite conditions or practices. It addresses hazards whether or not they are regulated by government standards (osha.gov, 2016).

### 3.3 OBLIGATION UNDER INTERNATIONAL TREATIES

Pakistan is a signatory to various international treaties and conventions on the conservation of the environment and wildlife protection. The country is obliged to adhere to the commitments specified in these treaties list of applicable set of treaties and conventions are presented below:

#### 3.3.1 London Dumping Convention 1972

The London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter was agreed in 1972. The London Convention defines a Black List of toxic substances, the disposal of which, by dumping into the sea, is prohibited, and a Grey List of less hazardous substances that may only be dumped under a prior special permit; the dumping of any other wastes not specified in these lists requires a prior general permit. In 1990, the London Convention was amended to require signatory countries to consider whether an adequate scientific basis exists for assessing the environmental impact of a substance (i.e. dredged material) before issuing a permit for dumping.

---

3.3.2 United Nation Convention on Law of the Sea (UNCLOS-82)

The UN Convention on the Law of the Sea was adopted and opened for signature in 1982. On November 16, 1994, it entered into force for 68 countries. Pakistan is a signatory to the Convention. The Convention establishes a comprehensive framework for use of the ocean and its resources. Its 320 articles, supplemented by nine detailed annexes, specify the rights all nations may exercise in the world oceans and their responsibility to do so with due regards for the rights and interests of other nations. The preservation and protection of the marine Environment and the conservation of marine living resources are fundamental obligations. The Law of the Sea Convention represents the first comprehensive statement of international law on protection and preservation of the marine environment and provides a legal and institutional framework for marine environmental protection and related dispute settlement. It establishes a basic structure of obligations, objectives and principles covering all sources of marine pollution that include Pollution by vessels (operational and accidental discharges from ships); dumping (the deliberate disposal of wastes at sea by ships, aircrafts, platforms, or other manmade structures). The Convention establishes the General Principles for the preservation and protection of the marine environment and identifies the source categories for the prevention, reduction and control of marine pollution. It discusses in detail issues such as response to marine pollution emergencies.
4 PHYSICAL ENVIRONMENT

This section gives the detailed description about the physical environmental condition. The data collected includes the information relating to topography and land use, geology, climate, air and water resources. The information and data presented in this part of the report is based on the surveys conducted by the team of experts and supplemented with the secondary data from published literature and previously conducted studies within the proposed project area. The base line data defines the present physical environmental quality of the proposed project site and adjoining areas.

4.1 TOPOGRAPHY OF THE PROJECT AREA

The city of Karachi has a land area of 3,640 km² and is located on the Arabian Sea coast in the extreme south of Pakistan, the city is located at 24°45” to 25°15” north and 66°37” to 67°37” east. It is bounded by Dadu District in the northeast, Thatta District in the south-east, the Arabian Sea to the south and the Lasbela District of Balochistan Province to the west. However it is important to note that the topography of the study area is quite gentle and its elevation is increasing as we move toward the north. The land bordering the study area has an elevation less than 5 m above the sea level (amsl) while the land in the northern periphery of the study area lies in-between 10 and 60 m amsl. The city of Karachi can be broadly divided into two parts; the hilly areas in the north and west and the coastal area in the south-east. The hilly areas of Karachi are known to be the off-shoots of the Kirthar Range. The highest point of these hills in Karachi is about 528m in the extreme north. These hilly areas are devoid of vegetation and have wide plains, dry river beds and water channels. Karachi has a long coastline in the south. The famous sea beaches include Hawks Bay, Paradise Point, Sands Pit, and Clifton. China Creek and Korangi Creek provide excellent calm water channels for rowing and other water activities. Away from the shoreline are small islands including Shams Pir, Baba and Bhit. Exhibit 4.1 represents the topographic elevation map of the proposed project area.
Exhibit 4.1: The Topographic Elevation Map of the proposed Project Area

Source: Cumulative Impact Assessment for Industrial and Port Developments at Port Qasim, Hagler Bailly Pakistan, 2016
4.2 LAND COVER & LAND USE OF KARACHI AND OF THE PROJECT AREA

The term land cover shows the physical land type on the surface of the earth, whereas, land use describes how the land cover is modified. Land cover include water, snow, grassland, forest, bare soil, etc., whereas, land use are the lands which are being in used such as agricultural land, built up areas, recreation area, wildlife management area, etc. Karachi the largest and the fastest growing urban center of Pakistan offering the most complex set of urban development challenges with a population of 20 million having the annual growth rate of 5% (Pakistan Economic Survey 2013-14).

The proposed project area (port Qasim) lies in the Malir district of Karachi to the south where a major portion (65%) of the notified Area of Port Qasim comprises of saline channels and creeks of the non-active Indus Delta. The remaining portion is occupied largely by mangroves (22%), mudflats and beaches (9%) and other areas (4%) such as industrial, commercial, residential and agriculture. Exhibit 4.2 represents the land cover pattern of Karachi, while Exhibit 4.3 is the graphical representation of the cover pattern of the proposed project area and Exhibit 4.4 represents the land use pattern in close proximity of the proposed project area.

Exhibit 4.2: Graphical Representation of Land Cover Pattern of Karachi

Source: Cumulative Impact Assessment for Industrial and Port Developments at Port Qasim, Hagler Bailly Pakistan, 2016
Exhibit 4.3: Graphical Representation of the Land Cover Pattern of the Proposed Project Area

<table>
<thead>
<tr>
<th>Land Cover and Use Class</th>
<th>Area (Hectares)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial and Commercial Areas</td>
<td>10,210</td>
</tr>
<tr>
<td>Built-up Residential Areas</td>
<td>11,938</td>
</tr>
<tr>
<td>Agricultural Areas</td>
<td>17,130</td>
</tr>
<tr>
<td>Saline Channels and Creeks (Intertidal)</td>
<td>53,765</td>
</tr>
<tr>
<td>Mangroves</td>
<td>35,546</td>
</tr>
<tr>
<td>Mudflats and Beaches</td>
<td>18,915</td>
</tr>
<tr>
<td><strong>Total Study Area</strong></td>
<td><strong>147,504</strong></td>
</tr>
</tbody>
</table>

*Source: Cumulative Impact Assessment for Industrial and Port Developments at Port Qasim, Hagler Bailly Pakistan, 2016*
Exhibit 4.4: Land use Pattern in Close Proximity of the Proposed Project Area

4.3 GEOLOGY OF THE PROPOSED PROJECT AREA

Geology of the local area is underlain a lower Indus basin described as Indus river alluvial early Eocene early deposition of sediments includes silt, sand stone, conglomerate, limestone with low compact and cementing materials. Surface feature describe as syncline delta and valley region and anticline ridges exposed. As stratigraphic description, there are two formations Gazij and Manchar formation dip gently northeast to southeast in offshore (HEC). The coastal region is found to be of tertiary and post-tertiary origin. Blatter et al (1929) dates it as recent as Eocene. The region has been formed by the upheaval of land from the Tethys Sea, which once extended up to the northern border of Pakistan but, gradually withdrew with the rising of the Himalayas. The underlying rocks are mostly of marine origin, highly folded, faulted and fissured everywhere (Sidra et al, 2010 Situation Analysis of Sindh Coast Issues and Options). However it is important to note that lithological units within the study area, and in the region have been extracted from the previous studies within the study area. The quaternary unconsolidated sedimentary sand, silt and gravel deposits are represented as (Qt, Qtx and Qmx) bound fold belts as (Tpm) in Exhibit 4.5 under the heading of Lithology Study within the proposed project area is associated with the southern extension of the Kirthar Range. Within the study area the quaternary unconsolidated deposits are associated with the non-active part of the Indus Delta as well.
Exhibit 4.5: Geology of Proposed Project Area

Source: Cumulative Impact Assessment for Industrial and Port Developments at Port Qasim, Hagler Bailly Pakistan, 2016
4.4 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. This region has the highest rates of seismicity and largest earthquakes in the Himalaya region, caused mainly by movement on thrust faults. 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 Karachi Division has been identified on the edge of moderate to high hazard zone. This zone has minor to moderate damaging affect. The proposed Project Site Port Qasim is located adjacent to an active tectonic setting, and is approximately 190 km east of the triple continental junction between the Arabian, Eurasian and Indian plates. The tectonic map of Pakistan is presented in Exhibit 4.6 Tectonics Map Pakistan, while Exhibit 4.7 represents tectonics of southern Pakistan and Exhibit 4.8: represents earthquake density of Pakistan respectively.

Exhibit 4.6: Tectonics Map of Pakistan
Exhibit 4.7: Tectonics of Southern Pakistan

Source: Cumulative Impact Assessment for Industrial and Port Developments at Port Qasim, Hagler Baley Pakistan, 2016

Exhibit 4.8: Earthquake Density of Pakistan

Source: Cumulative Impact Assessment for Industrial and Port Developments at Port Qasim, Hagler Baley Pakistan, 2016
The study area experiences an earthquake density of less than 1 Richter Scale per year. Earthquake epicenters, for magnitudes between 3.8 and 5.5 M_L, have been recorded along the Pab fault, Hab fault, Ornach-Nal fault, smaller micro faults east of Karachi and in the offshores areas southwest of Port Qasim. Based on the Global Seismic Hazard Map Project (GSHAP), the peak ground acceleration (PGA) of 10 % in 50 years is 1.6 m/s^2. **Exhibit 4.9** represents seismic hazard map of Pakistan.

**Exhibit 4.9: Seismic Hazard Map of Pakistan**

![Seismic Hazard Map of Pakistan](image)


### 4.5 TSUNAMIS

The coastal belt of Pakistan is located in an area of potential tsunami. While large tsunami genetic earthquakes have been relatively rare but there is potential for a tsunami associated with the Makran Subduction Zone (MSZ) or smaller localized tsunamis associated with several smaller thrust faults around Karachi. A map of historical tsunamis that have been generated, some in close proximity to the Port Qasim Area, is shown **Exhibit 4.10.**
Coastal areas of Karachi might experience the effect of Tsunamis as the coast line of Pakistan has had already experienced this natural hazard in the recent past. An earthquake of magnitude 8.3 generated a destructive tsunami wave in the Northern Arabian Sea and the Indian Ocean on 28th November, 1945, producing 12 m to 15 m high sea waves that killed at least 4,000 people in Pasni and adjoining areas. The tsunami hit as far as Mumbai in India. Karachi, about 450 km from the epicenter, experienced 2 m high sea waves which affected harbor facilities. Hence, the occurrence of tsunami cannot be ruled out in future. The city of Karachi lie close to potential epicenters for large earthquakes and it demands attention of the local government to enhance the capacity for managing disastrous situation, for minimizing disaster risk and response in order to reduce losses from tsunami or other climatic events. The coastal belt of Pakistan is also highly vulnerable to cyclones and associated storm surges. It has been recorded that Fourteen cyclones events had occurred between 1971 and 2001(NDRMFP, 2007)

4.6 CLIMATE

The climate at Port Qasim is characterized as hot and dry during summer, and mild during winter with heavy, sporadic, rainfall during the monsoon. The summer monsoon prevails in the Project area from (Mid-March to Mid-June) characterized by very hot temperatures, dry conditions, moderate wind from the southwest, and low humidity; Monsoons (Mid June to Mid-September) characterized by high
rainfall, high temperatures, high humidity, and high winds from the southwest. Although the temperatures are milder compared to summer but high humidity makes the heat oppressive; Post-monsoon summer (Mid-September to Mid-November) characterized by cessation of rains and reduction in wind speed. Temperature increases by couple of degrees and humid decreases by about 10%; and Winters (Mid November to Mid-March) are characterized by moderate temperature, dry conditions, low humidity, and low winds from the north and northeast. The monsoon is characterized by a reversal in wind direction during the remaining months and heavy rainfall occurs over most part of the Indian Subcontinent. Yearly mean maximum and minimum temperatures are presented below in Exhibit 4.11.

**Exhibit 4.11:** Mean Maximum and Minimum Temperature of the Proposed Project Area

*Source: Jinnah International Airport*
4.7 RAINFALL

According to IPCC 2007 report decrease in rainfall pattern has been observed along the coastal belt and arid plains of Pakistan, in upcoming years most part of Pakistan will experience dry humid conditions especially Sindh, Balochistan, Punjab and the central parts of Northern Areas will receive less than 250 mm of rainfall in a year (PMD). The distribution of rainfall in Pakistan varies on wide ranges, the rainfall is associated with the monsoon winds and the western disturbances. The provinces of Khyber Pukhtunkhuwa and Balochistan receive maximum rainfall in the months of December to March while Punjab and Sindh receive 50-75% of rainfall during monsoon season (Khan, 1993 & 2002). The probability of precipitation observed at Port Qasim varies throughout the year. Over the entire year, the most common forms of precipitation are thunderstorms, drizzle, and moderate rain. Thunderstorms are the most severe precipitation observed and it mostly occurs in August. Drizzle is also the most common precipitation which is mostly observed during the month of July. The mean monthly precipitation records for Karachi South District can be seen in Exhibit 4.12.

Exhibit 4.12: Maximum Precipitation (%)

![Exhibit 4.12: Maximum Precipitation (%)](image)

Source: Jinnah International Airport

4.8 RELATIVE HUMIDITY

The relative humidity typically ranges from 25% (dry) to 91% (very humid) over the course of the year, rarely dropping below 10% (very dry) and reaching as high as 100% (very humid).

The air is driest around February 9, at which time the relative humidity drops below 33% (comfortable) three days out of four; it is most humid around August 2,
exceeding 83% (humid) three days out of four. The mean monthly relative humidity for Karachi South district can be seen in **Exhibit 4.13**.

**Exhibit 4.13**: Relative Humidity

![Relative Humidity Chart]

*Source: Jinnah International Airport*

### 4.9 WIND SPEED AND DIRECTION

The proposed project area lies in a region where wind blows throughout the year with highest velocities during the summer months the direction of the wind is from south-west to west and during winter season the wind blows from north to northeast and it shifts southwest to west in the evening hours. The wind usually carries sand and salt with it resulting in severe corrosion and erosion. The wind direction and speed in between the two monsoon seasons, summer and winter are rather unsettled and large variations are noted in term of speed and direction. The seasonal winds are dry and have a desiccating effect during May & June, in July and August the wind contain moisture.

Over the course of the year, typical wind speeds vary from 0 mph to 19 mph (calm to fresh breeze), rarely exceeding 29 mph (strong breeze). The highest average wind speed of 13 mph (moderate breeze) occurs around May 18, at which the average daily maximum wind speed is 18 mph (fresh breeze). The lowest average wind speed of 5 mph (light breeze) occurs around November 16, at which the average daily maximum wind speed is 10 mph (gentle breeze). The wind is most often out of the west (31% of the time) and south west (23% of the time). The wind is least often out of the south east (1% of the time), south (2% of the time), east (3% of the time), north west (5% of the time), and north (5% of the time). **Exhibit 4.14 & Exhibit 4.15** show the wind speed and direction of the proposed project area respectively.
Exhibit 4.14: Average Wind Speed

![Average Wind Speed Graph](Source: Jinnah International Airport)

Exhibit 4.15: Average Wind Directions

![Average Wind Directions Graph](Source: Jinnah International Airport)
4.10 EXISTING AMBIENT AIR QUALITY OF THE PROPOSED PROJECT AREA

A total of seven locations were selected to monitor the ambient air quality of the proposed project area. The monitoring equipment was placed at the different sampling site for 24 hours. **Exhibit 4.16** represents Ambient Air Monitoring Points at the study area. While on the other hand **Exhibit 4.17** represents the monitoring results accordingly.

**Exhibit 4.16** Ambient Air Monitoring Points in the Study Area

![Ambient Air Monitoring Points Map](image-url)
Exhibit 4.17: Ambient Air Quality Monitoring Results of the Project Area

<table>
<thead>
<tr>
<th>S. No</th>
<th>Parameters</th>
<th>Monitored values at location 1</th>
<th>Monitored values at location 2</th>
<th>Monitored values at location 3</th>
<th>Monitored values at location 4</th>
<th>Monitored values at location 5</th>
<th>Monitored values at location 6</th>
<th>Monitored values at location 7</th>
<th>SEQS</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SPM (ug/m³)</td>
<td>106</td>
<td>87</td>
<td>208</td>
<td>59</td>
<td>60</td>
<td>60</td>
<td>65</td>
<td>500 ug/m³</td>
<td>OK</td>
</tr>
<tr>
<td>2</td>
<td>PM₁₀ (ug/m³)</td>
<td>60</td>
<td>58</td>
<td>347</td>
<td>49</td>
<td>57</td>
<td>60</td>
<td>59</td>
<td>150 ug/m³</td>
<td>Exceeded SEQS at Location 3</td>
</tr>
<tr>
<td>3</td>
<td>PM₂.₅ (ug/m³)</td>
<td>40</td>
<td>29</td>
<td>55</td>
<td>29</td>
<td>38</td>
<td>38</td>
<td>40</td>
<td>75 ug/m³</td>
<td>OK</td>
</tr>
<tr>
<td>4</td>
<td>CO (mg/m³)</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>10 mg/m³</td>
<td>OK</td>
</tr>
<tr>
<td>5</td>
<td>CO₂ (mg/m³)</td>
<td>330</td>
<td>338</td>
<td>349</td>
<td>347</td>
<td>347</td>
<td>353</td>
<td>353</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>6</td>
<td>RH (%)</td>
<td>66.6</td>
<td>67.7</td>
<td>73.1</td>
<td>74</td>
<td>74</td>
<td>75</td>
<td>75</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>7</td>
<td>Temp (°C)</td>
<td>30.4</td>
<td>30.2</td>
<td>29.8</td>
<td>28</td>
<td>28</td>
<td>27</td>
<td>27</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>8</td>
<td>Noise (dB)</td>
<td>70</td>
<td>68</td>
<td>68</td>
<td>70</td>
<td>65</td>
<td>60</td>
<td>72</td>
<td>85</td>
<td>----</td>
</tr>
</tbody>
</table>
4.10.1 Storms and Cyclones

Tropical cyclones also occur periodically in the coastal areas. These cyclones have high intensities. A total of 14 cyclones have been observed which reached the coastal areas of Pakistan since 1971 to 2001. The cyclone of 1999 in Thatta and Badin districts wiped out 73 settlements and killed 168 people and 11,000 cattle's. Nearly 0.6 million people were affected. It destroyed 1800 small and big boats and partially damaged 642 boats, causing a loss of Rs.380 million. Losses to infrastructure were estimated to be Rs.750 million. Climate change may increase the frequency and intensity of storms and could cause changes in their tracks. Although the frequency of cyclones along Pakistan coast belt is low but it can cause a huge damage when it occurs. Hence the possible occurrence of a future cyclone with severe consequences is quite rare but cannot be ruled out (NDRMFP, 2007)

4.11 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 obtained from secondary sources and through field observation and data collection (EIA field survey).

4.11.1 Surface Water Resources

There is no significant natural freshwater source in the proposed project area. The Indus River is about 85 km to the east of Karachi city and the Hub River lies at a distance of 60km to the north west of Karachi. A perennial stream that originates in Balochistan and marks the boundary between Karachi Division and Balochistan are the sources of fresh water in Karachi. The Lyari and Malir Rivers that passes through the city do not have any natural flow, except during the monsoons. The Lyari River falls in Kemari and Malir River falls in Gizri Creek. Malir River is ephemeral and is constituted from two major tributaries i.e. Mol and Khadeji as well as some minor tributaries. Khadeji is a perennial stream that originates at Khadeji falls and gains flow as it travels across the Malir Basin. Port Qasim lies in the non-active and western extent of the Indus delta which is largely arid and swampy, the deltaic coastline associated with Indus Delta is dissected by 17 major creeks and numerous minor creeks. The major creeks of the Indus Delta within the Study area include the Phitti, Khuddi and Khai Creeks. Minor creeks, within the Study Area close to Port Qasim include the Korangi, Gizri, Kadiro, Issaro, Gharo, Chann Waddo, Rakhal and Chara creeks among others.

The Indus River had a largely river-dominated estuary but due to the increasing demand of fresh water and increasing number of dams and reservoirs the discharge of fresh water to the deltaic region is low which is seriously affecting the growth of mangroves and the aquatic flora and fauna. The flow of fresh water increase during the summer southwest monsoon season. In between 1940s and 1950s
Embankments were constructed on Haleji and Keenjhar lakes to divert freshwater from Indus River into these lakes and to feed the dry Gharo River. The diverted water again reenters the intertidal delta within the Study Area at a distance of 17 kilometers. The water from the Keenjhar Lake is also used for canal-fed irrigation within the eastern Study Area.

The main source of freshwater into the intertidal deltaic creeks of the Study Area is rain and associated runoff during the summer Monsoon. The rainwater drains the land in the north of the Study Area and joins the intertidal deltaic creeks along the Gharo River, Malir River, ephemeral drains such as Badal nullah, Ghaggar nullah, Lat nullah, and Mahyo nullah, as well as wastewater drains, particularly into Korangi Creek. Additionally it is important to note that to establish baseline of the project area, raw water which is used for drinking purpose onto the existing berths was also collected and subjected to microbial and chemical analysis. Results are presented below as Exhibit 18 and Exhibit 19 respectively.

### Exhibit 18: Drinking Water Chemical Analysis Report

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Parameters</th>
<th>Units</th>
<th>SSDWQ</th>
<th>Concentration</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pH</td>
<td>.....</td>
<td>6.5-8.5</td>
<td>7.61</td>
<td>pH meter</td>
</tr>
<tr>
<td>2</td>
<td>Total Dissolved Solids</td>
<td>mg/l</td>
<td>1000</td>
<td>536</td>
<td>APHA 2540 C</td>
</tr>
<tr>
<td>3</td>
<td>Total Suspended Solids</td>
<td>mg/l</td>
<td>......</td>
<td>&lt;5</td>
<td>Hach Method 8006</td>
</tr>
<tr>
<td>4</td>
<td>Chloride</td>
<td>mg/l</td>
<td>250</td>
<td>87.90</td>
<td>APHA 4500 Cl C</td>
</tr>
<tr>
<td>5</td>
<td>Total Hardness*</td>
<td>mg/l</td>
<td>&lt;500</td>
<td>203.57</td>
<td>APHA 2340 C</td>
</tr>
<tr>
<td>6</td>
<td>Fluoride*</td>
<td>mg/l</td>
<td>≤1.5</td>
<td>0.62</td>
<td>Hach Method 8029</td>
</tr>
<tr>
<td>7</td>
<td>Nitrate</td>
<td>mg/l</td>
<td>&lt;50</td>
<td>0.90</td>
<td>Hach Method 8039</td>
</tr>
<tr>
<td>8</td>
<td>Nitrite</td>
<td>mg/l</td>
<td>&lt;3</td>
<td>0.044</td>
<td>Hach Method 8507</td>
</tr>
<tr>
<td>9</td>
<td>Sulphate*</td>
<td>mg/l</td>
<td>250</td>
<td>68</td>
<td>Hach Method 8051</td>
</tr>
<tr>
<td>10</td>
<td>Bicarbonate</td>
<td>mg/l</td>
<td>......</td>
<td>115.15</td>
<td>APHA 2320 B</td>
</tr>
<tr>
<td>11</td>
<td>Residual Chlorine</td>
<td>mg/l</td>
<td>0.5</td>
<td>0.06</td>
<td>Hach Method 8021</td>
</tr>
</tbody>
</table>
**Exhibit 19: Drinking Water Microbial Analysis Report**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Parameters</th>
<th>Recommended Value</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total Colony Count</td>
<td>&lt;500 cfu / ml</td>
<td>450 cfu / ml</td>
</tr>
<tr>
<td>2</td>
<td>Total Coliform</td>
<td>0 cfu / 100 ml</td>
<td>10 cfu / 100 ml</td>
</tr>
<tr>
<td>3</td>
<td>Faecal Coliform</td>
<td>0 cfu / 100 ml</td>
<td>0 cfu / 100 ml</td>
</tr>
<tr>
<td>4</td>
<td>Faecal Streptococci</td>
<td>0 cfu / 100 ml</td>
<td>0 cfu / 100 ml</td>
</tr>
</tbody>
</table>

*Recommended Values as per WHO guidelines for Drinking Water*

**4.11.1.1 Sea Water**

A random sample of seawater was collected from port Qasim on July 4, 2016 during different time intervals. The sampling locations were chosen considering the marine ecosystem, port activities and wastewater inflows from the on-shore industry.

**Exhibit 20: Sea Water Analysis Report**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Parameters</th>
<th>Unit</th>
<th>Concentration</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pH</td>
<td>.....</td>
<td>7.57</td>
<td>pH meter</td>
</tr>
<tr>
<td>2</td>
<td>Temperature</td>
<td>°C</td>
<td>29</td>
<td>Thermometer</td>
</tr>
<tr>
<td>3</td>
<td>Nickel*</td>
<td>mg/l</td>
<td>0.025</td>
<td>US EPA 200.8</td>
</tr>
<tr>
<td>4</td>
<td>Zinc*</td>
<td>mg/l</td>
<td>0.004</td>
<td>US EPA 200.8</td>
</tr>
<tr>
<td>5</td>
<td>Lead*</td>
<td>mg/l</td>
<td>&lt; 0.001</td>
<td>US EPA 200.8</td>
</tr>
<tr>
<td>6</td>
<td>Copper*</td>
<td>mg/l</td>
<td>0.287</td>
<td>US EPA 200.8</td>
</tr>
<tr>
<td>7</td>
<td>Selenium*</td>
<td>mg/l</td>
<td>&lt; 0.001</td>
<td>US EPA 200.8</td>
</tr>
<tr>
<td>8</td>
<td>Antimony*</td>
<td>mg/l</td>
<td>&lt; 0.001</td>
<td>US EPA 200.8</td>
</tr>
<tr>
<td>9</td>
<td>Cadmium*</td>
<td>mg/l</td>
<td>&lt; 0.001</td>
<td>US EPA 200.8</td>
</tr>
<tr>
<td>10</td>
<td>Chromium*</td>
<td>mg/l</td>
<td>0.011</td>
<td>US EPA 200.8</td>
</tr>
<tr>
<td>11</td>
<td>Mercury*</td>
<td>mg/l</td>
<td>&lt; 0.001</td>
<td>US EPA 200.8</td>
</tr>
<tr>
<td>12</td>
<td>Arsenic*</td>
<td>mg/l</td>
<td>0.209</td>
<td>US EPA 200.8</td>
</tr>
<tr>
<td>13</td>
<td>Total Organic Compound</td>
<td>mg/l</td>
<td>24</td>
<td>Merck Test(1.14878)</td>
</tr>
<tr>
<td>14</td>
<td>Oil &amp; Grease</td>
<td>mg/l</td>
<td>ND</td>
<td>Solvent extraction</td>
</tr>
</tbody>
</table>
4.11.1.2 Waves

Karachi lies on the northern end of the Arabian Sea that extends southwards into the Indian Ocean for thousands of kilometers. The coast is exposed to waves from the south, southwest and west. The wave regime on the coastal belt of Karachi varies with season. It has been observed that during the winter season, when winds are around 5 m/s, the coastal waters are almost calm and during the southwest monsoon the wave height is less than 1 m, the winds are around 13 m/s and the waves on the coast are more than 3 m high. Deep sea wave data, for the southwest Monsoon months (May to September) applicable to Pakistan coast is given in the Exhibit 21.

Exhibit 21: Deep Sea Wave Data, For the Southwest Monsoon Months (May to September) Applicable To Pakistan Coast

<table>
<thead>
<tr>
<th>Resultant Wave Height (m)</th>
<th>Ave Period (Seconds) for Higher of Sea/Swell Height</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6-7  8-9 10-11 12-13 14-15 16-17 18</td>
<td></td>
</tr>
<tr>
<td>0.0 to 0.5</td>
<td>2.6% 4.1% 0.4% 0.1% 0.0% 0.0% 0.0% 0.0%</td>
<td>7.4%</td>
</tr>
<tr>
<td>0.6 to 1.0</td>
<td>1.1% 5.3% 1.8% 0.4% 0.1% 0.0% 0.0% 0.0%</td>
<td>8.9%</td>
</tr>
<tr>
<td>1.1 to 1.5</td>
<td>1.2% 6.7% 6.3% 2.2% 0.6% 0.1% 0.1% 0.0% 0.0%</td>
<td>17.3%</td>
</tr>
<tr>
<td>1.6 to 2.0</td>
<td>0.1% 3.8% 4.9% 2.9% 0.9% 0.2% 0.1% 0.0% 0.0%</td>
<td>12.8%</td>
</tr>
</tbody>
</table>

4.11.1.3 Tides

Tides along Karachi Coast are semi-diurnal but diurnal inequality is also present. The effect of this shows up in daily tidal cycle as there are two High Waters and two Low Waters which also vary considerably from each other in tidal heights. These are classified as HHW, LHW, LLW and HLW. The tides move from west to east i.e. the tide at the Hub River Coast arrives about 20 minutes earlier than Karachi. Similarly the tides at Karachi Harbour arrive at about 10 minutes earlier than entrance of Port Qasim. When tides progress up the Phitti Creek its magnitude increases and there is time lag. The tides reach Port Bin Qasim after 22 minute which is about 20 miles from Karachi and is located about 15 miles up to creek from the sea. At Gharo Creek tides fall down rapidly due to frictional effects and the gradual weakening of the tidal forces. At Gharo 35 miles from the Phitti Creek entrance the tides are almost half of the mean sea tides at the entrance. Lowest Astronomical Tide (L.A.T) is – 0.6 m. The highest Astronomical Tide (H.A.T) at PQA is + 3.7 m while the Mean Tidal Level (M.T.L) is recorded as + 1.76 m Exhibit.
4.11.1.4 Seawater Currents

The speed of the current is generally low, about ½ knots. The speed increases up to 1 knot during SW monsoon. The direction of the set is directly related with the prevailing wind system. The set is generally easterly in the SW monsoon and westerly in the NE monsoon. The slight difference in direction in the Western and Eastern part of the Karachi Coast is due to circulatory pattern of the current around gyral which are usually formed at the center of the sea. There is a clockwise gyre during SW monsoon and anti-clockwise gyre during NE monsoon (Quraishee, 1988). Quraishee (1984, 1988) has also observed the existence of warm core eddies in the offshore areas of Pakistan.

4.11.1.5 Seawater Temperature

The sea surface temperature of the Study Area ranges from between 18 °C to 32 °C. The important features of the sea temperature variations are the following:

- The sea water temperature in the Arabian Sea is strongly influenced by the monsoons.
- The highest temperature occurs around May, shortly before the southwest monsoon sets in.
- Temperature drops in mid-summer because at this time cold water from the deeper sea circulates near the coast.
- When the southwest monsoon subsides in October, the influx of the cold deep-zone water also recedes. Coupled with a simultaneous decline of the air temperatures, the water surface temperature along the entire coast is relatively homogenous.
- In the course of the winter cooling, a temperature drop sets in from south to north.
- The water is coldest in February

4.11.1.6 Seawater Salinities

The average salinity of the sea water is in between 35 to 37 % (parts per thousand) it remains constant throughout the year except in the months of monsoon. During the month of monsoon the average value of salinity decrease to 25-28 % for a few days. The salinity in most of the intertidal creeks of the Indus Delta remains between 37 and 41‰ for most of the year. It drops to about 30‰ in certain creeks during the period of August to October, due to the rain. The influx of floodwater from the Indus River lowers salinity in the creeks adjacent to the river (Cumulative Impact Assessment of Bin Qasim, Hagler Ballery Pakistan, 2016).
4.11.2  **Groundwater Resources**

Groundwater resources in Karachi are limited. The aquifers close to the coastal belt are mostly saline and dry and this water cannot be used for drinking, domestic and agriculture purposes. Meanwhile the aquifers which lies near the vicinity of the Hub River belt are well developed and are source of water for agriculture and other domestic purposes. Generally, the aquifers in the project area are estimated to lie at depths of about 30 ft to 40 ft.
The Indus River delta covers an area of about 240,000 hectares and is characterized by 17 major creeks and innumerable minor creeks, dominated by mud flats, and fringing mangroves. The coastal morphology is characterized by a network of tidal creeks and a number of small islands with sparse mangrove vegetation, mud banks, swamps, and lagoons formed because of changes in river courses. The Port Qasim Authority area, consists of Gharo Phitti Creek System. This network of creeks consists of three major creeks: Gharo Creek, Kadiro Creek and Phitti Creek. All three are connected in a series starting from Gharo Creek at the north-eastern end to the Phitti Creek at the south-western end. This creek system is about 28 km long and its width ranges from 250 to 2,500 m. The Korangi Creek, and Kadiro Creeks are connected with it at the north-eastern end while it acts as main waterway connected with the open sea at the south-western end. The main channel of Port Bin Qasim lies in this creek system, which has been dredged to maintain a navigable depth of -11.3 metres. The inner section of the creek is sheltered from the onslaught of high energy waves during the south west monsoons (June, July and August). Strong tidal currents have been observed during spring and neap tides. Seawater flows in the creek with velocities as high as 2-3 m/sec during the flood and ebb tides. The sediments are subjected to coastal dynamic processes, such as, tides, winds, waves, and currents. This leads to accretion and erosion of the Indus deltaic coast. The daily ebb and flow of water entering and leaving the creek has an erosional effect on the sediment movement in the creek.

The biological baseline of the project area was established, identified and documented by both primary and secondary means. Information was collected from literature review and field data collection. Surveys were, conducted during June-July-2016. 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 project area. The main objective of this survey was to monitor the impacts of fauna and flora assemblages in response to the construction activity in the area. The coal transshipment activity would be more intense in the 2% of the PQA area; however considering other concomitants of the ecosystem the impact has been carefully studied to justify the proposed mitigations. The area covered was approximately 5 km radius in which floral and faunal species were documented. A hand held GPS was used to document changes in the ecological assemblages Exhibit 5.1 represents the study area radius map Exhibit 5.2 biodiversity survey sampling stations. The diversity of avian, large and small mammals, and reptile species was also determined. Random
sampling was conducted in and around the designated coal wharfs 3 & 4, located in Kadero Creek PQA. The objective of the study was to establish terrestrial and marine ecological baseline of the Project site and its vicinity. In addition to the field survey, reviews of available literature and interviews with members of the local communities were also carried out to verify the information collected.
Exhibit 5.1: The Study Area Radius Map
Exhibit 5.2: Survey Sampling Stations
5.1 HABITAT

The Port Qasim is located on the northwest edge of the Indus delta system. The system is characterized by long and narrow creeks, mud flats and the Indus River Delta-Arabian Sea. As shown above in Exhibit 5.1 the proposed project radius sustains a healthy mangroves ecosystem but project activities do not require clearance/cutting of mangroves species within the project vicinity and surrounding. A detailed description of the flora and fauna of the proposed project area is presented below under separate headings accordingly.

5.2 FLORA OF THE PROJECT AREA

The vegetation is dominated mostly by mangroves and shrubs; however variations in vegetation composition were observed with varying microhabitats. The floristic list of the area is shown as per Exhibit 5.5. The patches of mudflats in the terrain were observed hospitable for Avicennia sp to germinate and establish, however, considerable patches can be seen as an effort to replant and reestablish Rhizophora mucronata. The associated vegetation consisted of halophytes belonging to family Chenopodiaceae. The other significantly represented members of the floristic list belonged to Poaceae, Asteraceae and Zygophylliaceae are presented in Exhibit 5.3.
Exhibit 5.3: Persistent Mangroves with Forest Loss and Gain of Indus Delta from 1973 To 2010

SOURCE: Cumulative Impact Assessment of Port Qasim Industrial Area, Hagler Bailly Pakistan, 2016
5.2.1 Flora of the Project Area

5.2.1.1 Survey/Sampling Methodology for Mangroves:

A comprehensive survey was carried out during the establishment of the baseline, to assess the health of Mangroves within the proposed project vicinity. According to the Sindh Forest Department, the mangroves in the area are under the control of Sindh Forest Department and Port Qasim Authority and it is declared as "Protected Forests". The survey route was recorded with GPS map 76, which was later plotted on Google earth to record the total area cover of Mangrove species within the 5 km of the project area. Exhibit 5.4 represents the total area cover of Mangroves within the proposed project vicinity.

5.2.1.2 Brief Description

The PQA built area is located adjacent to the main land and has been surrounded by extensive networks of creeks system dominated by mangroves vegetation where few of the halophytic species were growing in association. A sizeable patch of mangrove forest exists at a distance of approximately less than a kilometer from the site showing semi-homogenous edaphic patterns, as the terrain is exposed to seasonal and periodic inundations; therefore the surrounding soil has the hard top showing crusts at places with salt in it. The sub soil area is wet and showed presence of waterlogged regimes. The Project is located near Port Qasim which is part of the Indus Delta. The Indus Delta supports the seventh largest mangrove forest system in the world. In the Indus Delta mangrove ecosystem, eight (8) species of mangroves have been reported out of 70 species known to occur in the tropical forests of the world. The Avicennia marina is the dominant species of the mangroves in the Indus Delta.
Two mangrove species were found growing in the area i.e. *Avicenia marina* (Forssk) Vierh and *Rhizophora mucronata* Lam. *Avicenia marina* was the dominant species compared to *Rhizophora sp.* The patches of mudflats in the terrain were observed conducive for *Avicenna* sp to germinate and establish, however, a considerable number of patches can be seen as an effort to reestablish and replant stands of *Rhizophora mucronata*.
Exhibit 5.4: Total Mangrove Cover within the Study Area

Total Mangrove Cover Area Within the Study Area (3835 Hectares)
5.2.1.3 **Sampling Methodology for Terrestrial Flora**

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

5.2.1.4 **Brief Description of Vegetation**

The vegetation is dominated mostly by shrubs; however variations in vegetation composition were observed with varying microhabitats. The floristic list of the area is shown as per Exhibit 5.5. The associated life forms consisted halophytes belonging to family Chenopodiaceae. The other significantly represented members of the floristic list belonged to Poaceae, Asteraceae and Zygophylliaceae. The terrestrial habitat in the Study Area largely consists of arid and dry plain land. Plant species reported from the area include Mesquite *Prosopis juliflora*, Indian Milkweed *Calotropis procera* and Caper Bush *Capparis deciduas* the most abundant among these, Mesquite *Prosopis juliflora* an alien invasive species which is harvested by the locals and sold in the local timber market for fuel wood and construction of local huts. Locals graze their camels on Mesquite *Prosopis juliflora*.

5.2.2 **Conservation Status**

Based on information available in the ESIs for projects in Port Qasim 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. In addition to that according to the Sindh Forest Department, the area under the control of Sindh Forest Department and Port Qasim Authority and declared as "Protected Forests".
### Exhibit 5.5: Floral Species Observed in PQA

<table>
<thead>
<tr>
<th>S. No</th>
<th>Taxon</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Blepharis sindica</em> Stocks ex T. And</td>
<td>Acanthaceae</td>
</tr>
<tr>
<td>2</td>
<td><em>Achyranthes aspera</em> L</td>
<td>Amaranthaceae</td>
</tr>
<tr>
<td>3</td>
<td><em>Pentatropis nivalis</em> (J.F.Gmel.) Field &amp; J.R.I. Wood</td>
<td>Asclepiadaceae</td>
</tr>
<tr>
<td>4</td>
<td><em>Calotropis procera</em> (Aiton) W.T.Aiton</td>
<td>Apocynaceae</td>
</tr>
<tr>
<td>5</td>
<td><em>Conyza aegyptiaca</em> Ait</td>
<td>Asteraceae</td>
</tr>
<tr>
<td>6</td>
<td><em>Launaea procumbens</em> (Roxb.) Amin</td>
<td>Asteraceae</td>
</tr>
<tr>
<td>7</td>
<td><em>Sonchus asper</em> Fig.</td>
<td>Asteraceae</td>
</tr>
<tr>
<td>8</td>
<td><em>Avicennia marina</em> (Forssk.) Vierh</td>
<td>Avicenniaceae</td>
</tr>
<tr>
<td>9</td>
<td><em>Heliotopium ophioglossum</em> Boiss</td>
<td>Boraginaceae</td>
</tr>
<tr>
<td>10</td>
<td><em>Capparis decidua</em> (Forsk.) Edgew</td>
<td>Capparidaceae</td>
</tr>
<tr>
<td>11</td>
<td><em>Arthrocnemum macrostachyum</em> (Moric.) C.Koch</td>
<td>Chenopodiaceae</td>
</tr>
<tr>
<td>12</td>
<td><em>Arthrocnemum indicum</em> (Willd.) Moq</td>
<td>Chenopodiaceae</td>
</tr>
<tr>
<td>13</td>
<td><em>Atriplex stocksii</em> Boiss</td>
<td>Chenopodiaceae</td>
</tr>
<tr>
<td>14</td>
<td><em>Chenopodium album</em> L</td>
<td>Chenopodiaceae</td>
</tr>
<tr>
<td>15</td>
<td><em>Salsola imbricata</em> Forsk</td>
<td>Chenopodiaceae</td>
</tr>
<tr>
<td>16</td>
<td><em>Suaeda fruticosa</em> Forsk. ex J.F.Gmelin</td>
<td>Chenopodiaceae</td>
</tr>
<tr>
<td>17</td>
<td><em>Suaeda monoica</em> Forsk. ex J.F.Gmelin</td>
<td>Chenopodiaceae</td>
</tr>
<tr>
<td>18</td>
<td><em>Convolvulus arvensis</em> L</td>
<td>Convolvulaceae</td>
</tr>
<tr>
<td>19</td>
<td><em>Cressa cretica</em> L</td>
<td>Convolvulaceae</td>
</tr>
<tr>
<td>20</td>
<td><em>Cyperus bulbosus</em> Vahl</td>
<td>Cyperaceae</td>
</tr>
<tr>
<td>21</td>
<td><em>Euphorbia serpens</em> Kunth</td>
<td>Euphorbiaceae</td>
</tr>
<tr>
<td>22</td>
<td><em>Alhagi maurorum</em> Medic</td>
<td>Fabaceae</td>
</tr>
<tr>
<td>23</td>
<td><em>Acacia nilotica</em> Delile</td>
<td>Mimosaceae</td>
</tr>
<tr>
<td>24</td>
<td><em>Prosopis juliflora</em> Swartz</td>
<td>Mimosaceae</td>
</tr>
<tr>
<td>25</td>
<td><em>Commicarpus boissieri</em> (Heimerl) Cufod</td>
<td>Nyctaginaceae</td>
</tr>
<tr>
<td>26</td>
<td><em>Aeluropus lagopoides</em> (L.) Trin. ex Thw</td>
<td>Poaceae</td>
</tr>
<tr>
<td>27</td>
<td><em>Chloris barbata</em> Sw</td>
<td>Poaceae</td>
</tr>
</tbody>
</table>
### 5.3 FAUNA OF THE PROJECT AREA

The proposed project area under review was assessed for its potential impact on Biodiversity, and ecosystem in short term and long term.

**Mammals:** Line transects for mammals of 200 m by 20 m were placed at each sampling location. All the animals that were sighted, or their signs detected (foot marks, droppings, dens), were recorded. The specimens were identified with the help of the most recent keys available in literature and the GPS coordinates of the location was documented. Anecdotal information regarding specific mammals was collected from the local people and relevant literature was also consulted.

**Reptiles:** Line transects of 200 m by 20 m were placed at each sampling location and reptiles were surveyed by active search during the day. The sampling sites were actively searched for all types of reptiles along the line transects. Active searching was also carried out in sampling areas with a focus on their microhabitats. The specimens were identified with the help of the most recent keys available in literature.

Dolphins have been sighted in the Indus deltaic region and in the PQA area. The survey team did not observe any dolphins in the area during the survey. Similarly, the team did not find any turtles or turtle remnants in the area or any turtle tracks were found on the muddy shores. No turtle nest was observed. It is unlikely that the turtles would nest in muddy substrate, they prefer sandy substrates instead.

<table>
<thead>
<tr>
<th>S. No</th>
<th>Taxon</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td><em>Cynodon dactylon</em> (L.) Pers</td>
<td>Poaceae</td>
</tr>
<tr>
<td>29</td>
<td><em>Desmostachya bipinnata</em> (L.) Stapf</td>
<td>Poaceae</td>
</tr>
<tr>
<td>30</td>
<td><em>Paspalum vaginatum</em> Swartz..</td>
<td>Poaceae</td>
</tr>
<tr>
<td>31</td>
<td><em>Pennisetum purpureum</em> Schum</td>
<td>Poaceae</td>
</tr>
<tr>
<td>32</td>
<td><em>Phragmites karka</em> (Retz.) Trin. ex Steud.</td>
<td>Poaceae</td>
</tr>
<tr>
<td>33</td>
<td><em>Sporobolus virginicus</em> (L.) Kunth</td>
<td>Poaceae</td>
</tr>
<tr>
<td>34</td>
<td><em>Rhizophora mucronata</em> Lam.</td>
<td>Rhizophoraceae</td>
</tr>
<tr>
<td>35</td>
<td><em>Salvadora persica</em> L</td>
<td>Salvadoraceae</td>
</tr>
<tr>
<td>36</td>
<td><em>Tamarix indica</em> Willd.</td>
<td>Tamaricaceae</td>
</tr>
<tr>
<td>37</td>
<td><em>Fagonia indica</em> Burm.f.</td>
<td>Zygophyllaceae</td>
</tr>
<tr>
<td>38</td>
<td><em>Zygophyllum simplex</em> L.</td>
<td>Zygophyllaceae</td>
</tr>
</tbody>
</table>
The survey team did not encounter any vulnerable, threatened, endangered marine species listed in the IUCN Red Book (2013) from the vicinity of the proposed project. Additionally it is important to note that only few avifaunal, mammalian faunal and herpeto faunal species were observed within the project vicinity as the area is well developed.

5.3.1 Avifauna of the Project Area

5.3.1.1 Sampling Methodology

In order to study the 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. Additionally 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 surveys was taken in this regard which include EIA studies in Bin Qasim, Karachi EIA of PIBT, EIA of ELENGY and EIA of Sinohydro’s 2x660 Coal Power Plant.

5.3.1.2 Brief Description

Both water and land birds have been reported from the PQA. Most of these birds are omnivores while others scavenge on marine crabs and dead fish. Past Impact assessment survey carried out for previous EIAs at Bin Qasim, Karachi, have also suggested that no threatened bird species was observed from the PQA area this could be because they are rare, and their populations are declining, they include the Saker Falcon *Falco cherrug* (Endangered), the White Rumped Vulture *Gyps bengalensis* (Critically Endangered), the Red Headed Vulture *Sarcogyps calvus* (Critically Endangered) and the Lesser Florican *Syphaiotides indicus* (Endangered). Exhibit 5.6 represents avifaunal species of the project area.
Exhibit 5.6: Avifaunal Species of the Project Area

<table>
<thead>
<tr>
<th>S. No</th>
<th>English Name and Scientific Name</th>
<th>IUCN Conservation Status</th>
<th>Population Total Count</th>
<th>Sighted</th>
<th>Reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>House Crow</td>
<td><em>Corvus splendens</em></td>
<td>LC</td>
<td>21</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>Cattle Egret</td>
<td><em>Bubulcus ibis</em></td>
<td>LC</td>
<td>1</td>
<td>X</td>
</tr>
<tr>
<td>3</td>
<td>House Sparrow</td>
<td><em>Passer domesticus</em></td>
<td>LC</td>
<td>18</td>
<td>X</td>
</tr>
<tr>
<td>4</td>
<td>Common Myna</td>
<td><em>Acridotheres tristis</em></td>
<td>LC</td>
<td>04</td>
<td>X</td>
</tr>
<tr>
<td>5</td>
<td>Seagulls</td>
<td></td>
<td>LC</td>
<td>62</td>
<td>X</td>
</tr>
<tr>
<td>6</td>
<td>Black Headed Bunting</td>
<td><em>Emberiza melanocephala</em></td>
<td>LC</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>7</td>
<td>Black Kite</td>
<td><em>Milvus migrans migrans</em></td>
<td>NT</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>8</td>
<td>Black Tailed Godwit</td>
<td><em>Limosa limosa</em></td>
<td>LC</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>9</td>
<td>Black Winged Stilt</td>
<td><em>Himantopus himantopus</em></td>
<td>LC</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>10</td>
<td>Black-bellied Plover</td>
<td><em>Pluvialis squatarola</em></td>
<td>LC</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>11</td>
<td>Black-headed Gull</td>
<td><em>Larus ridibundus</em></td>
<td>LC</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>12</td>
<td>Blue Rock Pigeon</td>
<td><em>Columbia livia</em></td>
<td>LC</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>13</td>
<td>Blyth’s Reed Warbler</td>
<td><em>Acrocephalus dumetorum</em></td>
<td>LC</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>14</td>
<td>Brahminy Kite</td>
<td><em>Haliaster indus</em></td>
<td>LC</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>15</td>
<td>Caspian Tern</td>
<td><em>Sterna caspia</em></td>
<td>LC</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>16</td>
<td>Cattle Egret</td>
<td><em>Bulbulcus ibis</em></td>
<td>LC</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>17</td>
<td>Common Heron</td>
<td><em>Ardea cinerea</em></td>
<td>LC</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>18</td>
<td>Common Sandpiper</td>
<td><em>Actitis hypoleucos</em></td>
<td>LC</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>19</td>
<td>Common Swallow</td>
<td><em>Hirundo rustica</em></td>
<td>LC</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>20</td>
<td>Common Tern</td>
<td><em>Sterna hirundo hirundo</em></td>
<td>LC</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>21</td>
<td>Curlew Sandpiper</td>
<td><em>Calidris ferruginea</em></td>
<td>LC</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>22</td>
<td>Dunlin</td>
<td><em>Calidris alpina</em></td>
<td>LC</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>23</td>
<td>Eurasian Curlew</td>
<td><em>Numenius arquata</em></td>
<td>NT</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

- LC= Least Concerned  NT= Near Threatened

5.3.2 Terrestrial Fauna of the Project Area

5.3.2.1 Mammalian Fauna of the Project Area

The proposed project area sustains few insignificant mammals such as: Five striped palm squirrel, Roof rat and House mouse are the common species of the area while small Indian mongoose is less common.
None of the species were recorded as protected, threatened or included in the CITES appendices.

5.3.2.2 Sampling Methodology

Direct count method was adopted to identify total number of identified species during the ecological/baseline surveys. The list of identified mammals is presented below Exhibit 5.7

Exhibit 5.7: List of Identified Mammals of the Project Area

<table>
<thead>
<tr>
<th>S. No</th>
<th>English Name</th>
<th>Scientific Name</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Five-striped Palm Squirrel</td>
<td><em>Funnambulus pennantii</em></td>
<td>x</td>
</tr>
<tr>
<td>2</td>
<td>Roof Rat</td>
<td><em>Rattus Rattus</em></td>
<td>x</td>
</tr>
<tr>
<td>3</td>
<td>House Mouse</td>
<td><em>Mus musculus</em></td>
<td>x</td>
</tr>
<tr>
<td>4</td>
<td>Small Indian Mongoose</td>
<td><em>Herpestes javanicus</em></td>
<td>x</td>
</tr>
</tbody>
</table>

5.3.2.3 Herpeto Fauna of the Project Area

Sampling Methodology

A Line transects of 200 m by 20 m were placed at each sampling location and reptiles were surveyed by active search during the day. The sampling sites were actively searched for all types of reptiles along the line transects. Active searching was also carried out in sampling areas with a focus on their microhabitats.

Brief Description

The specimens were identified with the help of the most recent keys available in literature (Khan, 2006). Small mammals such as rodents, squirrels are reported from the Study Area. A low abundance and diversity of the reptiles species was observed in the Study Area. Most of the reptiles observed were seen associated with vegetation. During the survey, a reptile species most commonly observed in the Study Area was the Sindh Gecko *Crossobamon orientalis*

5.3.3 Marine Benthic Invertebrates

This community includes the microbes: detritus feeders, small and large herbivores, and small and large carnivores. In the mangrove ecosystem, the benthic community of the adjacent shallow water is a subject of interest. Here, the
microbes decompose the plant litter into organic detritus - a fundamental commodity for the transfer of energy from lower to higher trophic level.

The benthic sediments samples were collected from 2 different locations. **Exhibit 5.8** The marine invertebrates play an important role in mixing the organically enriched bottom sediments and are the key linkages in transferring the energy from lower trophic level to the next higher trophic level in the food chain

<table>
<thead>
<tr>
<th>Location</th>
<th>Latitude N</th>
<th>Longitude E</th>
<th>Substrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station 1</td>
<td>24°46’9.62 N</td>
<td>67°20’7.53 E</td>
<td>Mud/clay</td>
</tr>
<tr>
<td>Station 2</td>
<td>24°45’49.12 N</td>
<td>67°20’36.15 E</td>
<td>Muddy/clay</td>
</tr>
</tbody>
</table>

**Exhibit 5.8:** Benthic Sediments/ Macrofauna Sampling Station Map
5.3.3.1 Sampling Methodology

The benthic samples were collected by using a sediment grab. The collected samples were preserved by adding 10% formalin. The samples were analyzed by the Centre of Excellence in Marine Biology (CEBM) University of Karachi. At CEMB, UOK the sample were homogenized vigorously and drawn into the tray (20 cm Length, 13.5 cm width, and 4 cm height). The benthic sediment samples were spread equally and depth of sample was measured before taking subsample for replicate sample analysis. For each sample 10 cm square sample along with 100 ml liquefied water was taken into separate bottle and preserved in 10% formalin mixed with Rose Bengal for staining of animals. Two replicates were analyzed for each sample and means were calculated for each macrofauna taxonomical group identified. The macrofauna were separated through the sieving of the sediments; for macrofauna 63 mm mesh size sieve was used. Observations were made through available keys of macrofauna identification. Samples were enumerated and micro photographed under the binocular stereo microscope. The data sheet was prepared for the statistical analysis.

5.3.3.2 Brief Description

The Marine Invertebrates plays an important role in mixing the organically enriched bottom sediments. The abundance of species in the given habitat are given in (Exhibit 5.9). The Marine Benthic Invertebrates (MBI) are key linkages in transferring the energy from lower trophic level to the next higher trophic level in the food chain.
**Exhibit 5.9:** Marine Benthic Invertebrate Fauna Observed at 2 Locations in Proximity

![Bivalve](image1)

![Bivalve](image2)

![Bivalve](image3)

![Bivalve](image4)

![Bivalve](image5)

![Gastropod](image6)

![Gastropod](image7)

![Gastropod](image8)

![Nematode](image9)

![Polycheats](image10)

![Sarcomastigophora](image11)

**Exhibit 5.10:** Descriptive Statistics of Marine Benthic Fauna at the Sampled Locations

<table>
<thead>
<tr>
<th>Sample</th>
<th>Mean Individuals</th>
<th>Variance</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
<th>Total Individuals</th>
<th>Total Species</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station 1</td>
<td>17.667</td>
<td>679.467</td>
<td>26.067</td>
<td>10.642</td>
<td>106</td>
<td>5</td>
<td>0</td>
<td>68</td>
<td>543.687</td>
</tr>
<tr>
<td>Station 2</td>
<td>7.667</td>
<td>27.867</td>
<td>5.279</td>
<td>2.155</td>
<td>46</td>
<td>6</td>
<td>3</td>
<td>16</td>
<td>22.298</td>
</tr>
</tbody>
</table>
5.3.3.3 Distribution of MBI

The species distribution pattern of benthic invertebrates in the project area of interest show random distribution pattern, while a few species aggregate exhibit 5.11. Statistically, the dispersion of a Population determines the relations between the variance and the arithmetic mean. If the variance more or less equals mean than the Population is said to be randomly distributed. If the variance is less than the mean the Population is termed as regularly distributed. And if the variance is greater than the mean than the Population is considered to be an aggregate population that are known to be found in clumps. The distribution of invertebrates is dependent on the surface current that redistributes the planktonic larval form to locations away from where they were spawned they are hence random in their population densities. Aggregation is also a function of reproduction, where the benthic organisms tend to colonies together. The substrate sediment samples taken from the project area contained the following species, Sarcomastigophora, Nematode worms, bivalve mollusk, showed aggregate distribution pattern, these faunal groups were by far the most dominant benthic species in the benthic sediment samples collected from the project site in PQA.

Exhibit 5.11: Distribution of MBI at the Sampled Locations

<table>
<thead>
<tr>
<th>Species</th>
<th>Variance</th>
<th>Mean</th>
<th>Chi-sq</th>
<th>d.f.</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastropod Shells</td>
<td>0.5</td>
<td>3.5</td>
<td>0.1429</td>
<td>1</td>
<td>Random</td>
</tr>
<tr>
<td>Nematode</td>
<td>128</td>
<td>8</td>
<td>16</td>
<td>1</td>
<td>Aggregated</td>
</tr>
<tr>
<td>Bivalve Shells</td>
<td>12.5</td>
<td>7.5</td>
<td>1.6667</td>
<td>1</td>
<td>Random</td>
</tr>
<tr>
<td>Broken shells</td>
<td>128</td>
<td>15</td>
<td>8.5333</td>
<td>1</td>
<td>Aggregated</td>
</tr>
<tr>
<td>Sarcomastigophora</td>
<td>2112.5</td>
<td>35.5</td>
<td>59.507</td>
<td>1</td>
<td>Aggregated</td>
</tr>
<tr>
<td>Polychaets</td>
<td>60.5</td>
<td>6.5</td>
<td>9.3077</td>
<td>1</td>
<td>Aggregated</td>
</tr>
</tbody>
</table>

**Key**

- **Variance:** Measure of how far a set of numbers is spread out
- **Mean:** Average of numbers
- **Chi-sq:** The chi-squared distribution (also chi-square or $x^2$-distribution) with k degrees of freedom is the distribution of a sum of the squares of k independent standard normal random variables.
- **d.f.:** Degree of Freedom.

5.3.3.4 Shannon Weiner Diversity Index

Shannon–Weiner Bio Diversity index was performed to evaluate the biodiversity index of the benthic invertebrates at all the three sampled stations. Exhibit 5.12 Shows the Bio Diversity index to be relatively higher at station 1 (Hmax 0.699) and
station 2. (Hmax 0.778). The bio Diversity calculated was comparatively lower. (Range 0.1- 3.0). The species richness (J’) ranged from 0.626 stations 1 and 0.894 at station 2. (Range 0.1 to 1.0) The biodiversity values of benthic invertebrates in Kadero Creek, PQA is generally low and remains poor since it is a disturbed area due to shipping and other coastal related activities.

**Exhibit 5.12:** Shannon Weiner Biodiversity Index Calculated For the 2 Sampled Locations

<table>
<thead>
<tr>
<th>Index</th>
<th>Station 1</th>
<th>Station 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shannon H’ Log Base 10.</td>
<td>0.437</td>
<td>0.696</td>
</tr>
<tr>
<td>Shannon Hmax Log Base 10.</td>
<td>0.699</td>
<td>0.778</td>
</tr>
<tr>
<td>Shannon J’</td>
<td>0.626</td>
<td>0.894</td>
</tr>
</tbody>
</table>

**5.3.3.5 Conservation Status**

Marine Benthic invertebrates are essential for the energy transfer within the coastal ecosystem. None of the species observed in the project area are vulnerable, threatened or endangered as per the IUCN criteria. However, due care must be taken so as not to unduly disturb the faunal communities. Marine benthic Invertebrates (macrofauna) (0.5mm) have a short regeneration/reproductive life cycle. They quickly recolonize within a short span of about 2-3 weeks. The impact would be Marginal that is when the activity cause slight reversible damage to a few species within a population over a short period of time, with no indirect effect to socio-economic activities. As such no mitigation measures are suggested.

**5.3.4 Benthic Fish Community**

Benthic fish community includes detritus feeders, small and large herbivores, and small and large carnivores. In the mangrove ecosystem, the benthic community of the adjacent shallow water is a subject of interest. Here, the microbes decompose the plant litter into organic detritus - a fundamental commodity of system energy. This detritus matter is picked up by the detritus feeders over the bottom, such as fishes, shrimps and shellfish, and then carried to the littoral zone by wave action, shared by the intertidal fauna such as crabs, shrimps, mudskippers, and other invertebrates. Grey mullets, gizzard shads, flat fishes, many skates and rays are some of the fish which prefer to live on soft bottom and feed on bottom detritus. At low tide, when a large part of muddy bottom is exposed, crabs, mudskippers and birds are seen in large numbers picking up their food which includes worms and different animals left behind by the receding tide.
5.3.5  Pelagic Fish Community

This community includes powerful swimmers, which are exclusively carnivore in nature like predaceous fishes, mullets croakers, snappers, carangids breams, perchers, and sea snakes. In the mangrove ecosystem the predaceous forms are often small in size and easily wander among the mangroves at high tide (Bianchi, 1985). The local fisher folk use small gill set nets across small tidal creeks to trap between 2-10 kg of fish mostly mullets (*Mugil cephalus*) during ebb and flow tides. Local fishing community members, fish for mud crabs *Scylla serrata* during low tide. The mud crab, burrows in mudflats in close proximity to the mangrove plantation. The locals excavate the soft mud with bare hands or a hooked iron rod is used which is inserted into the mud crab dwelling during the exposed mud flats at low tide. The crabs are caught from their habitats and kept alive in moist gunny bags. The locals earn their livelihood through the capture and sale of mud crabs.

5.3.5.1  Conservation Status

None of the species observed in the project area are vulnerable, threatened or endangered as per the IUCN criteria. Maintenance dredging, reclamation activity during the construction phase in the designated coal wharf 3 &4 area in PQA,
would have a Moderate Impact on the fisheries of the area. The dredging, reclamation activity would affect a portion of a population causing short term reversible change in abundance/distribution over one generation, with no indirect effect to socio-economic activities. The fish would temporarily move to other less disturbed nearby areas. The suggested mitigation option would be to curtail dredging and reclamation activity during the spawning period of coastal fish (July/August) SW Monsoon period.

5.3.6 Marine Mammals, Turtle and Endangered Species

Dolphins have been sighted in the Indus deltaic region and in the PQA area. The survey team did not observe any dolphins in the area during the survey. There is no published information available with regards to the number of Cetaceans that visit the PQA area. Similarly, the team did not find any turtles or turtle remnants in the area or any turtle tracks were found on the muddy shores. No turtle nest was observed. It is unlikely that the turtles would nest in muddy substrate, they prefer sandy substrates instead.

5.3.6.1 Conservation Status

The survey team did not encounter any vulnerable, threatened, endangered marine species of birds, listed in the IUCN Red Book (2013) from the proposed Coal Wharf 3 & 4 PQA.
Exhibit 5.13: Pictorial Profile of the Biodiversity Survey Team
5.3.7 CONCLUSION

Marine benthic invertebrates are essential for the energy transfer within the coastal ecosystem. However, they have a short reproductive life cycle, especially the marine benthic meiofauna (0.5 mm) that can quickly re-colonize a new site within a short span of about 2 – 3 weeks.

None of the MBI species reported or observed in the vicinity are included in the IUCN Red List. Even though individuals are liable to be killed, the habitat loss associated with any construction activity is not likely to have a significant long-term impact on the MBI species due to their ability to re-colonize quickly.

The local fishermen are also engaged in catching undersize juveniles of fish that is converted into trash fish, swimming crabs (*Portunus pelagicus*) and juvenile shrimps (*Metapenaeus spp*) from the area due to any construction and repair activity of the wharf 3&4, may not lead to decline in the abundance of these species. The noise levels may redistribute the local fish population temporarily; the fish join other fish schools, only to return back to the area. It is submitted that no commercial fishing activity is not allowed in the PQA navigation channel.
6.1 SCOPE AND METHODOLOGY

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 area. The approach and methodology was a combination of qualitative and quantitative data gathering techniques. The data collection addresses the primary requirements of (EIA), incorporating the Pakistan Environmental Assessment Procedures 2000.

This chapter represents the assessment of the socio-economic baseline of the entire proposed project area based on social surveys. The assessment includes the administrative, demographic and social structures, amenities, health, education, livelihood, security and economics of the proposed project area. The assessment also includes a focus on the gender aspects.

6.1.1 Tools for Data Collection

The socio-economic assessment is focused on evaluation of population, languages, literacy rate, educational facilities, public health facilities, private health facilities, diseases prevailing times, 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

The PQA was established on June 29, 1973. Port Qasim is the 2nd deep sea industrial commercial port operating in Karachi. The Port is situated in Indus delta region at about a distance of 28 nautical miles in the south-east of Karachi. Port Qasim is geographically located on the trade route of Arabian Gulf. The port currently caters for more than 40% of seaborne trade requirements of the country. The port is engaged in providing shore based facilities and services to international shipping lines.

The proposed coal transshipment project lies on the marginal wharf of Port Qasim. However it is important to note that the port is located in one of the largest industrial zones of Karachi namely Bin Qasim industrial area. Three major
industrial areas are located in the proposed project vicinity namely the eastern, northern, southwestern zones and Pakistan steel mills. (PQA) is the main administrative body of the whole town. Administrative setup of the project area has been presented below as Exhibit 6.1.

Exhibit 6.1: Administrative Setup of the Proposed Project Area

6.3 ENTRY AND EXIT POINT

The proposed coal transshipment project lies in the jurisdiction of the industrial area of Bin Qasim on the Marginal Wharf of Port Qasim, the area of PQA is less populated but it is rapidly growing as administrative towns of Karachi city. The local administration is working on the development and maintenance of roads and infrastructures and has led to the development of link roads and traffic networks in the city. The considerable major access routes to the proposed project area are:

- Port Qasim Road
- National Highway – (N5)

6.4 DEMOGRAPHICS

Karachi is the largest city of Pakistan and it is world’s 5th largest city, spread over an area of 3,530 square kilometers. The city credits its growth to the mixed populations of economic and political migrants and refugees from different national, provincial, linguistic and religious origins that come to settle here permanently along with their families.

The population of Bin Qasim Town is approximately 1,260,000 (Pakistan Economic Survey 2013-2014). However the population of the city is exponentially increasing

with the passage of time due to the rapid developmental activities such as new residential towns are being developed to reduce the burden of overpopulation on the central city. There are seven union councils in Bin Qasim Town which are listed below

1. Cattle Colony
2. Gaghar
3. Gulshan-e-Hadeed
4. Ibrahim Hyderi
5. Landhi Colony
6. Quaidabad
7. Rehri

Both upper and middle class population of the city is living in the vicinity of port Qasim. Gulshan-e-Hadid and Steel Town are the two main residential areas of the proposed project area. Small Goths such as Rehri Goth and Laat Basti are located on the north western side of port Qasim, most of the residents belongs to lower middle or lower class. Both the people of Rehri Goth and Laat Basti are associated with fishing. Only a few percentage of the residents of these communities are engaged in other sectors of life for earning.

### 6.5 NETWORKING AND BUSINESS ACTIVITIES

Major portion of the surrounding area of the proposed project site are under development and new housing schemes and industries are being developed, these surrounding areas are usually considered as rural or newly developing area of Karachi. Pakistan Steel Mills is one of the significant land mark of Pakistan which exist at a distance of about 5 Km from the proposed project site. According to the officials of Pakistan Steel mills, Pakistan Steel Mill, they have employed almost 17 thousand personnel belonging to different regions, cultures from all over the country. Steel Mill has played a significant role and contributed in the economic development of Pakistan. Only Steel Town and Gulshan-e-Hadeed are among the well-developed towns in the vicinity of project area. Steel Town was purposely developed for the employees and workers of the Pakistan Steel Mills.

Additionally it is important to note that currently Berth 3 and Berth 4 are being used for import of rice, grain, cement, coal and other industrial products used by the industries within the close proximity of the proposed project site and other industries as well. Therefore it important to note that currently Berth 3 and 4 plays an important role in the industrial supply chain, development and production ultimately contributing to the economy, moreover there are few small scale dhabas and a few commercial shops located at Berth 4. These dhabas and shops are mainly utilized and facilitate the dock laborers. Exhibit 6.2 represents the business activities at berth 4.
Exhibit 6.2: The Business Activities of the Project Area

Exhibit 6.2: The Business Activities of the Project Area

- Dilawar Hotel a local Dhaba at Berth 4
- Quetta Bismillah Arafat Hotel a local Dhaba at Berth 4
- A local Fruit Cart Adjacent to Chaudry Javed Hotel at Berth 4
- Chaudry Javed Hotel a local Dhaba at Berth 4
- Bin Qasim Handi Craft Store at Berth 4
- Inside view of Handicraft Store at Berth 4

Other warehouses, industries, Hospitals, shops, Restaurants, school, college, dispensaries and pharmacies within the close proximity of the proposed project area were also observed and reported accordingly.
6.6 LIVELIHOOD

The proposed project area sustains variety of livelihood opportunities for the residents of the vicinity as well as other parts of the city. However, the livelihood opportunities in the project area can be broadly classified as; fishing and non-fishing communities.

6.6.1 The Fishing Communities of the Proposed Project Area

Fishing communities are those who are engaged with fishing as a major source of their livelihood, these communities are located on the northwestern side of the port Qasim. Additionally it is important to note that these communities are located about 15 km away from the proposed project site. These communities are a group of diverse community who resides on the seashore of Rehri Goth, Korangi creek and Ibrahim Haidiri, most of them belong to the Baloch khaskhali tribe, and they totally rely on the mangroves forest for fishing of fish, crabs and shrimps. Ibrahim Haidiri and Rehri Goth are the two biggest fishing communities of the proposed project site. Almost 90% of the fishing communities are directly or indirectly attached with fishing business in the form of net forming, boats and ships building, fisheries, selling fishes in the local as well as in international markets. The fishing communities are also engaged with ecotourism as many local tourist visit the creeks for recreational activities as well as for fishing, these sites are playing an important role for the nature explorer to explore the inner beauty of mangroves and other aquatic flora and fauna. The mangroves and migratory birds of the creeks provide aesthetic quality of life to the visitors and nature lovers.

Exhibit 6.3 represents the pictorial profile of the fishing communities nearby the proposed project area.

Exhibit 6.3: Pictorial Profile of the Fishing Communities nearby the Proposed Project Area
6.6.2 The Non Fishing (Lower Class Communities)

Non-Fishing Communities are located in the northeast of the Study Area with most of the population concentrated near Ghaghar Phattak in (commonly known as Ghaghar Crossing) on main national highway (N-5). These communities were categorized as ‘Non-Fishing Communities’ as their livelihood is mainly daily wage and labor in the industries located in PQA industrial and commercial zones, towns of Gharo Dhabeji, and Karachi city.

In addition to communities in the Study Area, the dependence of local businesses on the ecosystem services is also of relevance. These include, but are not limited to, the:

- Fishing industry
- Fish processing industry
- Salt production facilities
- Net weaving and repairing
- Boat making and repairing; and
- Tourism

6.6.3 The Non Fishing (Middle & Higher Class Communities)

Most of the people living in Steel Town belong to higher and middle income class of the proposed project area. These people are engaged with Pakistan Steel Mills while some of the people living near to the proposed project areas are working on the port, the rest of the population is working in different industrial units of North-western, south-western and eastern part of port Qasim. Livelihood of the people
living in these areas is different from the residents of central city. The residents of Gulshan-e-Hadeed and other developed towns of the proposed project area are usually engaged in private and government jobs within and outside the city. The Higher Income class of the project area is mostly engaged with businesses are mostly working in different sectors such as private and public sectors.

### 6.7 LEADERSHIP DYNAMICS

The proposed project study area has been divided into different zones depending on land use as well as resource use. About 1700 labors are working on existing berths of port Qasim. These laborers are working under the labor union of Port Qasim. The laborer union of Port Qasim is very active having a proper union structure, they have collective bargaining agents, these agents are responsible for representing the issues of labor and raise voices in case of injustice.

Additionally it is important to note that the proposed project area also sustains a variety of industries and to look after the industrial issues there is a fully functional association referred to as Bin Qasim Association of trade and Industry (BQATI) which came into existence under section 42 of companies ordinance 1984 dated February 3, 2006 with clear objectives to promote industrial activities in the area and to contribute positively to the economic well-being, industrial production and to advance, develop, protect, safeguard, and to promote the rights, interest and privileges of the industrialist, traders and service providers are having their office and / or industries / facilities in the Bin Qasim Town, Karachi.

The area is less populated so no political or religious leadership was found. As the area lies under the jurisdiction of Port Qasim authority so most of the works and issues related to the areas are being solved by the PQA, according to the local communities of the project area, most of issues are being resolved by the Port Qasim Authority and the area Police.

### 6.8 EDUCATION

There are only few renowned educational facilities are available specifically universities and colleges. These educational facilities are not enough to facilitate the communities of these areas. Most of the students within the project area seeking higher education have to travel to the central part of city.

Few renowned educational institutions in Bin Qasim Town are listed below:

- Textile Institute of Pakistan (Main Campus)
- Fast Institute (National University)
- Islamic Public School
- Askari Public School
• The Educators (Gulshan-e-Hadeed Campus)
• TCF School (Near Rehri Goth)

The educational facilities of the proposed project area are shown in **Exhibit 6.4**.

**Exhibit 6.4: Educational Facilities of the Proposed Project Area**

---

**6.9 HEALTH**

Only few hospitals and health care facilities are available within the proposed project area. In addition only one hospital is well equipped within the Bin Qasim Town namely Pakistan Steel Hospital, this hospital has a capacity of about 100 beds. This hospital can only accommodate only one Hundred serious patients at a time which is comparatively low as compared to the existing population of the community. The hospital is located on National Highway near Steel Town, which was established to facilitate the local community.

The residents of nearby Goths of the proposed project sites have only one public health facility namely Benazir Bhutto Shaheed Dispensary, which is a public facility as well as several clinics which includes; Al-Hadeed Medical Centre, Child and Mother Clinic and Family Health Care Hospitals.

Major contagious diseases in the area were observed to be GIT “Gastro Intestinal Tract Infections” and respiratory tract diseases due to the unavailability of clean drinking water and emissions of industries at Port Qasim and Pakistan Steel Mill.

Respiratory tract related infectious diseases are the major contagious disease reported in the project area, this type of diseases are directly linked with the emissions from the industrial units as well as due to the transshipment of coal and transportation of coal throughout the railway line, apart from the project area...
people of the Rehri Goth reported that they are having the epidemics of water borne, water washed and water related diseases, these disease are linked with the inadequate supply of fresh water. Exhibit 6.5 shows the health care facilities of the proposed project area.

**Exhibit 6.5: Health Care Facilities of the Proposed Project Area**

![Health Care Facilities of the Proposed Project Area](image)

**100-Bed Pakistan Steel Hospital**  
**A Child Health Care Centre in Memon Goth.**

### 6.10 CULTURE, ETHNICITY AND RELIGION

Various cultural and ethnical groups such as Baloch, Pakhthuns, Sindhi and Punjabis are living in the projects, some of the them are permanently resident of Gulshan-e-Hadeed and steel town while a major portion of the population are residing in the project vicinity due to their employment. The people of the project areas has adopted a mix lifestyle. Both the urban and rural establishments of the area have miscellaneous ethnic communities and multiples languages are spoken such as Sindhi, Punjabi, Pashtu and Balochi. The residents of Rehri Goth which is about 15 km away from the proposed project site are mostly Balochi belonging to Khaskhal tribe and they speak Balochi Language.

The developing areas and Goths of Bin Qasim Town are facilitated with basic amenities especially the peoples of bin Qasim and Gulshan-e-Hadeed. People of the project area have however established small communities according to their livelihood. The people of Steel Town and Gulshan-e-Hadeed represent urban life style and their way of life reflects the developed environment while on the other side, the inhabitants of Lutt Basti and Rehri Goth are pure Goths and their daily routine practices resemble the Sindhi rural environment.

There is a Jama masjid located at Berth 4 namely Jama Masjid e Babul Islam and a famous shrine Hassan Shah Bukhari at Russian point which is about 8 to 10 km away from the project site. Additionally it is important to note that variety of
mosques and madaris are available in each society and Goths. **Exhibit 6.6** represents the spiritual affiliations of the proposed project area.

**Exhibit 6.6: Spiritual Affiliations of the Proposed Project Area**

![Famous Shrine of Hazrat Hassan Shah Bukhari at Russian Beach](image1)

![Jama Masjid e Babul Islam at Berth 4](image2)

**6.11 RECREATIONAL AREAS**

Bin Qasim Town has few recreational areas like Quaid e Azam Park which is one of the best recreational park of the town this park was built in recent years which is adjacent to Steel Town. A large number of local people and residents from different part of Karachi visits this park and it has been noticed that on weekends the numbers of visitor increases. Another famous recreational point is the Arabian Sea Country Club situated in the centre of Bin Qasim Industrial Zone. This recreational place is basically a golf club and it is quite far from the residential areas and this facility is mostly used by Golf players. There are many playgrounds, small parks and gardens available within towns of the area especially Gulshan-e-Hadeed and Steel Town.
### Exhibit 6.7: Socioeconomic Features of the Proposed Project Area

<table>
<thead>
<tr>
<th>Well Being Indicator</th>
<th>Name of Town / Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bin Qasim Town</td>
</tr>
<tr>
<td></td>
<td><strong>GPS Coordinates</strong></td>
</tr>
<tr>
<td></td>
<td>N 24°47’22.0”</td>
</tr>
<tr>
<td></td>
<td>E 67°22’57.0”</td>
</tr>
<tr>
<td>Major Communities</td>
<td>Urdu-speaking, Punjabi, Sindhi, Pakhtoon</td>
</tr>
<tr>
<td>No. of Houses</td>
<td>105000 approx.</td>
</tr>
<tr>
<td>Livelihood</td>
<td>Labor, business, shops, transporters, Public and private jobs</td>
</tr>
<tr>
<td>Electricity</td>
<td>Available</td>
</tr>
<tr>
<td>Fueling Source</td>
<td>Available</td>
</tr>
<tr>
<td>Major Institutions</td>
<td>National University (Fast Institute)</td>
</tr>
<tr>
<td></td>
<td>About 18 km away from the project site</td>
</tr>
<tr>
<td>Literacy Rate</td>
<td>Low</td>
</tr>
<tr>
<td>Drinking Water</td>
<td>Tankers system, groundwater, KWSB</td>
</tr>
<tr>
<td>Major Health Problems</td>
<td>Malaria, Skin Diseases, Respiratory Tract Diseases</td>
</tr>
</tbody>
</table>
### Well Being Indicator

<table>
<thead>
<tr>
<th>Well Being Indicator</th>
<th>Name of Town / Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Facilities</td>
<td>Not Satisfactory</td>
</tr>
<tr>
<td>Major Hospitals</td>
<td>Pakistan Steel Hospital (100 beds)</td>
</tr>
<tr>
<td>Major Needs</td>
<td>Govt. hospitals. Modern Schools, Security, Drinking Water, Continuous Electricity</td>
</tr>
<tr>
<td>Major Markets</td>
<td>Small Markets and Shops</td>
</tr>
<tr>
<td>Transport</td>
<td>Public Transport, Motorcycle, cars, buses</td>
</tr>
</tbody>
</table>
7.1 OBJECTIVES OF PUBLIC CONSULTATION AND SCOPING MEETINGS

The main objective of public consultation and scoping meetings is to disseminate information about the project and its expected impact on the primary and secondary stakeholders. The public consultation and participation serves as an effective tool for social interaction. This tool helps to develop the significant confidence between the stakeholders and the proposed project developer so as to minimize the anticipated environmental and social impacts of the project. Additionally, it is important to note that the word primary stakeholder is usually referred to those, which may be directly affected by the proposed project’s activities while on the other hand secondary stakeholders refers to those who are usually affected indirectly or they have power to make decisions at governmental or institutional level. The most important objective of these consultation meetings was to determine the extent of the impact of different proposed project activities and suggest appropriate mitigation measures accordingly.

This section of EIA clearly describes the issues raised by the stakeholders during different consultation meetings conducted specifically for this EIA, informal and focused group discussions with the primary and secondary stakeholders were carried out which was primarily focused on determining the perceptions of the local communities, dock laborers and industries in close proximity of the proposed project area. The overall objectives of the process were as follows

- To inform and acquire feedback from primary and secondary stakeholders on proposed project activities
- To gain the consent of all the primary and secondary stakeholders for carrying out proposed project activities;
- To identify potential issues and mitigation measures;
- To incorporate stakeholders concerns in the project documents.
- To identify the negative impacts due to the project execution.

The key stakeholder groups consulted in different Socioeconomic Zones and segments of the Study Area are listed below in Exhibit 7.1
Exhibit 7.1: List of Identified and Consulted Stakeholders

<table>
<thead>
<tr>
<th>S. No</th>
<th>Stakeholder Consulted</th>
<th>Contact Person/Representative</th>
</tr>
</thead>
</table>
| **LIST OF PRIMARY STAKEHOLDERS**  
(Hotel, Shops And Community) |                                               |                                                   |
| 1     | Dock Laborers                                 | Senior Laborer: Mr Ibrahim                        |
| 2     | Dilawaer Hotel at Berth 4                     | Hotel Owner                                       |
| 3     | Chaundary Javed Hotel at Berth 4              | Hotel Manager                                     |
| 4     | Quetta Arafat Hotel at Berth 4                | Hotel Representative                              |
| 5     | Bin Qasim Handicraft Store at Berth 4         | Shop Owner: Mr. Mehmood Ghaznavi                  |
| 6     | Rehri Goth Community                          | Community Head: Mr. Omar                         |
| **LIST OF PRIMARY STAKEHOLDERS**  
(INDUSTRIES) |                                               |                                                   |
| 1     | DP World                                      | Site Manager HSE: Capt. Farrukh Husnain           |
| 2     | Pakistan House International Limited          | Manager: Mr. Aslam M.s Baggia                     |
| 3     | Mujahid Oil Refinary                          | General Manager: Mr. Khalid Warraich             |
| 4     | Mujahid Oil Refinary                          | Manager Terminal: Syed Qaiser Raza                |
| 5     | A.Puri Terminal                               | Manager: Ishrat Hussain                           |
| 6     | MaPak edible oils                             | Chief Engineer: M.Hamdullah                       |
| 7     | Terminal One Limited                          | Terminal Manager: Johar Abbas                     |
| 8     | Kashif Basit Trading                          | Terminal Operation Manager: Syed Bilal Jilani     |
| 9     | Feroz Son Tank Terminal                       | Manager: Shahid Ali Khan                         |
| 10    | Bulk Oil Terminal                             | Terminal Manager: M.Fareed Khan                   |
| 11    | Hamza Tank Terminal                           | General Manager: Tariq Shafi                      |
7.2 METHODOLOGY ADOPTED FOR CONSULTATION MEETINGS

A team of environmental and social impact assessment specialist identified the relevant stakeholders and requested different stakeholders for consultation and scoping meetings as per their convenience, formulated project specific consultation questionnaire and conducted focused group discussions (FGDs) key informant interviews (KII) and the industry specific consultation questionnaires were distributed among the industries in close proximity of the proposed project to identify their concerns and opinions regarding the proposed project. These meetings included all the identified stakeholders such as; dock laborers, governmental departments and institutes, business communities, local communities and NGOs etc. A point vise summary of overall consultation process is as follows:

- Organization of consultation meetings at prominent places to meet the targeted audience.
- A simple non-technical description of the project was given, along with an overview of the project’s likely human and environmental impact.
Following the project description, a discussion was held so that the participants could raise their voice concerns and opinions.

All the stakeholders were encouraged to ask questions and share their concerns related to the project.

Participants were asked to suggest alternatives in case of their particular concerns.

The concerns and suggestions were recorded in field notes.

Dock laborers and industries located in close proximity of the proposed project area were identified as primary stakeholders since it has been anticipated that they are the ones who may be directly affected by the proposed project activities, in both construction and operational phase.

7.3 STAKEHOLDER CONSULTATION OUTCOMES

As discussed above stakeholder consultations were carried out with both primary and secondary stakeholders using FGDs and KII questionnaires as an effective tool for the process. The outcomes and findings of the consultation meetings with primary stakeholders have been presented below under the heading 7.3.1 similarly outcomes and findings of consultation meetings with secondary stakeholders have been presented under the heading 7.3.2 accordingly.

7.3.1. Primary Stakeholder Consultations Outcomes & Findings

7.3.1.1. Focused Group Discussions Outcomes

<table>
<thead>
<tr>
<th>Stakeholder Consulted</th>
<th>Dock Laborers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultation/Meeting Venue</td>
<td>Berth 3 &amp; 4</td>
</tr>
<tr>
<td>Name And Contact Details Of Focal Person</td>
<td>Mr. Ibrahim 0347-2487298</td>
</tr>
<tr>
<td>Years of Association with Profession</td>
<td>28 Years</td>
</tr>
</tbody>
</table>

Concerns And View Regarding The Project:

- 1751 laborers are working here since 30 years, the laborers were observed to be insecure regarding their job security since most of them are untrained to operate sophisticated equipment for coal transshipment.
### Stakeholder Consulted

Worker union of Port Qasim

### Consultation/Meeting Venue

Union office

### Name And Contact Details Of Focal Person

General Secretary  
Mr. Hussain Badsha  
0344-0760720

### Years of Association with Profession

05 Years

### Concerns And View Regarding The Project

- The union representatives showed serious concern regarding environmental pollution since the transportation wagons will be uncovered from Port Qasim till Sahiwal, they foresee serious level of air pollution because of coal particles dispersion.

- The union recommended that the project developer should use advanced technologies to prevent coal dispersion in the project vicinity and across all the possible routes through which coal will be transported.

- The union supported the project, since it is in the greater national interest.

- The union demanded adjustment of local laborers in the proposed project as with an appropriate ratio and as per the need of the project developer.
### Stakeholder Consulted
- **Local Community**

### Consultation/Meeting Venue
- Otaq at Rehri Goth

### Name And Contact Details Of Focal Person
- **Mr. Omar**
  - Contact Number: 0346-2032344
  - Years of Association with Profession: 20

### Concerns And View Regarding The Project
- The community was observed to be interested in different business and employment opportunities associated with the proposed project.
- The community was observed to be expressive and was more than willing to offer their skill set for the project developers, which included boating and fishing activities.
- The community requested the project developer for establishment of few small scale educational and health care facilities as a CSR activity.

---

### 7.3.2. Views of Industrial Representatives of Bin Qasim Industrial Area

The concerns and views of the industrial representatives regarding the proposed project are summarized as follows:

- One of the major concerns identified among, the industries mentioned in *Exhibit 7.1* was that the existing industries may lose business.

- The industries recommended that PQA should arrange a separate jetty which should be away from the existing industries in close proximity of berth 3 & 4 in order to avoid contamination of food grade products.

- Majority of industries had serious concern regarding the handling of coal and it was observed that most of the industrial site mangers suggested that the coal transshipment project at berth 3 & 4 may result in adverse impacts on the current existing environment and on to the human health.
### 7.3.3. Key Informant Interviews Outcomes

<table>
<thead>
<tr>
<th>Stakeholder Consulted</th>
<th>Bin Qasim Handicraft Store at Berth 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultation/Meeting Venue</td>
<td>Store</td>
</tr>
<tr>
<td>Name And Contact Details Of Focal Person</td>
<td>Mehmood Ghaznavi</td>
</tr>
<tr>
<td>Years of Association with Profession</td>
<td>10 years</td>
</tr>
</tbody>
</table>

**Concerns And View Regarding The Project**

- The shop owner was aware that the existing structures on berth 4 will be demolished and we will have to leave the existing shop.
- The owner did not receive any notification for evacuating this place so far.
- The owner was ready to oblige the rules and regulations of the authority and will leave the area, after receiving the formal notice.
- Shop owner was insecure regarding the existing business and reported if we move to some other place even within the proximity of Bin Qasim our business will be affected.

<table>
<thead>
<tr>
<th>Stakeholder Consulted</th>
<th>Dilawar Hotel at Berth 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultation/Meeting Venue</td>
<td>Existing Hotel</td>
</tr>
<tr>
<td>Name And Contact Details Of Focal Person</td>
<td>Owner</td>
</tr>
<tr>
<td>Years of Association with Profession</td>
<td>10 years</td>
</tr>
</tbody>
</table>
### Concerns And View Regarding The Project

- The owner was very much positive and was ready to oblige the authority and evacuate from the area.
- The owner demanded a proper notification from the authority before evacuating the place.
- The owner showed concern regarding dock laborers as they prefer this hotel for breakfast, lunch and dinner they may face difficulties if this hotel is moved.

### Stakeholder Consulted

**Chaundy Javed Hotel at Berth 4**

<table>
<thead>
<tr>
<th>Consultation/Meeting Venue</th>
<th>Existing Hotel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name And Contact Details Of Focal Person</td>
<td>Hotel Manager</td>
</tr>
<tr>
<td>Years of Association with Profession</td>
<td>08 years</td>
</tr>
</tbody>
</table>

**Quetta Arafat Hotel at Berth 4**

<table>
<thead>
<tr>
<th>Consultation/Meeting Venue</th>
<th>Existing Hotel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name And Contact Details Of Focal Person</td>
<td>Hotel representative</td>
</tr>
<tr>
<td>Years of Association with Profession</td>
<td>10 years</td>
</tr>
</tbody>
</table>

**Concerns And View Regarding The Project**

- The hotel manager reported that they haven’t received any notification from PQA till now.
- Once they receive the notice they are ready to oblige the authority.
- The owner demanded a proper notification from the authority before evacuating the place.
7.3.4. Secondary Stakeholder Consultations Outcomes & Findings

7.3.1.1 Focused Group Discussions Outcomes

<table>
<thead>
<tr>
<th>Stakeholder Consulted</th>
<th>PQA</th>
</tr>
</thead>
</table>
| Consultation/Meeting Venue | DG Office  
PQA |
| Name And Contact Details Of Focal Person | Director General  
Mr. Shabir Qazi |
| Years of Association with Profession | ----------- |

Concerns And View Regarding The Project

- PQA has allowed the project developer to utilize Berth 3 & 4 for coal handling.
- The proposed coal transshipment project is much better than the current coal handling practices at Berth 3 & 4.
- The proposed project is likely to increase employment opportunities for the laborers, since Berth 1 & 2 will be utilized for handling of other items which was previously handled at Berth 3 & 4 in addition to this it will also create job opportunities for laborers.
- PQA has authorized the project developer to dismantle the existing structures i.e. the store house and hotels at berth 4, however has strongly instructed the developer to dispose of the demolition waste at PQA designated solid waste disposal site.
- PQA is willing to provide some space to the existing hotels and a handicraft shop at Berth 1 & 2.
- Traffic management is not going to be an issue in case if heighted cargos are imported because now Berth 1 & 2 will be utilized for handling of other item, however we would like to recommend the sufficient height of elevated steel trestle for conveyor belt 4.
- The Berth 3 & 4 will be operated for coal transshipment because there is an urgent need to supply coal at Sahiwal for the 2 X 660 MW power plants; hence this project is in greater national interest.
### Stakeholder Consulted

<table>
<thead>
<tr>
<th>Stakeholder Consulted</th>
<th>Environment and Safety Department &amp; Marine Pollution Control Centre</th>
</tr>
</thead>
</table>

### Consultation/Meeting Venue

<table>
<thead>
<tr>
<th>Consultation/Meeting Venue</th>
<th>Port</th>
</tr>
</thead>
</table>

### Name And Contact Details Of Focal Person

<table>
<thead>
<tr>
<th>Name And Contact Details Of Focal Person</th>
<th>Deputy Manager E&amp;S: Mr. Sham Lal Sharma</th>
</tr>
</thead>
</table>

### Years of Association with Profession

<table>
<thead>
<tr>
<th>Years of Association with Profession</th>
<th>-----------</th>
</tr>
</thead>
</table>

### Concerns And View Regarding The Project

- Dust generation has been always a problem here due to coal unloading from ships.
- Prevention and control systems should be designed to protect both workers health and the general environment.
- Environmental consequences include the effect of fine particles on atmosphere, visibility, damage to buildings, effects on vegetation and animals, and health effects on people in surrounding.
- As in the workplace, the first priority is to prevent the generation of airborne dust, and, if generation cannot be prevented, then secondly, its removal.
- Measures that minimize waste generation should be given priority, and any inevitable waste disposal should be so planned as to avoid environmental damage.
- There are SOPs developed for handling and transportation of coal prepared by cargo & environment and safety department.
- There are edible oil industries that can be affected by coal dust; trolleys of coal on conveyer belt should be covered to reduce dust release in air.
Stakeholder Consulted: BQATI

Consultation/Meeting Venue: BQATI Conference Hall

Name And Contact Details Of Focal Person:
- General Secretary
- Mr. Abdur Rehman Ismail
- 0321-2102187

Years of Association with Profession: --------------

Concerns And View Regarding The Project:

- BQATI Bin Qasim Association of Trade and Industry had serious concerns regarding the coal transshipment project.

- It was observed that the Association was very much concerned regarding the coal dispersion within the close proximity of Berth 3 & 4, mainly because edible oil industries are at a distance of about 2-3 km from the proposed project site.

- The Association strongly recommended that the project developer should ensure that coal transshipment project should not result in coal dispersion within the close proximity of the proposed project.

- The height of steel trestle to be used to elevate BC 4 across the road should be sufficient enough to ensure smooth traffic flow.

- It was strongly recommended that the project developer should ensure implementation of all the mitigation measures to prevent coal dispersion and traffic congestion so as to avoid future litigations.

- Association raised few queries regarding the operational phase and address the concerns in the form of action plan as soon as possible before execution of the proposed project.
7.3.1.2 Key Informant Interviews

<table>
<thead>
<tr>
<th>Stakeholder Consulted</th>
<th>WWF Karachi, Pakistan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultation/Meeting Venue</td>
<td>WWF office Karachi</td>
</tr>
<tr>
<td>Name And Contact Details Of Focal Person</td>
<td>Technical Director &amp; Ex DG Marine Fisheries Mr. Muazzam Ali Khan</td>
</tr>
<tr>
<td>Years of Association with Profession</td>
<td>20 years</td>
</tr>
</tbody>
</table>

Concerns And View Regarding The Project

- No major impacts on fisheries are foreseen however in case of major spills or accident the whole area will be adversely impacted, including all the components of ecosystem.
- Coal is inert material itself but it is not going to exhibit any adverse impact even if it spills into the sea until and unless it is burnt.
- Mangroves can be affected by air dispersion containing coal.
- Positive impacts on social life are foreseen.
- Human safety must be ensured in case of this project.
- Environmental spills and release should be controlled and strategies should be adopted in case of accidents.
- The developmental projects should be supported, however due consideration should be given to environmental, human health and safety conservation, prevention and control.

<table>
<thead>
<tr>
<th>Stakeholder Consulted</th>
<th>IUCN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultation/Meeting Venue</td>
<td>IUCN Office Karachi</td>
</tr>
<tr>
<td>Name And Contact Details Of Focal Person</td>
<td>NRM Coordinator National Coordinator MFF Mr. Ghulam Qadir Shah</td>
</tr>
<tr>
<td>Years of Association with Profession</td>
<td>---------</td>
</tr>
</tbody>
</table>
### Concerns And View Regarding The Project

- Mangroves may be affected due to coal dispersion, suspended particles which will disperse in air can affect photosynthesis process.

- Storage area should be properly designed to prevent coal dispersion.

- Coal storage yard should be away from main terminal at any secure place inland.

- It was suggested that the project developer should contribute for environmental management; they are using this area so they should give some margin of their profit for environment and contribute significantly for environmental conservation.

- The project developer should oblige all the applicable environmental, health and safety, social and laborer laws of the state accordingly.

### Stakeholder Consulted

<table>
<thead>
<tr>
<th>Stakeholder Consulted</th>
<th>SEPA</th>
</tr>
</thead>
</table>

### Consultation/Meeting Venue

<table>
<thead>
<tr>
<th>Consultation/Meeting Venue</th>
<th>SEPA Office Karachi</th>
</tr>
</thead>
</table>

### Name And Contact Details Of Focal Person

<table>
<thead>
<tr>
<th>Name And Contact Details Of Focal Person</th>
<th>DG SEPA Mr. Naeem Mughal</th>
</tr>
</thead>
</table>

### Years of Association with Profession

<table>
<thead>
<tr>
<th>Years of Association with Profession</th>
<th>-----------</th>
</tr>
</thead>
</table>

### Concerns And View Regarding The Project

- It was suggested that a combined coal transporting terminal can be made in order to cater the needs for the Lahore-Sahiwal power plant and also PQEPC.

- It was strongly recommended that the project developer should while making sure that all the relevant environmental laws are obliged by them and pursue project developmental activities after receiving the NOC from SEPA.

- It was also recommended that make sure all the environmental issues regarding the coal transfer facility should be addressed.

- SEPA supports the proposed project and cooperation for the same will be offered, however the developer must comply with the state law.
- Pakistan Railway Minister Khawaja Saad Rafique has directed Pakistan Railways administration to make such policies for the next two years in which operational system and the China-Pak Economic Corridor (CPEC) could be focused.

- Government of Pakistan has already planned to increase the number of existing hopper wagons and has planned to order about 200 new hopper wagons for coal transportation across the country.

- One train will have 40 hopper wagons and capacity of each hopper wagon is about 60 tons which means each one train will be capable of carrying 2400 tons of coal.

- To control traffic Pakistan Railway is upgrading its existing signaling system which will be beneficial to control traffic and the proposed project will not be any hindrance in smooth traffic flow.

- Development and maintenance of marshalling yard, should be responsibility of project developer.

- Railway track related construction and maintenance will be done by Pakistan Railways.

- In case of any accident on route to power plant, it is client’s liability to ensure safety of coal.

- It is strongly recommended to spray any binding agent before coal transportation to prevent dispersion.

- Country is facing severe energy crisis so these type of development projects will make positive impacts on socio economic.
Stakeholder Consulted | Marine Fisheries
--- | ---
Consultation/Meeting Venue | Marine Fisheries Office Karachi
--- | ---
Name And Contact Details Of Focal Person |
DG Mr. Israr Ahmed
--- | ---
Years of Association with Profession | 
--- | ---
Concerns And View Regarding The Project |
- The proposed project will exhibit positive socioeconomic impacts, as it will enhance the job opportunities.
- Due consideration must be given to prevent coal dispersion, as dispersion will impact the area badly and severely.
- Will enhance business activities indirectly as the coal will be supplied to power plant and sufficient power will be generated in country hence industrial production will enhance.
Analysis of alternatives is an integral part of the EIA process to select the best option among all the possible project options such as:

- Site
- Technology/Design

The assessments and recommendations made by the EIA team are presented below:

### 8.1 PROJECT SITE ALTERNATIVES ANALYSIS

As discussed previously in chapter 2 of the report the proposed project is for unloading and transshipment of coal from best possible and available ports within the country, ultimately this coal will be utilized to feed the 2X660 MW power plants in Sahiwal. The annual requirement of these power plants has been presented below as Exhibit 8.1

**Exhibit 8.1:** Annual Coal Consumption of Sahiwal Power Plants

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Design Coal</th>
<th>Check Coal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 Boiler</td>
<td>2 Boilers</td>
</tr>
<tr>
<td>Coal consumption per year</td>
<td>10^4 t/a</td>
<td>200.5</td>
<td>401.0</td>
</tr>
</tbody>
</table>

The figures mentioned above in Exhibit 8.1 represent that these power plants will require huge quantities of coal on annual basis; therefore it is important to note that the coal which has to be imported needs large wharf capacities where the imported coal can be stored, handled and transported easily. The available ports for handling such bulk quantities within the country are:

- Karachi Port.
- Port Qasim.
8.1.1 Analysis of Karachi Port for Transshipment of Coal to Sahiwal

Karachi Port is currently the largest port in Pakistan, presently there are 30 berths for coal, cement, petroleum, chemicals and containers etc. which are operational and occupied already. Therefore Karachi Port is also not a feasible alternative site option to be considered for transshipment of coal to Sahiwal.

8.1.2 Analysis of Port Qasim for Transshipment of Coal to Sahiwal

Location of the Port Qasim makes it very well connected to the transportation infrastructure of the country. It is at distance of only 15 km from the national highway, providing direct access to the hinterland through road. A further 14 km of railway track inside the terminal links it to the national railway network through 6 railway tracks. Therefore it has been observed that the Port Qasim is the ideal site for development of coal transshipment project. However it is important to note that Port Qasim is already occupied as well Exhibit 8.3 represents the current allocation of terminals while on the other hand Exhibit 8.4 represents the available options for coal transshipment project.

**Exhibit 8.2: The Current Allocated Terminals at PQA**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Berths</th>
<th>Berth Length</th>
<th>Owned by</th>
<th>Deadweight tonnage DWT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multipurpose Terminal</td>
<td>4</td>
<td>200 m</td>
<td>PQA</td>
<td>35,000</td>
</tr>
<tr>
<td>Container Terminal</td>
<td>3 (Terminal 1) + 2 (Terminal 2)</td>
<td>712 m (Terminal) + 615 m (Terminal 2)</td>
<td>Qasim International Container Terminal</td>
<td>45,000</td>
</tr>
<tr>
<td>Liquid Chemical Terminal</td>
<td>1</td>
<td>TBC</td>
<td>Engro Vopak Terminal Limited</td>
<td>75,000</td>
</tr>
<tr>
<td>Oil Terminal</td>
<td>1</td>
<td>TBC</td>
<td>Fotco Oil Terminal</td>
<td>75,000</td>
</tr>
<tr>
<td>Multipurpose Terminal</td>
<td>4</td>
<td>200 m</td>
<td>PQA</td>
<td>35,000</td>
</tr>
</tbody>
</table>

As per the above mentioned information out of 4 available berths owned by PQA two can be allocated for the proposed project.
Exhibit 8.3: Available Berths for Coal Transshipment Project

Key: Yellow = Occupied terminals, Blue = Berth 1 & 2 and Green = Berth 3 & 4

<table>
<thead>
<tr>
<th>S. No</th>
<th>SITE</th>
<th>LIMITATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>KPT</td>
<td>30 berths for coal, cement, petroleum, chemicals, containers etc already occupied</td>
</tr>
<tr>
<td>2</td>
<td>Port Qasim</td>
<td>Only 4 multipurpose berths available i.e. berth 1, 2, 3 and 4</td>
</tr>
</tbody>
</table>
8.2 PROJECT TECHNOLOGY ALTERNATIVES ANALYSIS

Currently the project developer intends to use water as a coal dust abatement and suppression technique during the following activities:

- Coal storage.
- After loading the coal transfer wagons.

The recommended alternatives to suppress coal dust to be used instead of water after loading coal transfer wagons has been presented below as Exhibit 8.4.

Exhibit 8.4: Recommended Alternative for Coal Dust suppression

<table>
<thead>
<tr>
<th>S. No</th>
<th>Alternative Coal Dust Suppression Material</th>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Foam</td>
<td>Best efficiency when effective mixing of foam and material can be achieved</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moisture addition is low</td>
</tr>
<tr>
<td>2</td>
<td>Binders</td>
<td>Eliminates the need for re-application</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Best efficiency in multiple transfer points</td>
</tr>
</tbody>
</table>
9.1 INTRODUCTION

After a thorough assessment of the existing environmental and socio-economic conditions and review of technical data, a team of environmental professionals analyzed the significant environmental impacts and suggested the necessary measures for mitigating the impacts. This Chapter presents the environmental impact assessment of the proposed project as a whole including all the components.

This section discusses the potential environmental and social impacts of the proposed activities, predicts the magnitude of the impact, assesses significance, recommends mitigation measures to minimize adverse impacts, and identifies the residual impacts of the project. The discussion starts with a description of the methodology used for the impact assessment. The impacts on the environment from various activities of the project can be categorized as follows:

**Impact on Physical Resources**
- Topography
- Bathymetry
- Land use pattern
- Site Aesthetics

**Impact on Environmental Resources**
- Air Quality
- Noise Levels
- Surface Water Quality
- Soils and Geology

**Impact on Ecological Resources**
- Terrestrial Ecology
- Aquatic Ecology

**Impact on Human Environment**
- Health and Safety
Socio-economics

- Traffic and Transport
- Business and Livelihood

Waste Disposal

- Solid waste disposal

9.2 IMPACT ASSESSMENT METHODOLOGY

Potential impacts from the proposed project activities were identified thorough review of the project activities, study of surrounding environment, review of literature, review of previous similar studies and expert’s judgment.

Once potential impacts have been identified, the assessment of each potential impact follows these steps:

9.2.1 Definition of the Criteria for Determining Significance

The consequence of the proposed activity is evaluated by comparing it against a recognized Significance Criteria. The criteria are of the following types:

- Institutional recognition laws, standards, government policies, or plans;
- Technical recognition guidelines, scientific or technical knowledge, or judgment of recognized resource persons;
- Public recognition social or cultural values or opinion of a segment of the public, especially the community directly affected by the project;
- Professional interpretation of the evaluator.

a. Prediction of the magnitude of the potential impacts

This step refers to the description, quantitatively (where possible) or qualitatively impacts of the project. This may be achieved through comparison with other similar activities.

b. Identification of the mitigation measures

If it is determined that the predicted impact is significant when compared with the criteria for determining significance, suitable mitigation measures are identified. There is a range of mitigation measures that can be applied to reduce impacts. Broadly, these measures can be classified into four categories:
- Avoiding the impact altogether by not taking certain proposed activity or parts of an activity, for example, using CFC-free equipment to avoid impact on ozone layer;
- Minimizing impacts by limiting the degree or magnitude of the activity, for example, minimizing dust emission by reducing vehicle speed;
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- Compensating for the impact by replacing or providing substitute resources or environments.

The project developer plays a key role in implementing the mitigation plan and assessing the feasibility of proposed measures.

c. **Evaluation of the residual impacts**

Incorporation of the suggested mitigation measures reduces the adverse impact of the project and brings it within the acceptable limit. This step refers to the identification of the anticipated remaining impacts after mitigation measures have been applied.

d. **Identification of the monitoring requirements**

The last step in the assessment process is the identification of the minimum monitoring requirements. The scope and frequency of the monitoring depends on the residual impacts. The purpose of monitoring is to confirm that the impact is within the predicted limits and to provide timely information if unacceptable impact is taking place.

e. **Formation of EIA matrix**

Once the above stated steps are completed, a summarized version of EIA matrix is formed identifying all the associated environmental impacts according to the scoring criteria presented in Exhibit 9.1 and Exhibit 9.2 represents impact assessment matrix respectively.
9.3 ENVIRONMENTAL IMPACTS ASSOCIATED WITH CONSTRUCTION AND OPERATIONAL ACTIVITIES

9.3.1 Impact on Physical Resources

9.3.1.1 Topography

The project developer intends to convert berth 3 & 4 located at marginal wharf into the modernized coal transshipment berths.

- **Potential Issues**

During the conversion of existing berths into the modernized coal transshipment berth the impact on topography is expected to be insignificant which could lead to change in the surface features only.

- **Criteria for Determining Significance**

An adverse impact on surface topography will be interpreted if it is established that the topographic elevation is changed by excavation and formation of heaps due to asphalting activities/carpeting.

- **Impact Analysis**

It is anticipated that during the berths carpeting and asphalting activities the improper leveling may result in nominal changes into the surface topography, additionally it is important to note that incase of residual construction material such as cement and or ready mix is not handled properly and left unattended it may result in formation of uneven structures referred to as heaps.

- **Mitigation**

Following mitigation measures will be incorporated to minimize any impacts.

  - Proper site leveling should be ensured, in order to minimize the probability of topographic changes onto the project site.

  - Ensure that construction material such as cement and or ready mix is handled properly and no residual material is left unattended so as to avoid the probability of formation of heaps and uneven structures.

- **Residual Impacts**

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

Surface topography, to be monitored during construction by an Independent Environmental Monitoring Consultant.

### 9.3.1.2 Bathymetry

The project developer intends to carry out dredging activities to increase the wharf depth, which is currently about 10.5 m; however, the developer is interested in increasing the depth so as to ensure the arrival of large ships onto the existing berths.

• **Potential Issues**

Dredging may affect the physical environment by changing the bathymetry in many ways that the bottom elevation will be decreased at the desired site while on the other hand, accumulation of dredged material and or sediments may result in increased bottom elevation at other sites. Additionally, it is important to note that dredging may not only result in changes in the bathymetric patterns but it may also alter the existing water quality such as turbidity and changes in existing wave conditions.

• **Criteria for Determining Significance**

An adverse impact on the bathymetry will be interpreted if the bathymetric elevation is disturbed and changes in water turbidity are observed.

• **Mitigation Measures**

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

  o Ensure that the dredged material is handled properly, rather it is not disposed off into the sea so as to minimize the probability of unwanted bathymetric patterns in close proximity of the project site.

  o If the turbidity exceeds from the existing levels defined in physical baseline of the report, dredging activities will be slowed down temporarily, until modifications can be made.

• **Residual Impacts**

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

---

• **Monitoring Requirements**

During operations and dredging activities periodic monitoring of following parameters will be carried out by means of bathymetric and monitoring surveys by Independent Environmental Monitoring Consultants:

- Sea water turbidity
- Changes if any in bottom elevation
- Locate the areas of sediment accumulation

9.3.1.3 **Land use Patterns**

The development will prevent any subsequent use or development of the site. Since all of the land surrounding the project area has already been developed. The impact of land take has been assessed to have a negligible/minor significance.

9.3.1.4 **Site Aesthetics**

Site aesthetics is an essential component to be considered during new developments, which may alter the land use patterns as well. Therefore it is very important to ensure that the proposed project site is aesthetically pleasing.

• **Potential Issues**

During construction, if construction residues are not well managed and or shifted and not disposed of at a designated area it may affect the site aesthetics. Additionally it is important to note in operational phase if the coal piles are not stored properly in the storage yard rather it is dumped at open grounds and incase if the green belts are not maintained properly unwanted shrubs and bushes may also flourish around the project area mainly near the railway line ultimately resulting in un aesthetical view of the entire project site.

• **Criteria for Determining Significance**

A significant impact will be interpreted if the construction residue and coal piles are observed to be scattered at the project site and an unwanted unpleasing shrubs and bushes flourish around the project area.

• **Impact Analysis**

The construction activities will generate appreciable amount of solid waste if the waste is scattered and not handled properly and left unattended it will result in adverse visual aesthetics at the project site. Formation of coal piles at undesignated areas will also escalate the adverse visual impact. Additionally unwanted bushes and shrubs will also adversely affect the project specific site aesthetics.
• **Mitigation Measures**
  
o  Construction waste and residue will be stored at a designated area till its final disposal.

o  It is strongly recommended that coal should be stored at a storage area and in any case coal piles will not be allowed to be dumped at open spaces and outside the storage yard.

o  Proper site specific housekeeping is to be ensured during project activities, in both construction and operational phases.

o  It is strongly recommend to plant appropriate and native tree species in the project surrounding so as to improve the site aesthetics

o  Timely maintenance of the green belts is strongly recommended to avoid the growth of unwanted shrubs and bushes around the belts.

• **Residual Impacts**

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

• **Monitoring Requirements**

During construction and operational phases periodic visual inspections will be carried out to ensure good site aesthetics by an Independent Environmental Monitoring Consultants:

- Proper housekeeping
- Coal storage practices
- Green belts

9.3.2 Impact on Environmental Resources

9.3.2.1 Air Quality

It is anticipated that both the construction and operational phases will emit air pollution in the proposed project vicinity such as construction activities involves use of air polluting machineries like, generators, bulldozers, cranes etc. while on the other hand unloading of coal into the hoppers and transferring from uncovered conveyor belts to the other areas such as uncovered storage areas may result in dispersion of significant amount of particulate matter within the project vicinity.

• **Potential Issues**

The project surrounding sustains edible oil industries and other food grade industries which require importing and handling of food grade items on to the
existing berths and these items may get contaminated by dispersion of coal dust. Similarly construction and operational phase equipment and machineries if not properly maintained and tuned may also result in significant amount of air pollution within the project vicinity.

- **Criteria for Determining the Significance**

A significant impact will be interpreted if the air quality of the project area is deteriorated and differs from the existing baseline and exceeds the existing SEQS limits. While on the other hand increase in respiratory diseases such as chronic bronchitis and asthma is another indicator of air pollution within the project vicinity.

- **Impact Analysis**

The air pollution within the project area may result from fugitive emission of particulate matter and gases including methane (CH₄), sulfur dioxide (SO₂) and oxides of nitrogen (NOx) are the main emissions which releases in the atmosphere during the operations such as transportation, collection, loading, unloading, of coal. While on the other elevated levels of (CO) are also anticipated by use of un tuned gas powered generators or machineries, similarly elevated levels of (Sox) and particulate matter from un tuned constructional and operational phase machineries such as cranes, lifters, loaders, bulldozers and or generators etc. Moreover demolition of existing structure onto the berth 4 will also result in particulate matter dispersion, specifically PM_{2.5} and PM_{10}.

- **Mitigation Measures**

  o Minimize drop heights when loaders dump coal into the hoppers and trucks.

  o Plantation of dense canopy trees is strongly recommended across the road parallel to the existing railway track so as to prevent and minimize the probability of nearby industrial unit exposure to the coal dust.

  o The operational activities should be suspended for the time being in case of high wind storms and other natural metrological contingencies/emergencies.

  o It is strongly recommended to maintain the appropriate coal moisture while loading the coal into the wagons for transportation from Port to Sahiwal.

  o Keep coal loads below the freeboard of the train bogies.

  o An alternative option to be considered to prevent coal dust dispersion during transportation from Port to Sahiwal is to spray any suitable and environmental friendly binding agents.

  o Construction and operational phase impacts on air quality by use of equipment and machineries should be mitigated by ensuring timely
maintenance and tuning of construction and operational phase machineries and equipment.

- Cordon of the demolition and construction sites to reduce the probability of fugitive emissions.

**Residual Impact**

Strict implementation of the proposed mitigation measures is not likely to leave any long-term residual impact, however the fugitive emissions may such as PM\textsubscript{2.5} is very difficult to control and it need special attention and control at the source.

**Monitoring Requirement**

During construction and operational phase periodic air quality monitoring will be carried out as prescribed in SEQS, by an Independent Environmental Monitoring Consultant. The parameters to be monitored includes *for emissions of construction and operational phase equipment and machineries*.

- NOx
- SOx
- CO
- PM
- Smoke

The parameters to be monitored includes *in ambient air includes*:

- PM\textsubscript{10}
- PM\textsubscript{2.5}
- CO
- SOx
- NOx

**9.3.2.2 Noise Levels**

It is anticipated that both the construction and operational phases will exhibit noise pollution in the project vicinity such as construction activities involves use of noise producing machineries like, generators, bulldozers, cranes etc while on the other hand conveyor belts movement, transfer towers/station working is also a significant source of noise pollution.
• **Potential Issues**

Noise exceeding more than SEQS limit has been identified as a hazard, if an individual is chronically exposed to the elevated levels of noise it may result in several noise related disorders as well as it may result in hearing loss.

• **Criteria for Determining the Significance**

A significant impact will be interpreted if noise levels exceed the SEQS limits within the project area.

• **Impact Analysis**

The noise pollution within the project area may result from un tuned construction and operational phase equipment or machineries the continuous exposure to the elevated levels of noise may result in; headaches, hearing problems and even loss in severe conditions, anxiety, accumulation of stress hormones and hypertension. All these health conditions may impact the overall health of the exposed workers, laborers and trespassers within the close proximity of the project area.

• **Mitigation Measures**

  o It is strongly recommended to maintain and properly lubricate the construction and operational phase equipment and machineries so as to reduce the noise levels at source.

  o Installation of suitable silencers is strongly recommended to be installed in construction and operational phase machineries and equipment.

  o Ensure that the generator room is enclosed by UPVC (unplasticized polyvinyl chloride) which reduced noise levels up to 75 dB (a) sheets or any other environmental friendly material.

  o Ensure that high noise areas such as generator room, power room and or any other noisy area is properly labeled and marked by proper safety symbols and unauthorized personnel are not given access to those areas.

  o To access high noise areas proper work permits should be issued for an individual along with proper PPEs such as ear plugs and ear muffs etc.

  o Plantation of dense canopy trees is strongly recommended across the road parallel to the existing railway track so as to prevent and minimize the probability of nearby industrial unit exposure to the elevated levels of noise.
9-11

- **Residual Impact**

Strict implementation of the proposed mitigation measures is not likely to leave any long-term residual impact, however the minimal level of noise is still expected from project activities.

- **Monitoring Requirement**

During construction and operational phases periodic noise level monitoring will be carried out as prescribed in SEQS, by an Independent Environmental Monitoring Consultant. The ambient noise levels and noise emission from equipment and machineries will also be monitored.

**9.3.2.3 Surface Water Quality**

There is no significant natural freshwater source in the project area. The Indus River is about 85 km to the east of Karachi city and the Hub River lies at a distance of 60 km to the north west of Karachi. The Lyari and Malir Rivers that passes through the city do not have any natural flow, except during the monsoons. Hence it is important to note that there is no significant inland surface water body within the close proximity of the project area except the coastline of Arabian Sea.

- **Potential Issue**

Oil spillage from arriving ships, coal wastewater, leachate, vehicular and equipment service activities wastewater etc.

- **Criteria for Determining the Significance**

A significant impact will be interpreted if the parameters analyzed in sea water during the establishment of baseline exceed the existing baseline levels.

- **Impact Analysis**

Elevated levels of pH, Temperature, heavy metals, Oil and grease and TOC etc. may accelerate the existing pollution levels. It is more likely that all the above mentioned pollutants are expected to be episodic in case of spills, leakages and improper site maintenance etc. Once these pollutants are released into the system they are likely to impact the biological and physical resources.

- **Mitigation Measures**

  o Ensure that the first activity before construction is to install the wastewater treatment plant, which will ensure that all the wastewater being produced
Environmental Impact Assessment for Coal Transshipment Project at Berth 3 & 4 of Port Qasim Karachi Sindh
HUANENG FUYUN PORT & SHIPPING PVT LTD

Environmental Impacts and Mitigations

9. During construction and operational phase is properly treated prior to discharge.

- Careful use of heavy machineries and equipment should be ensured in order to prevent leakages which may result in release of contaminants ultimately adding the pressure to the proposed wastewater treatment plant.

- Ensure that the oil, lubricants and chemical storage areas are protected with secondary containment walls which is almost double as the size of stored items such as chemicals and oils to ensure that in case of any accident the oil and chemicals may not enter the proposed project area as well as the waste water treatment plant. This mitigation measure will be implemented by the project developer by adopting and devising a proper spill prevention and control plan for both the phases i.e. the construction and operational phase accordingly.

- **Residual Impacts**

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

- **Monitoring Requirement**

During construction and operational phases quarterly monitoring of wastewater will be carried out as prescribed in SEQS and for parameters not prescribed in SEQS the wastewater samples will be subject to the USEPA guidelines accordingly.

9.3.2.4 **Soils and Geology**

Since the project is being developed onto the existing marginal wharf which is already made up of asphalt material, hence no major impact onto the soil is envisaged, but it is important to note that across the road existing railway lines are laid onto the existing soil.

- **Potential Issue**

Leakage and spillage from construction material and machineries may result in soil contamination.

- **Criteria for Determining the Significance**

The adverse impact onto the site soil will be interpreted incase if the concentrations of the parameters analyzed in soil during the baseline are increased in the future
• **Impact Analysis**

In case of spillage or leakage the soil will not only get contaminated but it will reduce the soil productivity which may ultimately result in desertification.

• **Mitigation Measures**

  o Careful use of heavy machineries and equipment should be ensured in order to prevent leakages which may result in release of contaminants directly onto the soil.

  o Ensure that malfunctioning machineries should be kept away from exposed soil area and should be repaired on immediate basis at designated workshops having impermeable floors.

  o It is strongly recommended that the native trees should be planted onto the existing soil, so as to increase the soil binding capacity and to prevent the erosion due to wind as well.

• **Residual Impacts**

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

• **Monitoring Requirement**

  Visual inspections will be carried out by an Independent Environmental Monitoring Consultant to ensure that the soil within the project surrounding is not being contaminated during the project activities.

9.3.3 Impact on Ecological Resources

9.3.3.1 **Terrestrial Ecology**

The project site is already disturbed due to the existing industrial activities therefore as mentioned in chapter 5 none of the terrestrial floral and faunal species were reported to be protected under SWPO (Sindh Wildlife Protection Ordinance), IUCN Red List and CITES (Convention on International Trade of Endangered Species).

• **Potential Issue**

  The existing railway line sustains a few tree species, which may be removed during the development of coal transfer station and or conveyor belts.
• **Criteria for Determining the Significance**

The adverse impact onto the terrestrial ecology will be interpreted in case if the mature trees parallel to the railway line are chopped or removed during project execution.

• **Impact Analysis**

In case of removing the existing trees parallel to the railway line, removal of these trees will not only uproot the small faunal species within the project area, but will also result in soil erosion and unaesthetic view of the project site.

• **Impact Mitigation**

  o In case of cutting of one mature tree, it is strongly recommended to re-plant the native tree species by the ratio of 1:5.

  o Timely maintenance of the green belts is strongly recommended to avoid the growth of unwanted shrubs and bushes around the belts.

• **Residual Impacts**

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

• **Monitoring Requirement**

Independent Environmental Monitoring Consultant will monitor the survival growth rate of the planted species.

9.3.3.2 **Aquatic Ecology**

The proposed project requires dredging activities in order to increase the wharf depth; therefore the dredging activities are expected to exhibit adverse impacts onto the existing aquatic ecology of the project area. Additionally the wastewater and coal dust dispersion during the operational phase is also expected to have adverse impact on the aquatic ecosystem.

• **Potential Issue**

The dredging activities will not only alter the sediment composition, i.e. of substrate characteristics in the surrounding of the dredging site but will also result in a change of the nature and diversity of benthic communities. Moreover the reduction in plankton species may also occur due to the wastewater discharge and from vessels propeller, bow waves. However it is important to note that most planktonic species have a very short regeneration time (in days and weeks), the limited
population in the path of the vessels movement effected will be replenished quickly. Mortality of fish egg is another potential issue associated with spillage of oily waste.

The mangroves of the project area are also likely to be significantly affected in the long run by dispersion of coal dust particles.

- **Criteria for Determining the Significance**

The adverse impact onto the aquatic ecology will be interpreted by using Shannon Weiner Diversity Index, which will be compared with the existing index values. Additional support to interpret the adverse impacts onto the mangroves of the project area will be determined by an expert’s judgment and frequent visits onto the site.

- **Impact Analysis**

Alteration of sediment composition by dredging activities may result in change of the nature and diversity of benthic communities, e.g. decline of individual density, species abundances or biomass; however this impact is anticipated as a short term impact. Spillage of oily waste on the water surface can cause mortality of fish egg, however the actual numbers affected (less than 1 percent of total population) is very small in comparison to their natural mortality rates and predation by other organism compared to their overall population size and abundance. However, some of the benthic communities are opportunist species; they will take advantage and recolonize the available benthic niche. Benthic Invertebrates have short regeneration time periods; therefore the benthic communities will occupy the disturbed/ newly created benthic niche. The coal dust particles may deposit onto the leaves of mangroves which may affect the transpiration rate, ultimately affecting the survival rate of the existing species within the project area.

- **Impact Mitigation**

  o Frequent dredging of sediments from intake and outlet water discharge channel to be avoided during the Summer Monsoon period.

  o Most planktonic species have a very short regeneration time (in days and weeks), the limited population in the path of the vessels movement effect is will be replenished quickly hence no mitigation measure is required.

  o Extra precautionary measure against spill must be taken during the breeding and spawning period of fish and shrimp (June, July) in the creeks and it is strongly recommended that the project developer should develop an oil spill contingency plan.

  o The coal dust dispersion should be controlled at source, so as to reduce the probability of mangrove leaves exposure to the coal dust which may result in
reduced transpiration rate of the species ultimately affecting the species in the long run.

- The anticipated impacts on to the existing mangrove forest nearby the project area are invisible in the short run, while the accumulation of coal dust particles onto the mangrove species may exhibit the devastating impacts onto the survival rate in the long run, therefore it is strongly recommended to observe the survival rate of the existing species on quarterly basis and in case if it is declining the species should be replanted by ratio of 1:5 by the help of local communities.

- **Residual Impacts**

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

- **Monitoring Requirement**

Quarterly benthic faunal sampling at the project site will be carried out by an Independent Environmental Monitoring Consultant to check the biodiversity status of the project area

**9.3.4 Impact on Human Environment**

**9.3.4.1 Health and Safety**

All the project activities from construction till operation involves activities which may result in health and safety hazards such as, slipping, tripping, falling from height, electrocution, fires, explosions etc.

- **Potential Issue**

One of the major potential issue related to the health and safety of the workers working in close proximity of the project area includes the exposure to coal dust particles and other health and safety hazards.

- **Criteria for Determining the Significance**

The adverse impact on to the health and safety of the workers working specifically for the proposed project and other workers working in close proximity of the project site will be interpreted incase if a number of accidents, incidents, near-miss, fatal injuries and severe health conditions are reported.
• Impact Analysis

It is anticipated that the project activities for both construction and operational phases may result in severe health and safety hazards and health conditions. It is important to note that the untrained workers may cause harm to themselves as well as others due to lack of awareness and skills. The severe health conditions associated with project operational phase are mainly associated with coal dust exposure which may result in chronic respiratory diseases and other severe health conditions as well. Recently there have been fire incidents in Karachi which have caused serious losses and same incase of severe fire hazard at the project site it should be noted that there are no proper arrangements in the city to tackle with such incidents.

• Impact Mitigations

  o Ensure that hazards associated with manual lifting are controlled by proper lifting techniques, work rotation system will reduce the chances of being exposed to work related stress associated with construction activities.

  o All the workers involved in construction, operational and maintenance activities will be provided with proper PPEs according to their job description including; safety belts, footwear, helmets, goggles, eye-shields, and clothes to workers depending on their nature of work.

  o Arrangement of proper first aid unit and emergency vehicle to take affected personnel to the nearest medical facility.

  o Organize awareness programs relevant to personal health and safety practices on quarterly basis specifically for the workers and other close by industries such as; awareness of coal dust hazards and prevention techniques.

  o Installation of warning signs to particular hazardous locations such as crane loading and unloading areas, bulldozer room, generator room, control room, fire control room and coal storage area accordingly.

  o Necessary training regarding safety aspects to the personnel working at the project site will be given.

  o Ensure that hazards associated with manual lifting are controlled by proper lifting techniques, work rotation system will reduce the chances of being exposed to work related stress associated with construction activities.

  o All the workers involved in construction, operational and maintenance activities will be provided with proper PPEs according to their job description including; safety belts, footwear, helmets, goggles, eye-shields, and clothes to workers depending on their nature of work.
9. Arrangement of proper first aid unit and emergency vehicle to take affected personnel to the nearest medical facility.

10. It must be made sure that proper arrangements to take care of fire emergencies are made.

11. New equipment will be stored in properly demarcated and identified areas.

12. Separate storage of each item will be adopted and each area will be marked either on floor or cordoned off by tapes.

13. Lifting equipment (cranes) used for the equipment will follow the prescribed safety specification.

14. Material Safety Data Sheet (MSDS) for chemicals, if any, will accompany the consignment.

15. A copy of the MSDS will be available near the storage area at all times.

16. Artificial and intrinsically safe lighting will be provided in the confined spaces.

17. If there is a risk of gases or fumes in the confined space the provisions for ventilation will be made.

18. The project developer must ensure implementation of proper HSE policy at all project locations so as to reduce the chances of occurrence of frequent hazards.

19. Ensure proper coordination and liaison with Pakistan Railway and develop a detailed SOP for safe transportation of coal from Karachi to Sahiwal.

**Residual Impacts**

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

**Monitoring Requirement**

HSE Inspections will be carried out on monthly basis to evaluate the health and safety practices at the project site.

**9.3.5 Socio Economics**

**9.3.5.1 Traffic and Transport**

The proposed project is not expected to disturb the routine traffic activities within the project area, incase if the height of conveyor belt 4 across the road is not
sufficient enough it may create difficulties for heighted cargos transportation such as boilers and other heavy machineries. Therefore it is recommended to increase the BC4 lift height up to 10 m. A proper traffic management plan should be followed for incoming and outgoing project specific vehicles and project developer should ensure that all traffic rules and regulations are obeyed and followed strictly. Both parties i.e. the project developer and PQA should sign a MOU for proper management of marine traffic.

9.3.5.2 Business and Livelihood

The proposed project is likely to increase employment opportunities for the laborers, since Berth 1 & 2 will be utilized for handling of other items which was previously handled at Berth 3 & 4 while on the other hand the proposed project will have additional requirement for laborers. Additionally it is important to note that the existing structures i.e. the hotels at berth 4 should be allotted spaces at berth 1 & 2.

9.3.6 Waste Disposal

9.3.6.1 Solid waste disposal

The solid waste will be generated during the demolition, construction and operational phase respectively.

- **Potential Issue**

Improper management of solid waste will result in site contamination, economic loss and other environmental hazards as well.

- **Criteria for Determining the significance**

The adverse impact onto the environment will be interpreted incase if the large quantities of solid waste are observed at project site.

- **Impact Analysis**

It is anticipated that all project activities such as demolition, construction and operational phase will generate a significant amount of solid waste which may include inert demolition material, camp waste, construction waste and kitchen and sanitary waste etc. The solid waste at the project site is not only going to exhibit adverse aesthetic view but it may also serve as disease causing vector and if not handled and managed properly may result in adverse health impacts and economic loss as well.
• **Impact Mitigations**
  
  o It is strongly recommended to reuse the demolition material where possible to prevent the economic loss.
  
  o The material to be used during construction and operational phase should be limited and should not exceed the needed amount so as to prevent solid waste production at project site.
  
  o All the construction and operational waste should be properly segregated, quantified and stored at a designated area prior to the disposal at PQA’s open dumping site.
  
  o The hazardous waste should be disposed off via PQA’s and SEPA’s approved contractor.
  
  o The kitchen waste should be used for composting such as tea bags, potato peals, vegetable peals etc should be mixed with an appropriate ratio of browns (carbon source) and greens (Nitrogen source), and the final product i.e. compost should be used at green belts where necessary.

• **Residual Impacts**

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

• **Monitoring Requirement**

An Independent Environmental Monitoring Consultant will carry out quarterly visual inspections to ensure good solid waste management practices at project site.
### Exhibit 9.1: Scoring Criteria for Impact Assessment Matrix

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Score</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Magnitude of change/effect</td>
<td>1</td>
<td>Within the proposed project site</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>To local conditions and/or to areas immediately outside</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Regional/national/international</td>
</tr>
<tr>
<td>The Permanence of the impact</td>
<td>1</td>
<td>No change/not applicable</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Temporary</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Permanent</td>
</tr>
<tr>
<td>The Reversibility of the condition (whether the condition can be changed and is a measure of the control over the effect)</td>
<td>1</td>
<td>No change/not applicable</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Reversible</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Irreversible</td>
</tr>
<tr>
<td>To what extent the impact is Cumulative (which is a measure of whether the effect will have a single direct effect or will have a cumulative effect over time, or a synergistic effect).</td>
<td>1</td>
<td>No change/not applicable</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Non-cumulative/single</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Cumulative</td>
</tr>
</tbody>
</table>
### Exhibit 9.2: Impact Assessment Matrix

<table>
<thead>
<tr>
<th>S. No</th>
<th>Receptor</th>
<th>Source</th>
<th>M</th>
<th>P</th>
<th>R</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Topography</td>
<td>Berths carpeting and asphalting activities.</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Bathymetry</td>
<td>Dredging Activities.</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Land-use Patterns</td>
<td>Construction of Coal Transshipment Project.</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Site Aesthetics</td>
<td>Construction residue, Improper housekeeping.</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Air Quality</td>
<td>Construction and operational machineries and equipment. Coal handling and storage during operational activities</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Noise Levels</td>
<td>Construction and operational activities, machineries and equipment</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Surface Water Quality</td>
<td>Oil spillage from arriving ships, coal wastewater, leachate, vehicular and equipment service activities wastewater etc.</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Soil</td>
<td>Leakage and spillage from construction and operational phase material and machineries may result in soil contamination.</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>Terrestrial Ecology</td>
<td>Cutting of trees</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>S. No</td>
<td>Receptor</td>
<td>Source</td>
<td>M</td>
<td>P</td>
<td>R</td>
<td>C</td>
</tr>
<tr>
<td>-------</td>
<td>---------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>10</td>
<td>Aquatic Ecology</td>
<td>Dredging and wastewater</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>Health and Safety</td>
<td>All the project activities from construction till operation phase</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>Traffic and Transport</td>
<td>Belt Conveyor 4 and project based incoming and outgoing vehicles</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>Business and Livelihood</td>
<td>Construction and operational phase activities.</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>Solid waste disposal</td>
<td>Construction and operational phase solid waste.</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

**KEY:** M=Magnitude, P=Permanence, R=Reversibility and C=Cumulative
The potential environmental impact during the construction and operations of the proposed coal transshipment yard on various environmental components such as social, biological and physical environment were predicted in the course of the EIA. The EIA has also identified mitigation measures to minimize the environmental impact of the proposed project, keeping these effects within acceptable limits.

The EMP 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.

10.1 PURPOSE AND OBJECTIVES

The purpose of this EMP is not only to address the expected environmental impacts of the 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 EMP are to:

- Facilitate the implementation of the mitigation measures that are identified in the EIA;
- 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.

10.2 APPROACH

- An integrated Environment Management System play important role in sustainable industrial development if their Environment Management Plan is more affective and economically beneficial covering all activities of the industry and give proper implementable guidelines.

The EMP prepared specifically for the activities of the proposed coal transshipment project has been presented in Exhibit 10.1.
### Exhibit 10.1: Environmental Management Plan

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Impact</th>
<th>Mitigation</th>
<th>Residual Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction Phase</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Air</strong></td>
<td>Chronic health effects</td>
<td>- Sprinkling of water&lt;br&gt; - Tuning of construction vehicles &amp; machines&lt;br&gt; - Dust masks for laborers&lt;br&gt; - Monitoring of vehicular emission&lt;br&gt; - Monitoring of Ambient Air</td>
<td><strong>LOW</strong></td>
</tr>
<tr>
<td></td>
<td>Reduced visibility in surrounding area</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Breathing problem</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Irritation in eyes</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Noise</strong></td>
<td>Stress</td>
<td>- Maintenance of silencers&lt;br&gt; - Lubrication of construction vehicles &amp; machineries&lt;br&gt; - Ear plugs&lt;br&gt; - Monitoring of Ambient Noise&lt;br&gt; - Monitoring of noise near construction machinery</td>
<td><strong>LOW</strong></td>
</tr>
<tr>
<td></td>
<td>Hypertension</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hearing loss</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Headache</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td>Formation of heaps due to improper handling of construction residue</td>
<td>- Proper site leveling after construction&lt;br&gt; - Proper handling and disposal of construction waste/residue</td>
<td><strong>LOW</strong></td>
</tr>
<tr>
<td><strong>Terrestrial Ecology</strong></td>
<td>A few number of trees may be cleared</td>
<td>- In case of cutting of trees, one plant should be replaced by 1:5</td>
<td><strong>Medium</strong></td>
</tr>
<tr>
<td>Aspect</td>
<td>Impact</td>
<td>Mitigation</td>
<td>Residual Impact</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td><strong>Aquatic Ecology</strong></td>
<td>Alteration in sediment composition due to dredging</td>
<td>- Frequent dredging of sediments from intake and outlet water discharge channel to be avoided during the Summer Monsoon period.</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Changes in diversity of benthic community</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Water use</strong></td>
<td>Wastage and misuse of water</td>
<td>- Avoid unnecessary use of water</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Prevent leakages</td>
<td></td>
</tr>
<tr>
<td><strong>Surface water</strong></td>
<td>Seawater contamination by oil spillage from construction vehicles and equipment</td>
<td>- Careful use of heavy machineries and equipment to prevent leakages and spills</td>
<td>Medium</td>
</tr>
<tr>
<td><strong>Social Environment</strong></td>
<td>Conflicts between laborers/project developers and nearby industries</td>
<td>- Specify time scale for construction activities</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Conflict resolution by taking the relevant stakeholders into confidence by addressing their grievance and concerns by proper mitigations</td>
<td></td>
</tr>
<tr>
<td><strong>Roads and networks</strong></td>
<td>Traffic congestion due to frequent and unscheduled mobilization of construction equipment and vehicles</td>
<td>- Trained drivers and operators to drive the construction vehicles</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Obey traffic and safety rules/precautions</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Signs and reflectors must be boarded for driver’s visibility at night</td>
<td></td>
</tr>
</tbody>
</table>
## Health and Safety

<table>
<thead>
<tr>
<th>Impact</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of awareness among general laborers about safety may lead to accidents&lt;br&gt;Unskilled and untrained workers might cause harm to themselves and others&lt;br&gt;Construction works may include many risks and hazards that may lead to severe injuries</td>
<td>- Safety symbols and instructions will be boarded at work sites&lt;br&gt;- Trained personnel will be appointed for the specific work&lt;br&gt;- General laborers working on other berths will not be allowed to access the construction area&lt;br&gt;- Appropriate PPEs must be used for technical work</td>
</tr>
</tbody>
</table>

**Residual Impact:** Medium

## Operational Phase

### Air

<table>
<thead>
<tr>
<th>Impact</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic health effects&lt;br&gt;Reduced visibility on roads&lt;br&gt;Contamination of food grade items by coal dust dispersion&lt;br&gt;Reduces photosynthetic rate of mangrove species and other plants due to coal dust accumulation</td>
<td>- Plantation of dense canopy trees across the railway line&lt;br&gt;- Water sprinkling at the coal storage yard and uncovered conveyor belts&lt;br&gt;- Minimize coal drop heights&lt;br&gt;- Keep coal loads below the freeboard of the train wagons.&lt;br&gt;- Cover transfer wagons by porous covering material or any suitable binding agent to reduce the probability of coal dust dispersion</td>
</tr>
</tbody>
</table>

**Residual Impact:** Medium
<table>
<thead>
<tr>
<th>Aspect</th>
<th>Impact</th>
<th>Mitigation</th>
<th>Residual Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise</td>
<td>Stress</td>
<td>Maintenance of silencers</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Hypertension</td>
<td>Lubrication of construction vehicles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hearing loss</td>
<td>Ear plugs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Headache</td>
<td>Monitoring of Ambient Noise</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitoring of noise near construction machinery</td>
<td></td>
</tr>
<tr>
<td>Surface water</td>
<td>Seawater contamination by oil spillage from</td>
<td>Oil Booms to be used in case of severe spills</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>arriving ships, coal wastewater and leachate</td>
<td>Wastewater treatment plant</td>
<td></td>
</tr>
<tr>
<td>Soil</td>
<td>Contamination of soil due to spillage and</td>
<td>Careful use of heavy machineries and equipment to prevent leakages</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>leakages from construction machineries and</td>
<td>Malfunctioning machineries should be kept away from exposed soil area and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>equipment’s</td>
<td>maintained at an designated workshop having impermeable floors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reduce soil productivity due to contamination</td>
<td>Plantation of dense canopy trees</td>
<td></td>
</tr>
<tr>
<td>Terrestrial Ecology</td>
<td>Reduces photosynthetic rate of plants due to coal dust accumulation</td>
<td>Water sprinkling at the coal storage yard and uncovered conveyor belts</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Minimize coal drop heights</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Keep coal loads below the freeboard of the train wagons.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cover transfer wagons by porous covering material or any suitable binding</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>agent to reduce the probability of coal dust dispersion</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ensure proper treatment of diseased plants</td>
<td></td>
</tr>
<tr>
<td>Aspect</td>
<td>Impact</td>
<td>Mitigation</td>
<td>Residual Impact</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>-----------------</td>
</tr>
</tbody>
</table>
| **Aquatic Ecology**  | Reduction in plankton species due to the wastewater discharge and from vessels propeller, bow waves. | - Extra precautionary measure against spill must be taken during the breeding and spawning period of fish and shrimp (June, July) in the creek  
- Re plantation of mangrove species by engaging local communities with the ratio of 1:5 incase if the existing population is declining | Medium           |
|                      | Mortality of fish egg associated with spillage of oily waste.         |                                                                            |                 |
|                      | The mangroves of the project area are also likely to be adversely affected in the long run by dispersion of coal dust particles. |                                                                            |                 |
| **Social Environment** | Conflicts between project developer and nearby industries             | - Conflict resolution by taking the relevant stakeholders into confidence by addressing their grievance and concerns by proper mitigations | Medium          |
| **Roads and networks** | Traffic congestion due to frequent mobilization of construction equipment and vehicles | - Trained drivers and operators to drive the construction vehicles  
- Obey traffic and safety rules/precautions  
- Signs and reflectors must be boarded for driver's visibility at night | Medium          |
<table>
<thead>
<tr>
<th>Aspect</th>
<th>Impact</th>
<th>Mitigation</th>
<th>Residual Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health and Safety</td>
<td>Lack of awareness among general laborers about safety may lead to accidents</td>
<td>Safety symbols and instructions will be boarded at work sites</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Unskilled and untrained workers might cause harm to themselves and others</td>
<td>Trained personnel will be appointed for the specific work</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operations works may include many risks and hazards that may lead to severe injuries</td>
<td>General laborers working on other berths will not be allowed to access the project area</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Appropriate PPEs must be used for technical work</td>
<td></td>
</tr>
</tbody>
</table>
### Exhibit 10.2: Environmental Monitoring Plan

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Monitoring Parameter</th>
<th>Location</th>
<th>Frequency of Monitoring</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction Phase</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air</td>
<td>Particulate Matter</td>
<td>Proposed Project Site</td>
<td>Monthly</td>
<td>Contractor / Project Developer</td>
</tr>
<tr>
<td></td>
<td>Smoke</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SOx</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NOx</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise</td>
<td>Noise levels</td>
<td>Proposed Project Site</td>
<td>Monthly</td>
<td>Contractor / Project Developer</td>
</tr>
<tr>
<td>Soil</td>
<td>Surface topography</td>
<td>Proposed Project Site</td>
<td>Continuous</td>
<td>Contractor / Project Developer</td>
</tr>
<tr>
<td>Terrestrial Ecology</td>
<td>Enumeration and Record of Plants</td>
<td>Across the Railway Route near Proposed project site</td>
<td>Continuous</td>
<td>Project Developer</td>
</tr>
<tr>
<td>Aquatic Ecology</td>
<td>Shannon Weiner Diversity Index</td>
<td>Macro fauna sampling nearby Proposed Project and radius of about 1 km</td>
<td>Monthly</td>
<td>Project Developer</td>
</tr>
<tr>
<td>Aspect</td>
<td>Monitoring Parameter</td>
<td>Location</td>
<td>Frequency of Monitoring</td>
<td>Responsibility</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------------------------------------</td>
<td>---------------------------</td>
<td>-------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Water use</td>
<td>Record log of water usage</td>
<td>proposed project site</td>
<td>Continuous</td>
<td>Contractor</td>
</tr>
<tr>
<td>Surface water</td>
<td>Vehicular Maintenance record</td>
<td>proposed project site</td>
<td>Continuous</td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td>Visual Inspection</td>
<td></td>
<td></td>
<td>Project Developer</td>
</tr>
<tr>
<td>Social Environment</td>
<td>Review of complaint register</td>
<td>proposed project site</td>
<td>Monthly</td>
<td>Project Developer</td>
</tr>
<tr>
<td></td>
<td>Local Consultations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roads and networks</td>
<td>Signs and detours are being followed</td>
<td>Port Qasim Industrial Area</td>
<td>Monthly</td>
<td>Contractor Project Developer</td>
</tr>
<tr>
<td></td>
<td>Driver's license</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health and Safety</td>
<td>Record of Safety Talks</td>
<td>proposed project site</td>
<td>Monthly</td>
<td>Contractor Project Developer</td>
</tr>
<tr>
<td></td>
<td>Record of safety Incidents (Major &amp; Minor)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Record of PPEs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Visual Assessments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aspect</td>
<td>Monitoring Parameter</td>
<td>Location</td>
<td>Frequency of Monitoring</td>
<td>Responsibility</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------</td>
<td>----------------------------------------------------</td>
<td>-------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Operational Phase</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Air</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Particulate Matter</strong></td>
<td>Smoke, CO, SOx, NOx</td>
<td>Proposed project site and across the railway line PQA</td>
<td>Monthly</td>
<td>Project Developer</td>
</tr>
<tr>
<td><strong>Noise</strong></td>
<td>Noise levels</td>
<td>Proposed project site</td>
<td>Monthly</td>
<td>Contractor/Project Developer</td>
</tr>
<tr>
<td><strong>Surface water</strong></td>
<td>pH, Temperature, Nickle, Zinc, Lead, Copper, Selenium, Antimony, Mercury, TOC, Oil &amp; Grease</td>
<td>Sea water across proposed project site</td>
<td>Monthly</td>
<td>Project Developer</td>
</tr>
<tr>
<td>Aspect</td>
<td>Monitoring Parameter</td>
<td>Location</td>
<td>Frequency of Monitoring</td>
<td>Responsibility</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>-------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Soil</td>
<td>Visual Inspection</td>
<td>proposed project site and across the railway line PQA</td>
<td>Monthly</td>
<td>Project Developer</td>
</tr>
<tr>
<td>Terrestrial Ecology</td>
<td>Plant disease diagnosis</td>
<td>Across the Railway route Port Qasim</td>
<td>Continuous</td>
<td>Project Developer</td>
</tr>
<tr>
<td>Aquatic Ecology</td>
<td>Shannon Weiner Diversity Index</td>
<td>Macro fauna sampling nearby proposed project site and radius and about 1 km</td>
<td>Quarterly</td>
<td>Project Developer</td>
</tr>
<tr>
<td></td>
<td>Survival rate of existing mangrove species</td>
<td>Mangroves within the 5 km radius of the project area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Environment</td>
<td>Review of consultation documents</td>
<td>Head office of project developer</td>
<td>Monthly</td>
<td>Project Developer</td>
</tr>
<tr>
<td>Roads and networks</td>
<td>Signs and detours are being followed</td>
<td>Port Qasim Industrial Area</td>
<td>Monthly</td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td>Driver’s license</td>
<td></td>
<td></td>
<td>Project Developer</td>
</tr>
<tr>
<td>Aspect</td>
<td>Monitoring Parameter</td>
<td>Location</td>
<td>Frequency of Monitoring</td>
<td>Responsibility</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------------------------------------</td>
<td>-------------------</td>
<td>-------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Health and Safety</td>
<td>Record of Safety Talks, Record of safety Incidents (Major &amp; Minor), Record of PPEs, Visual Assessments</td>
<td>proposed project site</td>
<td>Monthly</td>
<td>Contractor, Project Developer</td>
</tr>
</tbody>
</table>
The EIA of the proposed coal transshipment project has achieved the following goals:

- Identification of national and provincial environmental regulatory requirements that apply to the proposed project activities;
- Identification of the environmental features of the project area including the physical, biological and social disturbance and likely impact of the project on the environment;
- Recommendation of appropriate mitigation measures that the project developer will incorporate and ensure as per this EIA into the project to minimize the adverse environmental impacts.

Baseline physical, biological, socio-economic and cultural data and information was collected from a variety of primary and secondary sources, including field surveys, review of relevant literature and online publications. The collected data was used to organize profiles of the physical, biological and socio-economic environments, likely to be affected by the project. Primary and secondary stakeholders were consulted through scoping meetings and consultation processes. These included communities, laborers, industries, associations and institutional stakeholders. The aim of public consultation was to assure the quality, comprehensiveness and effectiveness of the EIA as well as to ensure that the views and opinions of the local people were adequately taken into account in the decision making process.

Further, an Environmental Impact Assessment Report was made to highlight the potential impacts of the described project on the area's physical, biological, socio-economic and cultural environments.

It is concluded that the potential impacts of the proposed coal transshipment project can easily be mitigated provided that the EMP and the mitigation measures proposed in this report are implemented in true spirit.

After assessing the proposed project activities and investigating the project area, the environmental consultants, GEMS have concluded that:

"If the activities are undertaken as described in this report, and the recommended mitigation measures along with environmental management plan is adopted specifically for coal dust suppression the proposed project will not result in any long-term adverse impacts on the local community as
well as on the physical and biological environment of the project area. It can be concluded that the proposed coal transshipment project includes improved and modernized coal handling technologies which is much better than the current coal handling practices at Port Qasim.”
ANNEXURE

I- Chemical Analysis Reports
  a) Sea Water
# CHEMICAL ANALYSIS TEST REPORT

**Report reference No.:** GEL/LAB/18916  
**Name of industry:** EIA of Coal Transhipment Project  
**Address:** C/O GEMS  
**Date:** 25.07.2016  
**Telephone No.:** ....  
**Grab/Composite:** Grab

**Nature of sample:** Sea Water  
**Date of sample collection:** 13.07.2016  
**Date of sample received:** 13.07.2016  
**Sample collected/sent by:** Collected By GEMS  
**Date of completion of analysis:** 25.07.2016

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Parameters</th>
<th>Unit</th>
<th>Concentration</th>
<th>Method</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pH value</td>
<td></td>
<td>7.57</td>
<td>pH meter</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Temperature</td>
<td>°C</td>
<td>29</td>
<td>Thermometer</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Nickel*</td>
<td>mg/l</td>
<td>0.025</td>
<td>US EPA 200.8</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Zinc*</td>
<td>mg/l</td>
<td>0.004</td>
<td>US EPA 200.8</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Lead*</td>
<td>mg/l</td>
<td>&lt;0.001</td>
<td>US EPA 200.8</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Copper*</td>
<td>mg/l</td>
<td>0.287</td>
<td>US EPA 200.8</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Selenium*</td>
<td>mg/l</td>
<td>&lt;0.001</td>
<td>US EPA 200.8</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Antimony*</td>
<td>mg/l</td>
<td>&lt;0.001</td>
<td>US EPA 200.8</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Cadmium*</td>
<td>mg/l</td>
<td>&lt;0.001</td>
<td>US EPA 200.8</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Chromium*</td>
<td>mg/l</td>
<td>0.011</td>
<td>US EPA 200.8</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Mercury*</td>
<td>mg/l</td>
<td>&lt;0.001</td>
<td>US EPA 200.8</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Arsenic*</td>
<td>mg/l</td>
<td>0.209</td>
<td>US EPA 200.8</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Total Organic Carbon</td>
<td>mg/l</td>
<td>24</td>
<td>Merck Test (1.14878)</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Oil &amp; Grease</td>
<td>mg/l</td>
<td>ND</td>
<td>Solvent extraction</td>
<td></td>
</tr>
</tbody>
</table>

*This report is not valid for any negotiations.  
Sub-Contracted From SUPARCO*

---

Analyzed/tested by:  
Waqas Khan  
Analyst

Checked/Verified by:  
Zahid Raza  
GM P & D

Muhammad Qadiruddin  
GM Karachi Lab

---

End of the Report

Global Environmental Lab (Pvt) Ltd  
2nd Floor, Aiwan-e-Sanat, ST-4/2, Sector-23, Korangi Industrial Area, Karachi.  
Ph: (92-21) 35113804-5 Fax: (92-21) 35113806 Email:info@gel.com.pk
ANNEXURE

I- Chemical Analysis Reports

b) Drinking Water
CHEMICAL ANALYSIS TEST REPORT

Report reference No: GEL/LAB/1641-8
Name of industry: EA of Coal Transshipment Project
Address: GEMS.

Nature of sample: Drinking Water
Date of sample collected: 18.07.2016
Date of sample received: 18.07.2016
Sample collected/sent by: Collected By GEMS
Date of completion of analysis: 22.07.2016

<table>
<thead>
<tr>
<th>S.No</th>
<th>Parameters</th>
<th>Units</th>
<th>SSDWQ</th>
<th>Concentration</th>
<th>Method</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pH value</td>
<td></td>
<td>5.5-8.5</td>
<td>7.61</td>
<td>pH meter</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Total Dissolved Solids</td>
<td>mg/l</td>
<td>1000</td>
<td>536</td>
<td>APHA 2540 C</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Total Suspended Solid.</td>
<td>mg/l</td>
<td>------</td>
<td>&lt;3</td>
<td>Hach Method 8006</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Chloride</td>
<td>mg/l</td>
<td>250</td>
<td>87.90</td>
<td>APHA 4500 Cl C</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Total Hardness*</td>
<td>mg/l</td>
<td>&lt;300</td>
<td>203.57</td>
<td>APHA 2340 C</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Fluoride*</td>
<td>mg/l</td>
<td>&lt;1.5</td>
<td>0.62</td>
<td>Hach Method 8029</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Nitrate</td>
<td>mg/l</td>
<td>&lt;30</td>
<td>0.90</td>
<td>Hach Method 8039</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Nitrile</td>
<td>mg/l</td>
<td>&lt;3</td>
<td>0.044</td>
<td>Hach Method 8507</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Sulphate*</td>
<td>mg/l</td>
<td>250</td>
<td>68</td>
<td>Hach Method 8551</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Bicarbonate</td>
<td>mg/l</td>
<td>------</td>
<td>115.15</td>
<td>APHA 2320 B</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Residual Chlorine</td>
<td>mg/l</td>
<td>0.5</td>
<td>0.06</td>
<td>Hach Method 8021</td>
<td></td>
</tr>
</tbody>
</table>

SSDWQ = Sindh Standards for Drinking Water Quality

This report is not valid for any negotiations.
* = Accredited

Analyzed/tested by: Muhammad Asif Khan
Analyst

Checked/Verified by: Zahid Raza
GM P & D

Muhammad Qadiruddin
GM Karachi Lab

End of the Report
ANNEXURE

II- Microbiological Analysis Report
   a) Drinking Water
**MICROBIOLOGICAL ANALYSIS REPORT**

**Attention:** C/O GEMS

**Reference No.:** GEL/LAB/MIC/16641 “A”  
**Test Report No.:** 2392 G16

**Name of Client:** M/S EIA OF Coal Trasshipment Project. 
**Address:** …

**Tel:** …

**Nature of Sample:** Drinking Water  
**Sample Condition:** Satisfactory  
**Sample Collected By:** Client

**Date of Reporting:** 26-07-16  
**Date of Sample Received:** 18-07-16  
**Date of Sample Analysis:** 18-07-16  
**Date of Result:** 20-11-15

**RESULTS:**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Parameters</th>
<th>*Recommended Value</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total Colony Count</td>
<td>&lt;500 cfu / ml</td>
<td>450 cfu/ ml</td>
</tr>
<tr>
<td>2</td>
<td>Total Coliform</td>
<td>0 cfu / 100 ml</td>
<td>10 cfu / 100ml</td>
</tr>
<tr>
<td>3</td>
<td>Faecal Coliform</td>
<td>0 cfu / 100 ml</td>
<td>0 cfu / 100ml</td>
</tr>
<tr>
<td>4</td>
<td>Faecal Streptococci</td>
<td>0 cfu / 100 ml</td>
<td>0 cfu / 100ml</td>
</tr>
</tbody>
</table>

*Recommended Values as per WHO guideline for Drinking water

**REMARKS:**
Sample submitted is microbiologically unsatisfactory.

**ANALYZED BY**  
Microbiologist

**CHECKED & VERIFIED BY**  
G.M. Karachi Lab

**END OF REPORT**
ANNEXURE

### III- Ambient Air Quality Report

<table>
<thead>
<tr>
<th></th>
<th>Sampling Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Sampling Point-1</td>
</tr>
<tr>
<td>b</td>
<td>Sampling Point-2</td>
</tr>
<tr>
<td>c</td>
<td>Sampling Point-3</td>
</tr>
<tr>
<td>d</td>
<td>Sampling Point-4</td>
</tr>
<tr>
<td>e</td>
<td>Sampling Point-5</td>
</tr>
<tr>
<td>f</td>
<td>Sampling Point-6</td>
</tr>
<tr>
<td>g</td>
<td>Sampling Point-7</td>
</tr>
</tbody>
</table>
## AMBIANT AIR QUALITY

**Report reference No:** GEL/LAB/GEMSEIA108-A  
**Date:** 20-07-2016  
**Name of Industry:** EIA OF COAL TRANSSHIPPING PROJECT  
**Address:** C/O GEMS  
**Telephone No.:**  
**Location:** Location 1, Berth 3 & 4, Port Qasim  
**Date of analysis:** 16-07-2016  
**Date of completion of analysis:** 17-07-2016  

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Parameters</th>
<th>Units</th>
<th>SEQS Limits.</th>
<th>Concentration</th>
<th>Method</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carbon monoxide (CO)</td>
<td>mg/m³</td>
<td>10</td>
<td>&lt;1</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Carbon Dioxide (CO₂)</td>
<td>%</td>
<td>330</td>
<td></td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Particulate Matter (SPM)</td>
<td>µg/m³</td>
<td>500</td>
<td>106</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Particulate Matter (PM₁₀)</td>
<td>µg/m³</td>
<td>150</td>
<td>60</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Particulate Matter (PM₂₅)</td>
<td>µg/m³</td>
<td>75</td>
<td>40</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Relative Humidity (RH %)</td>
<td>%</td>
<td>...</td>
<td>67</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Temperature</td>
<td>°C</td>
<td>...</td>
<td>30</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Noise</td>
<td>dB</td>
<td>75</td>
<td>70.00</td>
<td>Noise Meter</td>
<td></td>
</tr>
</tbody>
</table>

**SEQS:** Sindh Environmental Quality Standards.  
This report is not valid for any negotiations.  
**BDL:** Below Detectable Limit

1. Sample analyzed by: [Signature]  
2. Verified by: [Signature]  
3. Signature of incharge of the environmental laboratory:  
   - **Name:** Muhammad Qadiruddin  
   - **Designation:** GM- Karachi Lab  
   - **Date:** 20-07-2016  

---  

**End of the Report**
# AMBIANT AIR QUALITY

Report reference No: GEL/LAB/GEMSEIA108-B  
Name of Industry: EIA OF COAL TRANSSHIPMENT PROJECT  
Address: C/O GEMS  
Location: Location 2, Berth 3 & 4, Port Qasim  
Date of analysis: 16-07-2016  
Date of completion of analysis: 17-07-2016

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Parameters</th>
<th>Units</th>
<th>SEQS Limits.</th>
<th>Concentration</th>
<th>Method</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carbon monoxide (CO)</td>
<td>mg/m³</td>
<td>10</td>
<td>&lt;1</td>
<td>EVMT</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Carbon Dioxide (CO₂)</td>
<td>µg/m³</td>
<td></td>
<td>338</td>
<td>EVMT</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Particulate Matter (SPM)</td>
<td>µg/m³</td>
<td>500</td>
<td>87</td>
<td>EVMT</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Particulate Matter (PM₁₀)</td>
<td>µg/m³</td>
<td>150</td>
<td>58</td>
<td>EVMT</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Particulate Matter (PM₂₅)</td>
<td>µg/m³</td>
<td>75</td>
<td>29</td>
<td>EVMT</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Relative Humidity (RH %)</td>
<td>µg/m³</td>
<td></td>
<td>67</td>
<td>EVMT</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Temperature</td>
<td></td>
<td></td>
<td>30</td>
<td>EVMT</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Noise</td>
<td>dB</td>
<td>75</td>
<td>68.00</td>
<td>Noise Meter</td>
<td></td>
</tr>
</tbody>
</table>

SEQS: Sindh Environmental Quality Standards.  
This report is not valid for any negotiations.  
BDL = Below Detectable Limit

1. Sample analyzed by: [Signature]  
2. Verified by: [Signature]  
3. Signature of incharge of the environmental laboratory:  
   Name: Muhammad Qadiruddin  
   Designation: GM- Karachi Lab  
   Date: 20-07-2016  

End of the Report
# Ambiant Air Quality

**Report reference No:** GEL/LAB/GEMSEIA108-C  
**Date:** 20-07-2016  
**Name of Industry:** EIA OF COAL TRANSSHIPMENT PROJECT  
**Address:** C/O GEMS  
**Telephone No.:**  
**Location:** Location 3, Berth 3 & 4, Port Qasim  
**Date of analysis:** 16-07-2016  
**Date of completion of analysis:** 17-07-2016

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Parameters</th>
<th>Units</th>
<th>SEQS Limits</th>
<th>Concentration</th>
<th>Method</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carbon monoxide. (CO)</td>
<td>mg/m³</td>
<td>10</td>
<td>&lt;1</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Carbon Dioxide (CO₂)</td>
<td>µg/m³</td>
<td>...</td>
<td>349</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Particulate Matter (SPM)</td>
<td>µg/m³</td>
<td>500</td>
<td>208</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Particulate Matter (PM₁₀)</td>
<td>µg/m³</td>
<td>150</td>
<td>347</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Particulate Matter (PM₂₅)</td>
<td>µg/m³</td>
<td>75</td>
<td>55</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Relative Humidity (RH %)</td>
<td></td>
<td>...</td>
<td>73</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Temperature</td>
<td>°C</td>
<td>...</td>
<td>29</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Noise</td>
<td>dB</td>
<td>75</td>
<td>68.00</td>
<td>Noise Meter</td>
<td></td>
</tr>
</tbody>
</table>

**SEQS:** Sindh Environmental Quality Standards.  
This report is not valid for any negotiations.  
BDL = Below Detectable Limit

1. Sample analyzed by: [Signature]

2. Verified by: [Signature]

3. Signature of incharge of the environmental laboratory:  
   **Name:** Muhammad Qadiruddin  
   **Designation:** GM- Karachi Lab  
   **Date:** 20-07-2016

---

**Global Environmental Lab (Pvt) Ltd**  
2nd Floor, Aiwan-e-Sanat, ST-4/2, Sector-23, Korangi Industrial Area, Karachi.  
Ph: (92-21) 35113804-5 Fax: (92-21) 35113806 Email:info@gel.com.pk
## AMBIANT AIR QUALITY

**Report reference No:** GEL/LAB/GEMS/EIA108-D  
**Date:** 20-07-2016

**Name of Industry:** EIA OF COAL TRANSSHIPMENT PROJECT  
**Address:** C/O GEMS

**Location:** Location 4, Berth 3 & 4, Port Qasim  
**Date of analysis:** 16-07-2016

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Parameters</th>
<th>Units</th>
<th>SEQS Limits</th>
<th>Concentration</th>
<th>Method</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carbon monoxide (CO)</td>
<td>mg/m³</td>
<td>10</td>
<td>&lt;1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Carbon Dioxide (CO₂)</td>
<td>µg/m³</td>
<td>...</td>
<td>347</td>
<td></td>
<td>EVM7</td>
</tr>
<tr>
<td>3</td>
<td>Particulate Matter (SPM)</td>
<td>µg/m³</td>
<td>500</td>
<td>69</td>
<td></td>
<td>EVM7</td>
</tr>
<tr>
<td>4</td>
<td>Particulate Matter (PM10)</td>
<td>µg/m³</td>
<td>150</td>
<td>49</td>
<td></td>
<td>EVM7</td>
</tr>
<tr>
<td>5</td>
<td>Particulate Matter (PM2.5)</td>
<td>µg/m³</td>
<td>75</td>
<td>26</td>
<td></td>
<td>EVM7</td>
</tr>
<tr>
<td>6</td>
<td>Relative Humidity (RH %)</td>
<td>µg/m³</td>
<td>...</td>
<td>74</td>
<td></td>
<td>EVM7</td>
</tr>
<tr>
<td>7</td>
<td>Temperature</td>
<td>°C</td>
<td>...</td>
<td>28</td>
<td></td>
<td>EVM7</td>
</tr>
<tr>
<td>8</td>
<td>Noise</td>
<td>dB</td>
<td>75</td>
<td>70.00</td>
<td></td>
<td>Noise Meter</td>
</tr>
</tbody>
</table>

**SEQS:** Sindh Environmental Quality Standards  
This report is not valid for any negotiations.  
EDL = Below Detectable Limit

1. Sample analyzed by: [Signature]  
2. Verified by: [Signature]  
3. Signature of incharge of the environmental laboratory:  
   - **Name:** Muhammad Qadiruddin  
   - **Designation:** GM- Karachi Lab  
   - **Date:** 20-07-2016

---

**Global Environmental Lab (Pvt) Ltd**  
2nd Floor, Aiwan-e-Sanat, ST-4/2, Sector-23, Korangi Industrial Area, Karachi.  
Ph: (92-21) 35113804-5 Fax: (92-21) 35113806 Email:info@gel.com.pk
# AMBIANT AIR QUALITY

**Report reference No:** GEL/LAB/GEMSEIA108-E  
**Name of Industry:** EIA OF COAL TRANSSHIPMENT PROJECT  
**Address:** C/O GEMS  
**Location:** Location 5, Berth 3 & 4, Port Qasim  
**Date of analysis:** 16-07-2016  
**Date of completion of analysis:** 17-07-2016  

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Parameters</th>
<th>Units</th>
<th>SEQS Limits</th>
<th>Concentration</th>
<th>Method</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carbon monoxide. (CO)</td>
<td>mg/m³</td>
<td>10</td>
<td>&lt;1</td>
<td></td>
<td>EVM7</td>
</tr>
<tr>
<td>2</td>
<td>Carbon Dioxide (CO₂)</td>
<td>µg/m³</td>
<td>...</td>
<td>347</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Particulate Matter (SPM)</td>
<td>µg/m³</td>
<td>500</td>
<td>60</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Particulate Matter (PM₁₀)</td>
<td>µg/m³</td>
<td>150</td>
<td>57</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Particulate Matter (PM₂₅)</td>
<td>µg/m³</td>
<td>75</td>
<td>38</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Relative Humidity (RH %)</td>
<td>µg/m³</td>
<td>...</td>
<td>74</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Temperature</td>
<td>°C</td>
<td>...</td>
<td>28</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Noise</td>
<td>dB</td>
<td>75</td>
<td>65.00</td>
<td>Noise Meter</td>
<td></td>
</tr>
</tbody>
</table>

SEQS= Sindh Environmental Quality Standards.

This report is not valid for any negotiations.
BDL = Below Detectable Limit.

1. **Sample analyzed by:**

2. **Verified by:**

3. **Signature of incharge of the environmental laboratory:**

   **Name:** Muhammad Qadiruddin  
   **Designation:** GM- Karachi Lab  
   **Date:** 20-07-2016

---

End of the Report
AMBIANT AIR QUALITY

Report reference No: GEL/LAB/GEMSEIA108-F  Date: 20-07-2016
Name of Industry: EIA OF COAL TRANSSHIPMENT PROJECT
Address: C/O GEMS
Location: Location 6, Berth 3 & 4, Port Qasim
Date of analysis: 15-07-2016
Date of completion of analysis: 17-07-2016

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Parameters</th>
<th>Units</th>
<th>SEQS Limits</th>
<th>Concentration</th>
<th>Method</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carbon monoxide</td>
<td>mg/m³</td>
<td>10</td>
<td>&lt;1</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Carbon Dioxide (CO₂)</td>
<td>µg/m³</td>
<td>...</td>
<td>353</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Particulate Matter (SPM)</td>
<td>µg/m³</td>
<td>500</td>
<td>60</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Particulate Matter (PM₁₀)</td>
<td>µg/m³</td>
<td>150</td>
<td>60</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Particulate Matter (PM₂₅)</td>
<td>µg/m³</td>
<td>75</td>
<td>38</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Relative Humidity (RH %)</td>
<td>%</td>
<td>...</td>
<td>75</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Temperature</td>
<td>dB</td>
<td>75</td>
<td>60.00</td>
<td>Noise Meter</td>
<td></td>
</tr>
</tbody>
</table>

SEQS: Sindh Environmental Quality Standards.
This report is not valid for any negotiations.

1. Sample analyzed by: [Signature]
2. Verified by: [Signature]
3. Signature of incharge of the environmental laboratory:
   Name: Muhammad Qadiruddin
   Designation: GM- Karachi Lab
   Date: 20-07-2016

End of the Report
## AMBIANT AIR QUALITY

**Report reference No.:** GEL/LAB/GEMSEIA108-G  
**Date:** 20-07-2016

**Name of Industry:** EIA OF COAL TRANSSHIPMENT PROJECT  
**Address:** C/O GEMS

**Location:** Location 7, Berth 3 & 4, Port Qasim  
**Date of analysis:** 16-07-2016  
**Date of completion of analysis:** 17-07-2016

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Parameters</th>
<th>Units</th>
<th>SEQS Limits.</th>
<th>Concentration</th>
<th>Method</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carbon monoxide. (CO)</td>
<td>mg/m³</td>
<td>10</td>
<td>&lt;1</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Carbon Dioxide (CO₂)</td>
<td>µg/m³</td>
<td>...</td>
<td>353</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Particulate Matter (SPM)</td>
<td>µg/m³</td>
<td>500</td>
<td>65</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Particulate Matter (PM10)</td>
<td>µg/m³</td>
<td>150</td>
<td>59</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Particulate Matter (PM2.5)</td>
<td>µg/m³</td>
<td>75</td>
<td>40</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Relative Humidity (RH %)</td>
<td>%</td>
<td>...</td>
<td>75</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Temperature</td>
<td>°C</td>
<td>...</td>
<td>27</td>
<td>EVM7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Noise</td>
<td>dBA</td>
<td>75</td>
<td>72.00</td>
<td>Noise Meter</td>
<td></td>
</tr>
</tbody>
</table>

**SEQS:** Sindh Environmental Quality Standards.

This report is not valid for any negotiations.

**BDL = Below Detectable Limit**

1. **Sample analyzed by:** [Signature]

2. **Verified by:** [Signature]

3. **Signature of incharge of the environmental laboratory:**
   - **Name:** Muhammad Qadiruddin
   - **Designation:** GM- Karachi Lab
   - **Date:** 20-07-2016

---

**Global Environmental Lab (Pvt) Ltd**

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

Ph: (92-21) 35113804-5 Fax: (92-21) 35113806 Email:info@gel.com.pk
ANNEXURE

IV- Air Dispersion Modeling Report
Air Dispersion Modeling of Port Qasim Coal Terminal

The Huaneng Shandong Ruyi (Pakistan) Energy (Private) Ltd. plans to convert Berths No. 3 and 4 located on the Marginal Wharf of Port Qasim into a coal unloading terminal and stockyard. These berths will be used for unloading and storing the imported coal, dispatching it into trains and transporting it to destination coal power plant.

Emission Sources

From the point of unloading coal from ships to the point of loading coal into trains for transportation, the whole process will result in coal dust emissions (particulate matter). The coal handling and transportation process is shown in Exhibit 1.

Exhibit 1: Coal Handling and Transportation Process
Modeling Details
The United States Environmental Protection Agency approved regulatory air quality model AERMOD\(^1\) was used to simulate emissions from the proposed coal transportation Project. Meteorological data of Karachi weather station for 2011 was used in modeling.

There are four sources of emission in the process as shown in Exhibit 1. The remaining activities were not modeled as they will be undertaken under covered conditions so it was assumed that there will be negligible emissions from these processes. The activities that are covered and not modelled include:

1. Transfer Tower 1 which transfers the coal to a second conveyor belt (BC2)
2. Transfer Tower 2 which transfers the coal to the fourth conveyor belt (BC4)
3. Transfer Tower 4 which transfers the coal to the fifth conveyor belt (BC5)
4. BC2, BC4 and BC5 which transports the coal to the loading station
5. Loading operations onto the train

Modeling Methodology
The emission sources were modeled as an area source except the conveyor belt which was modeled as line source. The details of emission sources and emission calculations are presented in Exhibit 2.

Exhibit 2: Details of Emission Sources and Emission Calculations

<table>
<thead>
<tr>
<th>Source</th>
<th>Length (m)</th>
<th>Width (m)</th>
<th>Area (m²)</th>
<th>Emission Factor Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile Hoppers</td>
<td>35.5</td>
<td>3</td>
<td>107</td>
<td>a. (k \times 0.0032 \times ((U/5)^{1.3})/(M/2)^{1.4})</td>
</tr>
<tr>
<td>Belt Conveyor 1 (BC1)</td>
<td>348.7</td>
<td>1.8</td>
<td>628</td>
<td>b. (k(0.0032((U/5)^{1.3})/(M/2)^{1.4}) \times \text{length of conveyor belt/1000ft})</td>
</tr>
<tr>
<td>Coal Stockyard</td>
<td>330.0</td>
<td>130.0</td>
<td>49,200</td>
<td>c. ((13.2 \times \text{Active Days} \times \text{Area} \times \text{Control Factor})/2000)</td>
</tr>
<tr>
<td>Loaded Trains</td>
<td>606.6</td>
<td>3.5</td>
<td>2,123</td>
<td>d. ((13.2 \times \text{Active Days} \times \text{Area} \times \text{Control Factor})/2000)</td>
</tr>
</tbody>
</table>

Note: \(k\) is particle size multiplier, \(U\) is wind speed and \(M\) is moisture content.

a. AP-42, Chapter 13-Miscellaneous Sources, “Section 13.2.4 for Aggregate Handling and Storage Piles.”
c. Ibid.

The following assumptions were made for calculating emission factors:

---
Wind speed of 2.7 meters per second.
Moisture content of 4.8%.
Active days are 310 (85% of the year).
Control factor of 1.0 for dry material.
Control factor of 0.3 for sprayed material.

**Modeling Scenarios**

Modeling was carried out for the following scenarios:

**Scenario 1**

Scenario 1 represents uncontrolled dust emissions.

**Scenario 2**

Scenario 2 represents dust emissions with controls on emissions from coal stockyard and loaded trains. The continuous water spraying in coal stockyard and during transferring coal to trains is one control. The expected reduction is 70%. There will be another control around stockyard in the form of boundary walls. These walls reduce the wind speed and hence results in less dispersion of dust. The expected reduction is 50%.

**Scenario 3**

The controls in Scenario 3 are the same as in Scenario 2 with the addition of further control on loaded trains. The trains before transportation will be sprayed by binding agent that will form a thin layer on coal and helps in reducing the emissions. The expected reduction is a further 90% from the loaded trains.

**Modeling Parameters**

The PM$_{10}$ and PM$_{2.5}$ emissions for each scenario and modeled source is tabulated in Exhibit 3.
### Exhibit 3: Modeling Parameters

<table>
<thead>
<tr>
<th>Source</th>
<th>Release Height (m)</th>
<th>Scenario 1</th>
<th></th>
<th>Scenario 2</th>
<th></th>
<th>Scenario 3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total Emissions (tons/year)</td>
<td>Emission Rate (µg/s/m²)</td>
<td>Total Emissions (tons/year)</td>
<td>Emission Rate (µg/s/m²)</td>
<td>Total Emissions (tons/year)</td>
<td>Emission Rate (µg/s/m²)</td>
</tr>
<tr>
<td><strong>PM₁₀</strong></td>
<td><strong>PM₂₅</strong></td>
<td><strong>PM₁₀</strong></td>
<td><strong>PM₂₅</strong></td>
<td><strong>PM₁₀</strong></td>
<td><strong>PM₂₅</strong></td>
<td><strong>PM₁₀</strong></td>
<td><strong>PM₂₅</strong></td>
</tr>
<tr>
<td>Mobile Hoppers</td>
<td>5</td>
<td>2.79</td>
<td>0.42</td>
<td>830.05</td>
<td>125.69</td>
<td>2.79</td>
<td>0.42</td>
</tr>
<tr>
<td>Belt Conveyor 1 (BC1)</td>
<td>3</td>
<td>0.30</td>
<td>0.04</td>
<td>14.99</td>
<td>2.27</td>
<td>0.30</td>
<td>0.04</td>
</tr>
<tr>
<td>Coal Stockyard</td>
<td>15</td>
<td>21.69</td>
<td>3.25</td>
<td>16.03</td>
<td>2.40</td>
<td>3.25</td>
<td>0.49</td>
</tr>
<tr>
<td>Loaded Trains</td>
<td>10</td>
<td>1.07</td>
<td>0.16</td>
<td>16.03</td>
<td>2.40</td>
<td>0.32</td>
<td>0.05</td>
</tr>
</tbody>
</table>
Modeling Results

The results are tabulated in Exhibit 4.

Exhibit 4: Modeling Results (µg/m³)

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Period</th>
<th>Baseline Concentration Range</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>SEQS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM₁₀</td>
<td>24-hour</td>
<td>110-120</td>
<td>14.63</td>
<td>10.48</td>
<td>10.48</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>Annual</td>
<td></td>
<td>5.48</td>
<td>1.71</td>
<td>1.09</td>
<td>120</td>
</tr>
<tr>
<td>PM₂₅</td>
<td>24-hour</td>
<td>25-35</td>
<td>2.19</td>
<td>1.58</td>
<td>1.58</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Annual</td>
<td></td>
<td>0.82</td>
<td>0.25</td>
<td>0.17</td>
<td>40</td>
</tr>
</tbody>
</table>

The contour maps for dust dispersion is shown for Scenario 1 and Scenario 2 from Exhibit 5 to Exhibit 12. The contour maps for Scenario 3 are similar to Scenario 2 as the trains contribution to emission is not significant (see Exhibit 4). However, the control on trains in Scenario 3 will significantly reduce the dust emissions during transportation which is not discussed here as it is out of the scope of the EIA. The results shows that PM₁₀ and PM₂₅ emissions are well below the standards.
Exhibit 5: Scenario 1 - Predicted Annual Increment in PM$_{10}$ (µg/m$^3$)
Exhibit 6: Scenario 1 - Predicted 24-hour Increment in PM$_{10}$ ($\mu g/m^3$)
Exhibit 7: Scenario 1 - Predicted Annual Increment in PM$_{2.5}$ ($\mu$g/m$^3$)
Exhibit 8: Scenario 1 - Predicted 24-hour Increment in PM$_{2.5}$ ($\mu$g/m$^3$)
Exhibit 9: Scenario 2 - Predicted Annual Increment in PM$_{10}$ ($\mu$g/m$^3$)
Exhibit 10: Scenario 2 - Predicted 24-hour Increment in PM$_{10}$ ($\mu$g/m$^3$)
Exhibit 11: Scenario 2 - Predicted Annual Increment in PM$_{2.5}$ ($\mu$g/m$^3$)
Exhibit 12: Scenario 2 - Predicted 24-hour Increment in PM$_{2.5}$ ($\mu$g/m$^3$)
ANNEXURE

V- List of References
LIST OF REFERENCES

3. http://www.mocc.gov.pk/gop/index.php?q=aHR0cDovLzE5Mi4xNjguNzAuMTM2L21vY2xjL3VzZXJmaWxlczEvZmlsZS9NT0MvTmF0aW9uYWFxZmVoYW5nNzM5YmYwNTc4ZTExYjg4ZjllOTI0ZjA2ZDQ5ZjBjMmUzYzIwMzgzYjEwODQyZDQwYmZlZmY=/ 3-2
5. Library, Sindh Environmental Protection Agency, 2016 3-5
<table>
<thead>
<tr>
<th>No.</th>
<th>Reference</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Cumulative Impact Assessment for Industrial and Port Developments</td>
<td>4-2</td>
</tr>
<tr>
<td></td>
<td>at Port Qasim, Hagler Bailly Pakistan, 2016</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Cumulative Impact Assessment for Industrial and Port Developments</td>
<td>4-3</td>
</tr>
<tr>
<td></td>
<td>at Port Qasim, Hagler Bailly Pakistan, 2016</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Cumulative Impact Assessment for Industrial and Port Developments</td>
<td>4-4</td>
</tr>
<tr>
<td></td>
<td>at Port Qasim, Hagler Bailly Pakistan, 2016</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Cumulative Impact Assessment for Industrial and Port Developments</td>
<td>4-6</td>
</tr>
<tr>
<td></td>
<td>at Port Qasim, Hagler Bailly Pakistan, 2016</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Cumulative Impact Assessment for Industrial and Port Developments</td>
<td>4-8</td>
</tr>
<tr>
<td></td>
<td>at Port Qasim, Hagler Baley Pakistan, 2016</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Cumulative Impact Assessment for Industrial and Port Developments</td>
<td>4-8</td>
</tr>
<tr>
<td></td>
<td>at Port Qasim, Hagler Baley Pakistan, 2016</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>United States Geological Survey (USGS), “Seismic Hazard Map of Pakistan”</td>
<td>4-9</td>
</tr>
<tr>
<td></td>
<td>(based on GSHAP), accessed 15 September 2014,</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Cumulative Impact Assessment for Industrial and Port Developments</td>
<td>4-10</td>
</tr>
<tr>
<td></td>
<td>at Port Qasim, Hagler Baley Pakistan, 2016</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Cumulative Impact Assessment of Port Qasim Industrial Area, Hagler Bailly</td>
<td>5-5</td>
</tr>
<tr>
<td></td>
<td>Pakistan,</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>EIA report of PIBT and EIA report of Sinohydro’s 2x660 Coal Power Plant</td>
<td>5-18</td>
</tr>
<tr>
<td>28</td>
<td>Environmental impacts of dredging and land reclamation at Abu Qir Bay,</td>
<td>9-5</td>
</tr>
</tbody>
</table>