

Environmental Impact Assessment for Proposed Dairy Plant

Final Report
May 2005



Engro Foods Private Limited

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ES. Executive Summary

ES.1 Introduction

Engro Foods Private Limited (EFL) intends to setup a dairy processing and packaging plant in Rohri Taluka of Sukkur District. The proposed site location is shown in **Figure ES-1**. The proposed site is serviced by a black top road, that connects Rohri with Sukkur city. The site is approximately 1.5km south of Sukkur city.

Pursuant to the requirements of the Pakistan Environmental Protection Act, 1997 (PEPA 1997), EFL commissioned Halcrow Pakistan to carry out an independent Environmental Impact Assessment study for the proposed dairy plant. The EIA report has been prepared in conformance with the requirements of PEPA 97 and the Pakistan Initial Environmental Examination and Environmental Impact Assessment Review Regulations 2000, and in line with the guidelines of the Pakistan Environmental Assessment Procedures, 1997.

The proposed plant will require an area of approximately 20-25 acres including areas allocated for the production and packaging plant, milk reception facility, small residential colony, administration buildings, and internal roads. The proposed plant will have a raw milk processing capacity of about 200,000 litres per day. The plant will produce UHT (Ultra Heat Treated) milk, UHT cream and powder milk. Milk will serve as the main ingredient in all products. The raw milk will be purchased from farmers and suppliers and the plant will not have its own dairy farm. The milk will be supplied in tanker lorries. The main water consumption during the plant operation would be for washing and cleaning of the plant equipment and milk supply tankers, cooling water, steam generation, and domestic use. The wastewater from the plant will mainly include effluent from cleaning and washing. Other sources will include domestic effluents, boiler blow down, steam condensate, and cooling water. A wastewater treatment unit comprising of a balancing tank and an activated sludge system will be used to treat effluent to the limits prescribed in the NEQS.

ES.2 The Proponent

Engro Foods Limited (EFL) is a newly incorporated company set up for the processing of UHT Milk and other related dairy products. EFL is a 100% subsidiary of Engro Chemical Pakistan Limited (ECPL).

ECPL is an agri-based company with its principal activities being manufacturing, purchasing and marketing of fertilizers. The Company also produces and markets seeds. ECPL has investments in joint venture companies that produce phosphate, potash and nitrogenous fertilizers like ammonia and urea. The Company operates solely in the domestic market.

ES.3 *The EIA Methodology*

The various steps undertaken in the EIA preparation included understanding of the proposed operations; review of alternatives; review of policy, legislation and guidelines; collection and review of secondary data including the physical, biological, socio-economic and cultural environments of the area; field data collection; community consultation; impact identification; recommendations for mitigation and monitoring measures; development of a project specific Environmental Management Plan (EMP). The Terms of Reference of the EIA were sent to the Sindh EPA for review and comments.

ES.4 *Public Consultation*

Public consultation is an integral part of the EIA process and a regulatory requirement. Public Consultation is essentially a tool used for the purpose of information dissemination, exchange of views, and soliciting feedback and suggestions of key stakeholders about the project and the EIA. During the EIA process, meetings were held with various stakeholders to solicit and record their views and concerns for inclusion in project design at the project-planning phase. The stakeholders consulted primarily included local communities, district and taluka administration, irrigation department, Sindh Wildlife Department, livestock department, and the president of the association of NGO's in Sukkur. Their views and concerns were enquired through different consultation techniques and were incorporated into the EIA mitigation measures.

ES.5 *Project Alternatives*

To ensure implementation of best available management and technology options, an analysis of alternatives to the proposed operation was undertaken. Alternatives considered included:

- Management options including no project option, alternative site option, and alternative timelines.
- Technological options including alternative technologies, options for utilities including water and electricity, waste management etc

The 'no project option' and 'alternative site option' were considered not feasible. The selected technology option for the proposed project has formed the basis for recommendations related to waste management.

ES.6 *Impacts and Mitigation*

The EIA covers potential effects of the proposed project in the project area. The potential impacts related to the proposed project have been identified through professional judgement, experience, process understanding, and field observations. Impact significance has been assessed using a risk assessment approach based on the

severity and likelihood of the potential impact. Mitigation measures are proposed based on regulatory requirement and industry guidelines.

Potential impacts on the environmental receptors that may arise from project activities and the mitigation measures that will be adopted to reduce or minimize all impacts have been assessed and are summarised in **Table ES-1**.

ES.7 Environmental Management Plan

The EMP provides a delivery mechanism to address potential impacts of the project activities, to enhance project benefits and to introduce standards of good practices in all project activities. The EMP has been prepared with the objectives of:

- Defining roles and responsibilities of the project proponent for the implementation of EMP and identifying areas where these roles and responsibilities can be shared with other parties involved in the execution and monitoring of the project
- Developing a monitoring mechanism and identifying requisite monitoring parameters to confirm effectiveness of the mitigation measures recommended in the EIA
- Defining the requirements necessary for documenting compliance with the EMP and communicating it to all concerned regulatory agencies
- Prescribing the mechanism with which consultation with stakeholders during the project will be maintained.

ES.8 Conclusion

The EIA has fully examined the project activities, the background environmental conditions of the project area and the impacts likely to arise from the project activities. Mitigation measures to help minimise the identified impacts have been recommended and an EMP has been provided for the implementation of these mitigation measures.

On the basis of the above, this EIA concludes that the residual impacts of the proposed operation will be of minor significance and careful implementation of the EMP will ensure that environmental impacts are managed and minimised and all statutory requirements are met by the project proponent.

Table ES-1: Summary of impacts and mitigation

Potential Impact	Sources	Recommended Mitigation Measures
Landform and Soils	<ul style="list-style-type: none"> ■ Land clearing and Earth Works 	<ul style="list-style-type: none"> ■ Unnecessary dust generation during construction will be avoided ■ During construction earthworks will be limited to within the demarcated plant area, unnecessary land uptake and clearing outside of the plant area (for parking etc) will be avoided ■ The plant level will be set such that cut and fill operations are minimised and excavations are used as fill material ■ The plant will have a storm water collection system with a settling basin so that the storm water effluent has minimal sediment load
Wastewater	<ul style="list-style-type: none"> ■ Process wastewater 	<ul style="list-style-type: none"> ■ All mitigation measures related to water conservation and minimization will indirectly result in minimizing wastewater discharge ■ The wastewater will be treated using activated sludge treatment supplemented by disinfection, balancing tanks and oil and grease traps ■ The wastewater treatment system will be designed to ensure that it can handle average and peak daily flows from the plant. To cater for peak flows, balancing tank will be used. ■ The sludge from the activated sludge treatment system or balancing or sedimentation tanks will be dried, disinfected/matured and disposed into municipal landfills
Solid wastes	<ul style="list-style-type: none"> ■ Construction material ■ Packaging 	<ul style="list-style-type: none"> ■ Solid wastes will be segregated and stored in sheds ■ Reusable and recyclable wastes will be provided to local contractors ■ All non-combustible and non reusable or non recyclable wastes will be sent to the nearest municipal landfills ■ Plastics, aluminum foils or packing, and other similar material will not be burnt ■ Combustible wastes will be burnt in a designated area which is at a safe distance and downwind of the plant, residential community and nearby settlements
Air Quality	<ul style="list-style-type: none"> ■ Air emissions 	<ul style="list-style-type: none"> ■ The exposure of construction workers to dust will be minimised by provision of dust masks and avoiding unnecessary exposure to dust ■ To minimise impacts generators and boilers will be kept well maintained, emissions will be monitored to comply with NEQS limits, and the emissions will be vented through vertical stacks to minimise exposure at ground level to workers ■ These particulates will be removed by cyclones or bag filters before the air is vented to the atmosphere.

Potential Impact	Sources	Recommended Mitigation Measures
		<ul style="list-style-type: none"> ■ Non-CFC gases will be used as a cooling agent for cooling of chilled water and cold storage areas. ■ These fugitive emissions will be avoided by following a robust leak detection and maintenance programme ■ All solid wastes at the plant and the residential colony will be segregated and recyclable waste will be sent to the local recycling and reuse industry. Combustible and non-recyclable solid waste including paper, cloth etc will be burnt in a burn pit. ■ Burn pit will be located away and downwind of the plant and the residential colony
Noise Pollution	<ul style="list-style-type: none"> ■ Equipment and machinery 	<ul style="list-style-type: none"> ■ In areas with higher noise levels appropriate PPE will be provided to workers. ■ The noise producing machinery will be subjected to a regular maintenance programme to avoid producing unnecessary noise ■ Where possible silencers will be fitted with noise producing equipment. Additional controls such as damping, screening or lagging will also be used where required
Water Abstraction	<ul style="list-style-type: none"> ■ All activities requiring water 	<ul style="list-style-type: none"> ■ Efficient and low water consumption technology will be selected for the plant ■ Approvals will be obtained from relevant authorities or associations if surface water is to be used ■ Groundwater wells, if installed, will be spaced more than 300m from surrounding wells ■ Discharge from groundwater wells (if installed) will be measured on a monthly basis, any significant reduction will indicate low water availability and hence over abstraction in which case alternatives will be sought e.g. use of surface water with reduced abstraction of from groundwater wells etc. ■ Water consumption will be metered and monitored so that excessive water usage can be noted and rectified ■ For water conservation the following measures will be taken ■ Avoiding water leakages in pipes, pumps, tanks etc ■ Installation of water guns/valves with the washing hoses at the tanker and floor washing areas (so that water can be turned off when not in use) ■ Washing only the milk carrying tanks instead of the whole tanker body ■ Possibly recycling rinse water in tanker cleaning, last rinse from previous tanker for first rinsing of next tanker

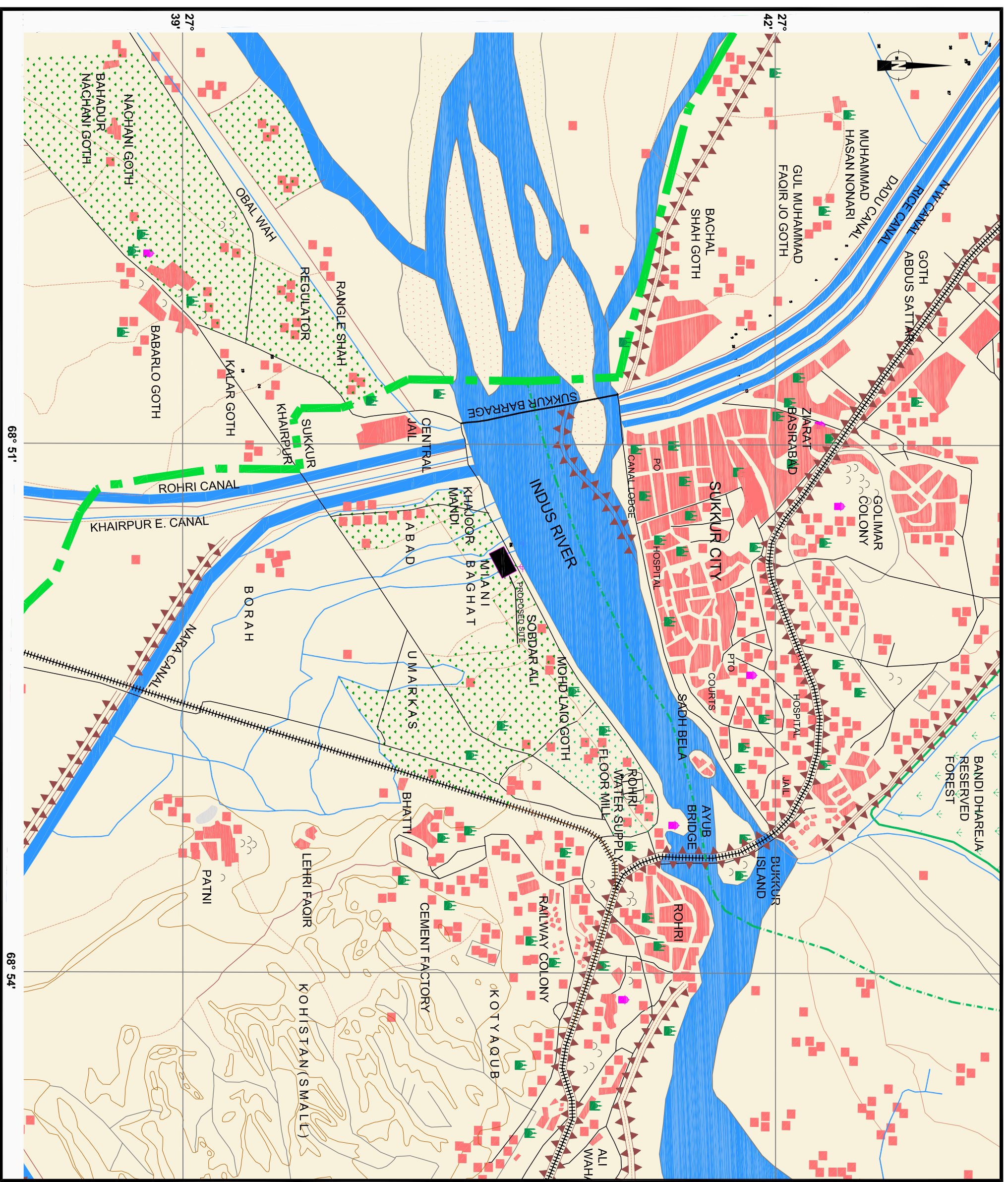
Potential Impact	Sources	Recommended Mitigation Measures
		<ul style="list-style-type: none"> ■ Floor washing will be kept to the minimum required and spills, leakages of materials that further require floor washing will be minimised ■ Using dry mopping for floor cleaning where feasible instead of cleaning by running water ■ Cleaning trays and other utensils in rinsing baths ■ Reusing cooling and utility water for general cleaning operations ■ Reusing milk evaporator discharge as feed water for the boiler ■ Minimising water requirements during CIP by reducing rinsing times
Chemicals and Oil Handling and Storage	<ul style="list-style-type: none"> ■ Chemicals and oils 	<ul style="list-style-type: none"> ■ All chemicals and oils will be stored in non-leaking containers or packaging and will be stored inside bunded areas with no ingress of water or direct exposure to rainfall ■ The bunded areas will have capacity equivalent to 120% of the product storage ■ All storage areas will have concrete flooring ■ MSDS will kept available at site and instructions related to handling and storage will be followed ■ Spilled material will be collected and reused if possible. If reuse is not possible the spilled material will be disposed after treatment. ■ Fuel and oil tanks will be regularly checked for leakages ■ Drip trays will be where required and feasible ■ Any soil contaminated from minor spills will be collected, washed and then disposed and the wastewater drained for treatment through the wastewater treatment plant
Wildlife		<ul style="list-style-type: none"> ■ Due to the close proximity of the Indus Dolphin Game Reserve to the proposed site, precautions and controls will be taken including controlled and monitored water abstraction from the Indus. ■ Monitoring and verification of the mitigation measures and any residual impacts visits of SEPA and Sindh Wildlife Department will be encouraged.
Disturbance to communities	<ul style="list-style-type: none"> ■ Land acquisition and changes in land use ■ Local economy, employment and household income ■ Environmental quality and nuisance for local residents 	<ul style="list-style-type: none"> ■ EFL will acquire land from the local owners and pay them compensation as per the prevailing market rates. ■ The land use for only the amount of land acquired will change to industrial from agriculture; the remaining land use in the surroundings will remain the same i.e. agriculture. ■ Providing employment to locals will improve their household incomes ■ Dust, particulates of milk powder, spills, and wastewater overflows can have an affect on the

Potential Impact	Sources	Recommended Mitigation Measures
	<ul style="list-style-type: none"> ■ Social services and utilities ■ Traffic congestion and safety of road users 	<p>surrounding land use. This will be avoided by adhering to the mitigation measures already proposed in the relevant sections of the EIA</p> <ul style="list-style-type: none"> ■ Water intake system from the Indus will be designed to ensure that it does not reduce water intake of farmers in the area ■ The plant will have its own parking area so that the tankers do not park on the main road. ■ The drivers will be advised to look out for any hazards, respect driving regulations, and will also reduce speed at any critical sections to avoid any road accidents
Emergencies and Hazards	<ul style="list-style-type: none"> ■ Flood ■ Fire 	<ul style="list-style-type: none"> ■ EFL will liaise with the XEN Guddu and Sukkur barrages during potential periods of flooding (i.e. mainly monsoon season) so that any emergency evacuation, if required, can be done ■ Like for any industrial plant, robust and comprehensive fire prevention and control measures will be implemented

...Table ES-1, Continued

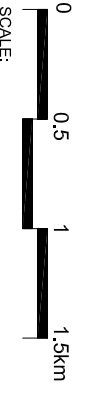
Potential Impact	Sources	Recommended Mitigation Measures
		<ul style="list-style-type: none">■ Priority in employment to local residents living close to the project location.■ Use local water sources only after complying with the relevant EIA requirements.■ Avoid impediment of flow of water in canal and water crossing.■ Repair/compensate any damage to canal, water channels, roads or other infrastructure.■ Observe strict compliance to Engro HSE guidelines.■ Train drivers in responsible and safe driving practices.■ Maintain communication channels between local spiritual leaders, community elders and Engro Pakistan.■ Respect cultural norms.■ Maintain appropriate offsets from sites of religious, cultural or archaeological significance.

Figure ES-1: Project area and baseline conditions



LEGEND

- PROPOSED SITE
- DISTRICTS BOUNDARY
- TALUKA BOUNDARY
- ROAD METALLED
- JEEPABLE TRACKS
- NARA CANAL
- RAILWAY LINE
- INDUS RIVER
- DATE FARMS
- FP BUND
- COMMUNITIES
- ZARAT, MOSQUE AND GRAVE YARD
- NULLAH
- CONTOUR



Revision	By	Checked/Approved	Date	Description

Client

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Project
ENVIRONMENTAL IMPACT
ASSESSMENT FOR MILK
PROCESSING AND PACKAGING PLANT

Drawing
PROJECT AREA AND
BASELINE CONDITIONS

Drawn by ZIH	Date: 06-05-2005
Checked by AG	Date: 06-05-2005
Authorised by AH	Date: 06-05-2005
Drawing No.	Revision

EXHIBIT ES-1

Drawing Scale: SEE ABOVE
 CAD Filename: PROJECTS/PK/ENGR100 Plot Scale:

68° 51'

68° 54'

27° 39'

27° 42'

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1 Introduction

1.1 The EIA

This report presents the findings of an Environmental Impact Assessment (EIA) carried out by Halcrow Pakistan (Pvt) Ltd, on behalf of Engro Foods Pakistan Limited (EFL) for proposed dairy processing and packaging plant in Rohri Taluka of Sukkur District.

The EIA has been prepared to conform to the requirements of the Pakistan Environmental Protection Act 1997, the Pakistan Initial Environmental Examination and Environmental Impact Assessment Review Regulations 2000, and the Pakistan Environmental Assessment Procedures, 1997.

1.2 EIA Report Structure

The EIA is presented in one volume along with the Environmental Management Plan (EMP). The EIA report contains sections on project description and alternatives, applicable laws and guidelines, baseline environmental conditions, public consultation, potential impacts and proposed mitigation, and conclusions. All figures, maps, photographs, and tables are provided as exhibits.

1.3 EIA Methodology

The EIA is conducted by a team of EIA professionals including environmentalists, biologists, and sociologists. The EIA is based on primary as well as secondary data. Primary data was collected on all physical, biological and socio-economic aspects using standard field survey methods (such as walkover surveys, focus group discussions etc). The Terms of Reference for the EIA were sent to Sindh EPA (SEPA) and some prominent NGO's for review and comments. Consultations were also held during field work with the local communities, district and taluka administration, irrigation department, Sindh Wildlife Department, livestock department, and the president of the association of NGO's in Sukkur.

Assessment of all potentially significant impacts on the physical, biological and socio-economic receptors is done both qualitatively and quantitatively, as required. The mitigation measures proposed are based on best industry practices and internationally recognised guidelines for cleaner production in dairy industry. Both the contents of the EIA and the EMP conform to the guidelines prescribed in the Pakistan Environmental Assessment Procedures 1997.

1.4 The Proponent

Engro Foods Limited (EFL) is a newly incorporated company set up for the processing of UHT Milk and other related dairy products. EFL is a 100% subsidiary of Engro Chemical Pakistan Limited (ECPL).

ECPL is an agri-based company with its principal activities being manufacturing, purchasing and marketing of fertilizers. The Company also produces and markets seeds. ECPL has investments in joint venture companies that produce phosphate, potash and nitrogenous fertilizers like ammonia and urea. The Company operates solely in the domestic market.

1.5 Contact Details

In case of further details or clarifications regarding this EIA, the proponent and the consultant can be reached at the following addresses:

Proponent	Consultant
Shamsuddin A. Shaikh Director Supply Chain, Engro Foods Pakistan Limited PNSC Building M.T.Khan Road P.O. Box 5736 Karachi 74000. Tel: 92-21-5611060-69 UAN: 111-211-211 Fax: 92-21-5610688, 5610401 Email: sashaikh@engro.com	Junaid Hassan Business Development Manager Halcrow Pakistan (Pvt) Ltd Branch Office C-195, KDA Scheme # 1A Karsaz Karachi Tel: 021-4123855 & 56 Fax: 021-4123854 E-mail: hasani@halcrowpk.com.pk

2 The Proposed Project

2.1 Project Location

The proposed site for the dairy plant is located in Rohri Taluka of Sukkur District. The proposed site location is shown in Exhibit 2-1. The proposed site is serviced by a black top road that connects Rohri with Sukkur city. The site is approximately 1.5km south of Sukkur city.

2.2 Project Schedule

Due to market forces and high demand for the products, the proposed plant will need to be commissioned on a fast track. The construction will start in June 2005 and finish in January 2006 after which the plant will be commissioned and operated. The plant design life is 25 years.

2.3 Plant Size and Layout

The proposed plant will require an area of approximately 15-20 acres including areas allocated for the production and packaging plant, milk reception facility, small residential colony, administration buildings, and internal roads. A tentative layout of the plant is shown in Exhibit 2-2.

2.4 Products and Raw Materials

The proposed plant will have a raw milk processing capacity of about 200,000 litres per day. The plant will produce UHT (Ultra Heat Treated) milk, UHT cream and powder milk. Milk will serve as the main ingredient in all products. The raw milk will be purchased from farmers and suppliers and the plant will not have its own dairy farm. The milk will be supplied in tanker lorries.

2.5 Plant Construction

As detailed earlier, the construction of the plant will commence in June 2005 and will finish by January 2006. The construction will involve minimal earthworks (land clearing, levelling, and excavations); construction of sub-structures (foundations) and super-structures for the main plant, administration buildings, small residential colony etc; construction of roads; construction of ancillary systems (water and wastewater treatment units etc); and peripheral walls. The construction will use and employ standard construction raw materials (cement, sand, steel reinforcement, bricks etc) and construction practices.

2.6 Process Description

2.6.1 *Milk Supply and Handling*

The raw milk will be procured from contractors who will supply milk to the plant site via tanker lorries. Approximately up to 90 tanker lorries, each of average capacity of 6,700 litres, will arrive at the site every day where the raw milk will be tested for fat content, odour and other parameters. The milk meeting the required specifications will be stored in chillers at 6°C for subsequent processing. The tanker lorries after decantation will be washed with water.

2.6.2 *UHT Milk*

The manufacturing of UHT milk will involve the following processes.

a. Pasteurisation

The chilled milk will be heated to a temperature of 75-85°C in a pasteuriser to kill pathogenic bacteria. The milk will be then cooled in the same equipment to 4-6°C. Heating and cooling is achieved by steam and chilled water. The pasteuriser is provided with a regeneration system to get maximum heat transfer efficiency in the heat-cool cycle.

During pasteurisation cream is also separated from the milk through a centrifugal cream separator. This cream will be further used to produce UHT cream.

b. Bactofugation, Standardization and Homogenisation

Harmful bacteria will be removed from the pasteurised milk through bactofugation. In addition, fat content of the milk will be adjusted to the required level and then it will be homogenised at 150 psi pressure to allow even distribution of fat globules in the milk.

c. UHT Treatment

The milk will be heated to a temperature of 140°C for 15 seconds. This will kill all pathogenic bacteria in the milk. The milk will be then cooled and stored in silos.

d. Packing

The UHT milk will be aseptically packed in tetra packs using specialised packaging machines. The tetra pack film will be sterilised by hydrogen peroxide solution. The packed milk will be stored for a few days so that any problems are detected before the milk is supplied to the market.

2.6.3 *UHT Cream*

The cream separated from the pasteurised milk will be pasteurised by heating it to a temperature of 95°C and then further heated to higher temperatures to produce UHT cream. The process is similar to the production of UHT milk. The UHT cream is cooled, stored in tanks, and packed for distribution to the market.

2.6.4 *Milk Powder*

For production of milk powder the pasteurised milk will be passed through six stage evaporators and condensed from 10% solids content to 50% solids content. Steam is used as a heating medium in the first evaporator; in all subsequent chambers water vapours from the first evaporator will serve the same purpose. After evaporation, milk is homogenised to prevent separation of fat, and then cooled. The cooled condensed milk will be pumped to a dryer where counter currents of hot air (at 180-190°C) will remove water vapours from the milk. The dried milk will be packed in consumer packs for further dispatch.

2.7 **Utilities**

2.7.1 *Electricity and Power*

Plant will be on captive power generation. Gas/Diesel generators will be employed for meeting complete requirement of the plant and housing areas. Electricity from WAPDA will be used for emergency purposes only.

2.7.2 *Water Consumption and Supply*

Approximately 850 cum of water will be required on a daily basis. The main water consumption will be for washing and cleaning of the plant equipment and milk supply tankers, cooling water, steam generation, and domestic use. No credible estimates on the water consumption during construction of the plant are available. However, water consumption during construction would be insignificant compared to the water consumption during plant operation.

The required water will be sourced from a ground water source, Indus River or Nara canal.

2.8 **Ancillary Operations and Facilities**

2.8.1 *Boilers and Steam Generation*

The main use of steam will be in pasteurisers, UHT plants, evaporators, and CIP (during hot water rinsing cycles). Nearly 90% of the steam condensate will be reused; the remaining 10% of feed water will be from raw water supply. The raw water will be softened through ion exchangers before use in the boilers.

2.8.2 *Cleaning and Washing*

At all dairy plants, cleaning and washing is of utmost importance as any contamination or left over residue can be a potential source of culture media for bacteria to grow. Two types of cleaning procedures will be adopted at the plant:

e. General Cleaning

This will involve general cleaning of all workplaces, floors, washing of empty containers, and washing of tanker lorries supplying raw milk. This will be done on a regular basis throughout the plant operation.

f. **Cleaning in Place (CIP)**

After any production cycle or shut downs, all equipment, vessels and pipelines will be cleaned by a specific CIP procedures. This can be automated or manual and short duration or long duration depending on the requirement. In each CIP process all lines and vessels are flushed with cycles of warm water and caustic soda and nitric acid to remove any contamination or left over residue.

2.8.3 *Water Treatment*

Water will be treated to make it suitable for boiler feed. Furthermore, site water analysis will be carried out and appropriate treatment process for potable water, will be selected and installed.

2.8.4 *Wastewater Treatment*

The wastewater from the plant will mainly include effluent from cleaning and washing. Other sources will include domestic effluents, boiler blow down, steam condensate, and cooling water. A wastewater treatment unit comprising of a balancing tank and an activated sludge system will be used to treat effluent to the limits prescribed in the NEQS. The process description of the wastewater treatment plant is given in Appendix A.

2.8.5 *Others*

The plant will include administration buildings, a small residential colony, internal roads etc. as ancillary facilities.

2.9 Process Chemicals

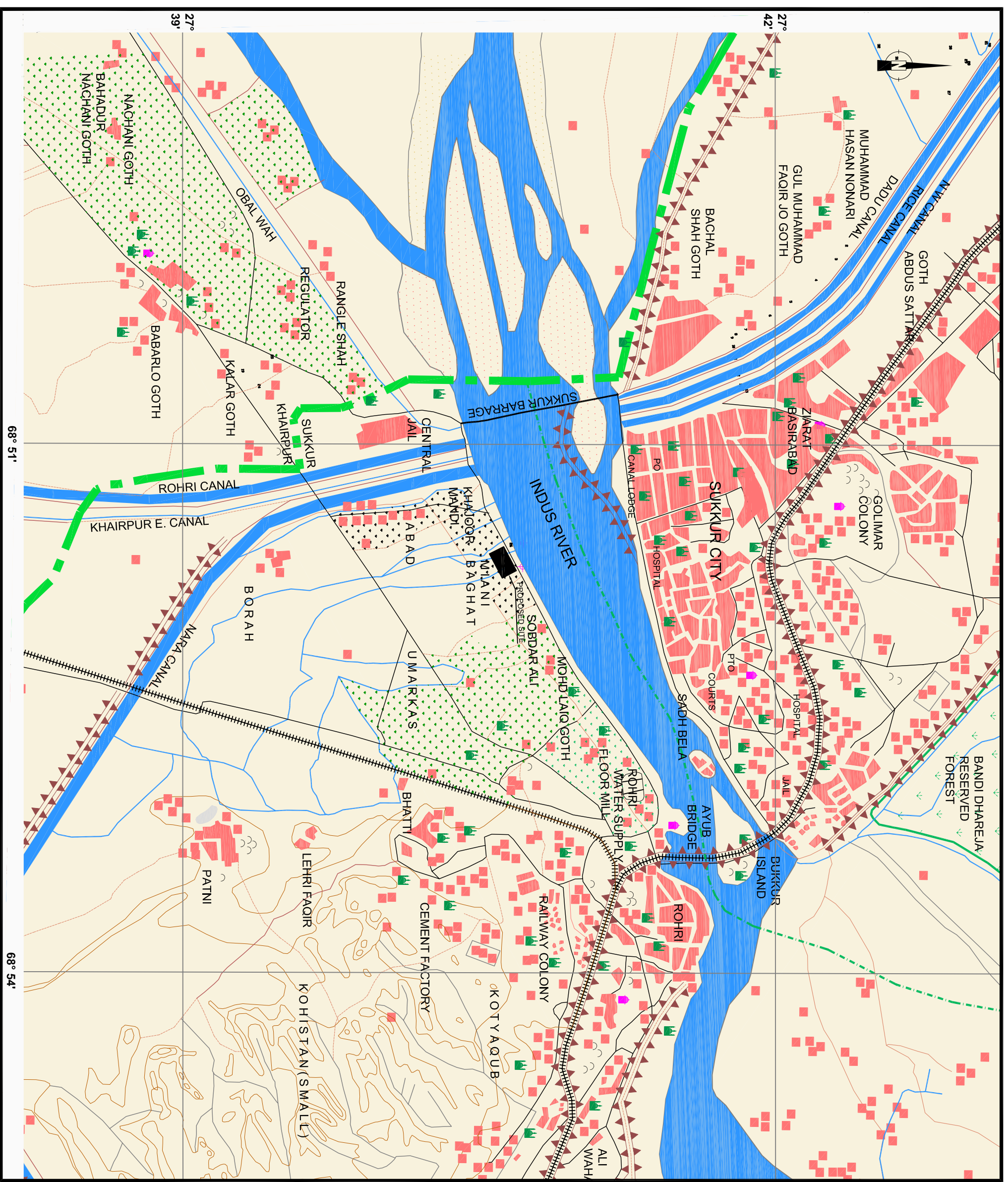
No chemicals will be used in the production of UHT milk, UHT cream, or powder milk. The usage of chemicals will be required only in ancillary operations including: washing and cleaning, water treatment, and wastewater treatment. The list of main chemicals that will be used is as follows:

- Caustic soda: as cleaning solution in CIP
- Nitric acid: as cleaning solution in CIP
- Hydrogen peroxide: sterilization of tetra pack films and vessels
- Sodium chloride: regeneration of resin in ion exchanger
- Detergents: for cleaning and washing

2.10 Workforce

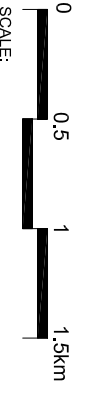
The plant will employ a total workforce of approximately 30 permanent and around 200 temporary workers during operation. During construction, a total permanent workforce of up to 10 people is expected, while local un-skilled and semi-skilled labour from the vicinity will be hired on a need basis. The permanent workforce employed at the plant will be housed in a small residential colony.

Exhibit 2-1: Key map of the proposed site



LEGEND

- PROPOSED SITE
- DISTRICTS BOUNDARY
- TALUKA BOUNDARY
- ROAD METALLED
- JEEPABLE TRACKS
- NARA CANAL
- RAILWAY LINE
- INDUS RIVER
- DATE FARMS
- FP BUND
- COMMUNITIES
- ZARAT, MOSQUE AND GRAVE YARD
- NULLAH
- CONTOUR



Revision	By	Checked/Approved	Date	Description

Client

ENGRO FOOD PAKISTAN LIMITED

Halcrow Pakistan (Pvt) Ltd.
 1-8 Mezzanine Floor Amn Arcade
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 www.halcrow.com



Project
ENVIRONMENTAL IMPACT
ASSESSMENT FOR MILK
PROCESSING AND PACKAGING PLANT

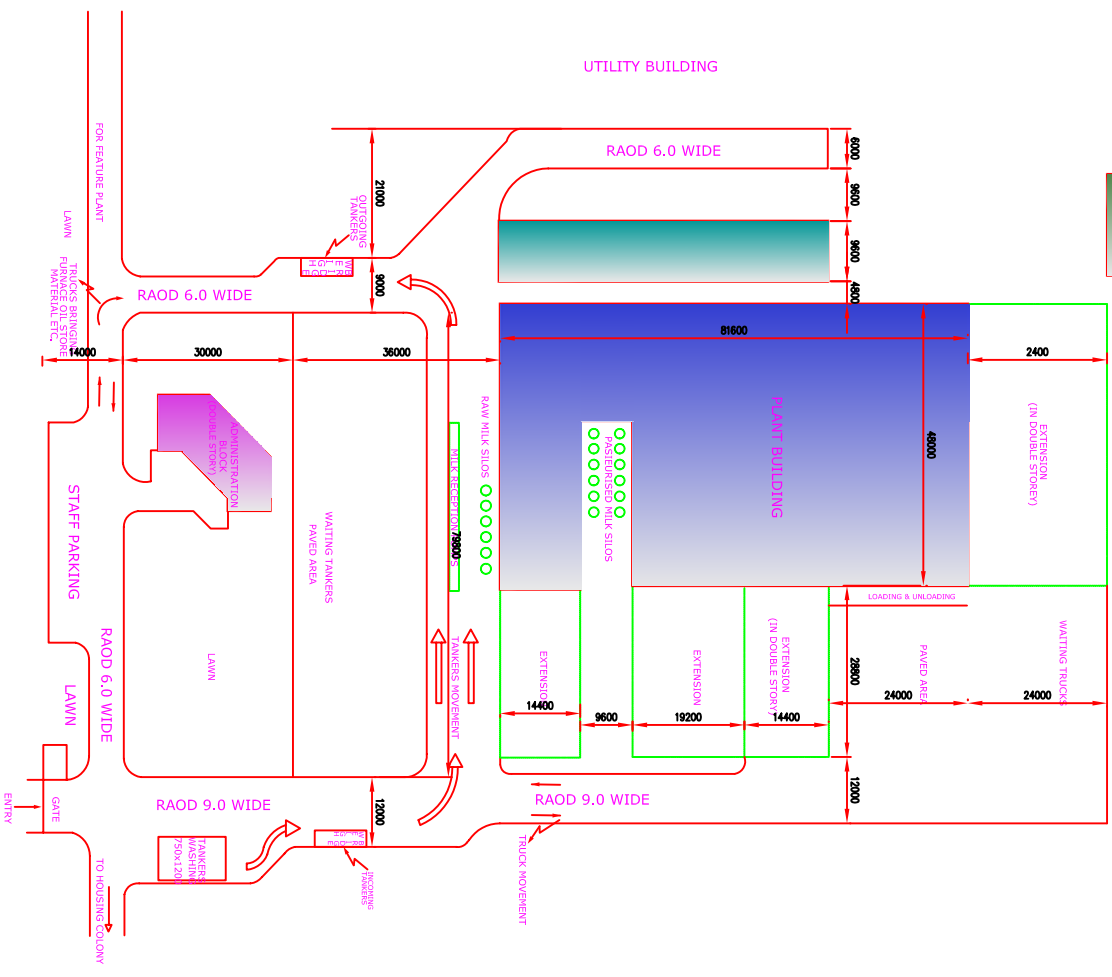
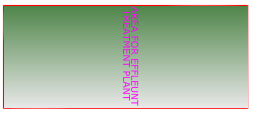
Drawing
PROJECT AREA AND
BASELINE CONDITIONS

Drawn by ZIH	Date: 06-05-2005
Checked by AG	Date: 06-05-2005
Authorised by AH	Date: 06-05-2005
Drawing No.	Revision

EXHIBIT 2-1

Drawing Scale: SEE ABOVE
 CAD Filename: PROJECTS/PK/ENGR100 Plot Scale:

Exhibit 2-2: Tentative Plant Layout



SCALE:

Revision	By	Checked/Approved	Date	Description

Client:

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Project:
 ENVIRONMENTAL IMPACT
 ASSESSMENT FOR MILK
 PROCESSING AND PACKAGING PLANT

Drawing:

**PROJECT AREA AND
 BASELINE CONDITIONS**

Drawn by ZH	Date: 13-05-2005
Checked by AG	Date: 13-05-2005
Authorised by AH	Date: 13-05-2005
Drawing No. EXHIBIT 2-2	Revision

Drawing Scale: SEE ABOVE
 CAD Filename: PROJECTS/PENOR100 Proj. Scale:

3 Policy and Regulatory Review

3.1 Introduction

This chapter provides details of local laws, international conventions, guidelines, and best practices applicable to the project. A broader and generic review of the environmental related institutions and laws in Pakistan is provided in Appendix B.

3.2 Legal Requirements

3.2.1 *Conduct of an EIA*

As per Schedule II of the IEE and EIA Review Regulations (2000) {2000 Regulations}, the proposed project falls under the category of projects which require an EIA (sub-category B. 4. of the Schedule which includes all food processing industries with total cost of one hundred million rupees and above). The preparation of this EIA satisfies the requirement of the 2000 Regulation.

3.2.2 *Approval from SEPA*

As per the 2000 Regulations, EFL will be required to submit the EIA report to SEPA (Sindh Environmental Protection Agency) and seek approval on the same from SEPA. 10 hard copies and 2 soft copies of the EIA report will need to be submitted to SEPA. SEPA will grant its decision on the EIA as per the rules and procedures set out in the 2000 Regulations. The following rules apply.

- A fee is payable to SEPA for review of the EIA.
- The EIA submittal is to be accompanied by an application in the format prescribed in Schedule IV of the 2000 Regulations.
- SEPA is bound to conduct a preliminary scrutiny and reply within 10 days of the submittal of the report a) confirming completeness, or b) asking for additional information, if needed.
- SEPA 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:
 - ▶ The type of project
 - ▶ The location of the project
 - ▶ The name and address of the proponent
 - ▶ The places at which the EIA can be accessed

- ▶ 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 30 days from the date of publication of the public notice.
- In the review process SEPA may consult a Committee of Experts, which may be constituted on the request of the DG SEPA.
- On completion of the review process and the public hearing, the decision of SEPA will be communicated to the proponent in the form prescribed in Schedule VI.
- 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 90 days of the issue of confirmation of completeness. However, SEPA can take up to 4 months for communication of final decision.
- 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 VII of the 2000 Regulations.
- The 2000 Regulations also require proponents to obtain from SEPA, after the end of construction phase 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.

3.2.3 *Project Monitoring and Compliance*

During project execution EFL will be required to comply with the recommendations of the EIA and any conditions of approval set forth by SEPA. Post EIA monitoring and reporting is mandatory under clause 19 of the 2000 Regulations. The Regulations require proponents of all projects to submit monitoring reports on completion of construction, yearly reports during operation, and any additional reports required by the EPA. The format and contents of such reports are not specified in the law.

3.2.4 *Effluent and Emission Standards*

Effluent and emissions from the project activities will have to meet the National Environmental Quality Standards, 2000 (NEQS). The NEQS are provided in Exhibit 3-1 and Exhibit 3-2.

3.2.5 *Effluent and Emission Self Monitoring and Reporting*

g. National Environmental Quality Standards (Self Monitoring and Reporting by Industry) Rules, 2001

The rules establish pollution limits for industries in Pakistan under an honor-based self-monitoring system obliging all industries to monitor liquid effluents and gaseous emissions and submit environmental monitoring reports (in the formats set out in Schedule VI) to the relevant EPA (in this case SEPA) timely and correctly. The dairy industry is classified as “B” category for monitoring of both liquid effluents and gaseous emissions. The reporting requirements for the dairy industry are given in Exhibit 3-3. All industrial units in “B” category are required to submit monitoring reports on a quarterly basis

h. Industrial Pollution Charge (Calculation and Collection) Rules, 2001

These rules ensure the correct calculation, reporting and payment of pollution charges by polluting/industrial units. As per this regulation, EFL will be liable to pay pollution charge for any pollution above NEQS. The list of parameters on which pollution charges shall apply and the method of calculating pollution charge are given in the Schedules attached to the Regulation.

i. Environmental Sample Rules, 2001

These rules authorise the Federal EPA and its authorised persons to obtain and test samples from industries to verify self-monitoring reports and calculation of pollution charges.

j. National Environmental Quality Standards (Certification of Environmental Laboratories) Rules, 2001

These rules were established as checks on environmental laboratories and require all laboratories to be certified from the Federal EPA as per the rules and criteria set out in the regulation.

3.2.6 *Canals*

As per the Sindh Irrigation Act, 1879 water required from a canal for project purposes will be abstracted only after gaining approval of the irrigation department. Damaging, altering, enlarging, obstructing canals or fouling canal water will be prohibited under the aforementioned Act and the Canal and Drainage Act, 1873 (amended in 1952, 1965, 1968 and 1970).

3.2.7 *Wildlife, Forests, and Protected Areas*

Under the Sindh Wildlife Protection Ordinance 1972 three types of protected areas viz. National Park, Wildlife Sanctuary and Game Reserve have been notified in the province for protection, conservation, preservation, and management of wildlife. These protected areas have varying restrictions with regards to the conduct of activities and projects.

The 170km reach of the Indus River between Guddu and Sukkur barrage is a designated game reserve providing a home to the Indus dolphin (*Platanista minor*), a blind cetacean endemic to this river. The game reserve was declared in 1974.

The proposed site lies outside the Game Reserve and therefore no restrictions on the conduct of the proposed operation apply. However, due to the close proximity of the Game Reserve to the proposed site, precautions and controls have been recommended in the EIA for the preservation of environmental quality.

3.2.8 *Protection of Antiquities*

In Pakistan and the province of Sindh, antiquities are protected under the Antiquities Act, 1975 and Sindh Cultural Heritage (Preservation) Act, 1994. Protected archaeological or cultural sites are neither reported from the area nor observed during the field visit and hence these laws are not applicable to the project.

3.2.9 *Others*

There are other acts, regulations, bye laws which may have some relevance to the project as well but these are either outdated (such as the Factories Act 1934, The Motor Vehicle Ordinance 1965, etc); not completely enforced (such as the Sindh Local Government Ordinance 2001 in which the district governments also have powers to make and implement bye laws related to sewage and waste disposal etc), or supplementary to the key laws discussed above (such as Sindh Fisheries Ordinance, 1980 which prohibits fouling of waters and is the same as some of the canal related laws discussed above).

3.3 **International Conventions**

Pakistan is a signatory to a number of international conventions and treaties. The relevant ones include:

- The Convention on Conservation of Migratory Species of Wild Animals, 1979 (CMS): the Convention requires countries to take action to avoid endangering migratory species. The term "migratory species" refers to the species of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries. The parties are also required to promote or co-operate with other countries in matters of research on migratory species. The Convention contains two appendices. Appendix I contains the list of migratory species that are endangered according to the best scientific evidence available. For these species, the member states are required to endeavour to: conserve and restore

their habitats; prohibit their hunting, fishing, capturing, harassing and deliberate killing; remove obstacles and minimise activities that seriously hinder their migration; and control other factors that might endanger them, including control of introduced exotic species. Appendix II lists migratory species, or groups of species, that have an unfavourable conservation status as well as those that would benefit significantly from the international co-operation that could be achieved through intergovernmental agreements.

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES): This convention came into effect in March 1973 at Washington. In all 130 countries are signatory to this convention with Pakistan signing the convention in 1976. The convention requires the signatories to impose strict regulation (including penalisation, confiscation of the specimen etc.) regarding trade of all species threatened with extinction or that may become so, in order not to endanger further their survival. The Convention contains three appendices. Appendix I includes all species threatened with extinction which are or may be affected by trade. The Convention requires that trade in these species should be subject to strict regulation. Appendix II includes species that are not necessarily threatened presently but may become so unless trade in specimen of these species is subject to strict regulation. Appendix III includes species which any contracting party identifies as subject to regulations in trade and requires other parties to co-operate in this matter.
- Convention on Biological Diversity 1992 (CBD): Pakistan as a signatory to the Convention on Biological Diversity is obligated to develop a national strategy for the conservation of biodiversity. The Government of Pakistan has constituted a Biodiversity Working Group under the auspices of the Ministry of Environment, Local Government and Rural Development to develop a Biodiversity Action Plan (BAP) for the country. After an extensive consultations, a draft Action Plan has been developed, which is presently under review. The Plan, which has been designed to complement the NCS (National Conservation Strategy) and the proposed provincial conservation strategies, identifies the causes of biodiversity loss in Pakistan and presents action proposals to conserve biodiversity in the country. Since the Plan is yet to be reviewed by the Cabinet, its provisions have not been finalised. The BAP recognises that at project level an EIA is used as a tool to identify environmental effects of a proposed project and to plan for reducing adverse effects. The BAP further stipulates that an EIA should be initiated at an early stage in project development cycle and that public participation in the review of potential effects is important
- Conventions on Wetlands 1971 (Ramsar Convention): Pakistan is a signatory to the said Convention. The principal obligations of contracting parties to the Convention are:
 - ▶ To designate wetlands for the List of Wetlands of International Importance.

- ▶ To formulate and implement planning so as to promote wise use of wetlands, to carry out EIA before transformations of wetlands, and to make national wetland inventories.
 - ▶ To establish nature reserves on wetlands and provide adequately for their wardening and through management to increase waterfowl populations on appropriate wetlands.
 - ▶ To train personnel competent in wetland research, management and wardening.
 - ▶ To promote conservation of wetlands by combining far-sighted national policies with coordinated international action, to consult with other contracting parties about implementing obligations arising from the Convention, especially about shared wetlands and water system.
 - ▶ To promote wetland conservation concerns with development aid agencies.
 - ▶ To encourage research and exchange of data.
- 1992 Climate Change Convention: The convention aims at stabilizing greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. To achieve the objective of the convention, all parties are generally required to develop national inventories of emission; formulate and implement national and regional programs of mitigation measures; all developed country parties and the EC were specifically obliged to take measures to limit greenhouse gas emissions by the year 2000 at 1990 levels
 - Vienna Convention on the Protection of the Ozone Layer and its Protocols 1985: The Parties to this Convention are aware of the potentially harmful impact on human health and the environment through modification of the ozone layer and recall the pertinent provisions of the Declaration of the United Nations Conference on the Human Environment, and in particular principle 21, and are also mindful that measures to protect the ozone layer from modifications due to human activities require international co-operation and action and should be based on relevant scientific and technical considerations.

Although not all of the treaties and conventions are directly legally binding on the proponent, the intent and objectives of applicable treaties and conventions will be respected. The EIA report satisfies the requirement of the CBD in that it looks at biodiversity issues and the protection of wildlife in the EIA. The species identified during field surveys that are covered under CITES and CMS have been given special consideration in the assessment of the potential project related impacts and their mitigation.

The Indus Dolphin Game Reserve is also a Ramsar site. The proposed site lies outside of the Game Reserve and will not contravene with any provisions of the Sindh Wildlife

Ordinance 1972 which provides legal cover as well to the provisions of the Ramsar Convention.

The gaseous emissions from the project will conform to the NEQS and will not contribute to any significant emissions of greenhouse gases and hence will not be in conflict with the recommendations and intent of the Convention on Climate Change.

3.4 Environmental Guidelines

The EIA takes into account relevant international and local guidelines in the conduct of the EIA, recommendations for mitigation measures, and development of the environmental management and monitoring plan. These include the following:

- Pakistan Environmental Assessment Procedures (1997)
- World Bank Environmental Assessment Source Book (1998) and its Updates
- World Bank Pollution Prevention and Abatement Handbook (including sector guidelines for dairy industry)
- Dairy Sector Environmental Report, ETPI, November 2000
- Cleaner Production Assessment in Dairy Processing, UNEP

The World Bank guidelines recommend the following standards for noise and air emissions for the dairy industry:

- Air emissions: 50 mg/Nm³ from powder milk production
- Noise emissions:
 - ▶ Residential and educational property boundary: 55 db(A) during day and 45 db(A) during night
 - ▶ Industrial or commercial property boundary: 70 db(A) during day or night.

Exhibit 3-1: NEQS for municipal and industrial effluents^a

Parameters	Into Inland Water	Into Sewage Treatment ^b
Temperature or temperature increase ^c	≤3°C	≤3°C
pH	6-9	6-9
Biochemical Oxygen Demand (BOD5) at 20°C ^d	80	250
Chemical Oxygen Demand (COD) ^d	150	400
Total Suspended Solids (TSS)	200	400
Total Dissolved Solids (TDS)	3,500	3,500
Grease and oil	10	10
Phenolic compounds (as phenol)	0.1	0.3
Chloride (as Cl ⁻)	1,000	1,000
Fluoride (as F)	10	10
Total cyanide (as CN ⁻)	1.0	1.0
An-ionic detergents (as MBAS) ^e	20	20
Sulphate (SO ₄)	600	600
Sulphide (S ⁻)	1.0	1.0
Ammonia (NH ₃)	40	40
Pesticides ^f	0.15	0.15
Cadmium ^g	0.1	0.1
Chromium (trivalent & hexavalent) ^g	1.0	1.0
Copper ^g	1.0	1.0
Lead ^g	0.5	0.5
Mercury ^g	0.01	0.01
Selenium ^g	0.5	0.5
Nickel ^g	1.0	1.0
Silver ^g	1.0	1.0
Total Toxic metals	2.0	2.0
Zinc	5.0	5.0
Arsenic ^g	1.0	1.0

...Table 3-1, Continued

Parameters	Into Inland Water	Into Sewage Treatment ^b
Barium ^g	1.5	1.5
Iron	8.0	8.0
Manganese	1.5	1.5
Boron ^g	6.0	6.0
Chlorine	1.0	1.0

Source: Qadar (2003)

Notes

- ^a All values are in mg/l, unless otherwise defined
- ^b Applicable only when and where sewage treatment is operational and BOD5=80 mg/L is achieved by the sewage treatment system
- ^c The effluent should not result in temperature increase of more than 3°C at the edge of zone where initial mixing and dilution take place in the receiving body. In case zone is defined, use 100 meters from the point of discharge
- ^d Assuming minimum dilution 1:10 on discharge, lower ratio would attract progressively stringent standards to be determined by the Federal Environmental Protection Agency. By 1:10 dilution means, for example that for each one cubic meter of treated effluent, the recipient water body should have 10 cubic meter of water for dilution of this effluent
- ^e Modified Benzene Alkyl Sulphate; assuming surfactant as biodegradable
- ^f Pesticides include herbicide, fungicides and insecticides
- ^g Subject to the total toxic metals discharge should not exceed level of total toxic metals

Exhibit 3-2: NEQS for selected gaseous pollutants from industrial sources^a

Parameter	Source of emission	Standard
Smoke	Any	40% or 2 Ringlemann scale or equivalent smoke number
Particulate matter ^b	Boilers and furnaces:	
	▶ Oil fired	300
	▶ Coal fired	500
	▶ Cement kilns	300
	▶ Grinding, crushing, clinker coolers and related processes, metallurgical processes, converter blast furnaces and cupolas	500
Hydrogen chloride	Any	400
Chlorine	Any	150
Hydrogen fluoride	Any	150
Hydrogen sulfide	Any	10
Sulfur oxides ^c	Sulfuric acid/Sulfonic acid plants	5,000
	Other plants except power plants operating on oil and coal	1,700
Carbon monoxide	Any	800
Lead	Any	50
Mercury	Any	10
Cadmium	Any	20
Arsenic	Any	20
Copper	Any	50
Antimony	Any	20
Zinc	Any	200
Oxides of nitrogen ^d	Nitric acid manufacturing unit	3,000
	Other plants except power plants operating on oil or coal:	
	▶ Oil Fired	400
	▶ Coal fired	600
	▶ Cement kilns	1,200

Source: Qadar (2003)

Notes:

- ^a All values are in mg/Nm³, unless otherwise defined
- ^b Based on the assumption that the size of the particulates is 10 micron or more
- ^c Based on 1% sulphur content in fuel oil. Higher content of sulphur will cause standards to be pro-rated
- ^d In respect of the emissions of the sulfur dioxide and nitrogen oxides, the power plants operating on oil or coal as fuel shall, in addition to NEQS specified above, comply with the following standards

Exhibit 3-3: Priority Paramters for Dairy Industry – Liquid Effluents

S.No.	Priority Paramters
1	Liquid Effleunts
	1. Effluent Flow
	2. Temperature
	3. pH
	4. BOD ₅
	5. TSS
	6. TDS
	7. Oil and Grease
2	Gaseous Emissions – Process
	None
3	Gaseous Emissions – Fired equipment
	1. CO
	2. NO _x *
	3. SO _x
	4. Particulates

Notes:

All parameters to be reported on a quarterly basis

Industry using Chromium in its cooling water will also report Chromium (trivalent, hexavalent)

Metal analyses of all gaseous emissions to be carried out once in two years

* Only where fuel contains hydrogen sulphide more than 20ppm

4 Review of Alternatives and Public Consultation

4.1 Project Alternatives

Alternatives are generated and examined to determine the best method of achieving project objectives, while minimising environmental impacts (WB December 1996¹). Alternatives that are generally reviewed for private sector projects include alternative site, timing, and technology. The analysis of some of the alternatives is not as exhaustive or strategic as would be required for public sector projects as the decision to invest in a particular sector is made by the project proponent. In some instances there will be an overlap between alternatives and mitigation measures, as alternative design, location, timing are also a way of impact mitigation.

4.1.1 *Do-Nothing Alternative*

Milk is a major part of our food consumption and an important element of our daily diet. In Pakistan as a food group, milk is second only to cereals in terms of per capita consumption. Pakistan, despite being the fifth largest milk producing country in the world, ranks low in terms of production of processed milk. Less than 3% of the total milk supplies in the country are processed through any form of treatment. There are presently only 15 dairy plants operating in the country, which are insufficient to meet the local demand of processed milk and related products. As a result the country spent approximately 500 million Rs. in 2001-2002 alone on the import of milk related products.

In the present situation the do-nothing situation is highly un-favourable. The proposed dairy plant will benefit the local consumers in that it will supply them with the much in demand supply of clean, hygienic milk that is safe for consumption and will also contribute to the improvement of the country's balance of payments.

4.1.2 *Alternative Technology*

No significantly different alternate technologies are available for processing UHT Milk and related dairy products and hence the selected technology is the only alternative available.

4.1.3 *Alternative Project Timelines*

Consideration of alternative timings for construction or operation of a project are necessary in cases where there are social, physical or biological receptors that may be

¹ World Bank December 1996. *Analysis of Alternatives in Environmental Assessments*. Environment Assessment Sourcebook, Update 17. The Environment Department, World Bank

sensitive to the project at a particular time and the postponement of the project in these times can avoid any potential significant impacts (such as breeding seasons of threatened animals, flooding etc). No such considerations are necessary for the project as no significant sensitivities exist in the area that cannot be mitigated by management or physical controls.

4.1.4 *Alternative Sites*

A total of seven sites were studied and evaluated both by the proponent and the EIA team. These sites were evaluated from the perspective of impacts of the plant on the surrounding environment (on air, land, water etc) and vice versa (e.g. the dairy production operations are sensitive to the environmental quality of the surroundings as well and the presence of odoriferous activities near the plant can affect the product quality). Of the seven sites studied the proposed site is evaluated to be the best possible option.

4.2 **Public Consultation**

4.2.1 *Benefits of Consultation*

There is a growing consensus that timely and broad-based stakeholder involvement is a vital ingredient for effective environmental assessment, as it is for project planning, appraisal and development in general. The World Bank has found that public participation in EIA tends to improve project design, environmental soundness and social acceptability (WB May 1999²). Conversely, EIAs that fail to be inclusive tend to have less influence over planning and implementation, and consequently result in higher social and environmental costs.

Placing sufficient emphasis on stakeholder involvement in the EIA process can also improve the predictive quality of environmental assessments. This is because the prediction of impacts using EIA often requires multi-year information and good quality baseline data. Yet one of the most common problems with “conventional” environmental assessment is that time and financial limitations, and project cycle schedules, constrain the collection of such data. Hence predictions are often based on a “snapshot” picture, which can be misleading or inaccurate. In contrast, assessments that involve different stakeholder groups, including those in local communities, have greater potential to access a wider information resource-base, and in some cases, generations of cumulative knowledge of their local environment (IIED, September 1998³).

² World Bank May 1999. *Public Consultation in the EA Process: A Strategic Approach*. Environmental Assessment Sourcebook, Update 26. The Environment Department, World Bank

³ IIED September 1998. *A Directory of Impact Assessment Guidelines*. International Institute of Environment and Development. Nottingham: Russell Press, Second Edition

4.2.2 *Legal Requirement for Public Consultation*

Public consultation is mandatory under the 2000 Regulations for all EIA studies. The Pakistan Environmental Assessment Procedures 1997 in its guidelines for Public Consultation further deliberate on the requirement for public consultation.

4.2.3 *Public Consultation during the Project*

For the purpose of this EIA, consultations were held with the project proponent, regulators, government agencies, NGOs and local communities. The outcomes of consultations with individual departments are summarised below. These have been used in the EIA for the understanding of the project area environment, expectations of different stakeholder groups, key sensitivities and proponent's expected obligations.

a. Consultations with EFL Staff

Meetings were held with Mr. Shamsuddin A. Shaikh (Director Supply Chain, Karachi); Mr Muhammad Pervaiz Hamayoun (Logistics and Engineering Services Manager, Karachi), and Mr. Masood Khatri (Senior Sales Officer, Sukkur).

Pertinent details of the project were obtained from these people including location, size, processes, products, technology, production capacity etc. The EFL staff was involved with the EIA team in the environmental review of various alternative sites, field surveys for data collection, and the impact prediction and design of mitigation measures.

During discussions with Mr Khatri in Sukkur, he informed the team that there would not be any problems of increased traffic on the local roads as the present load is nominal. The total milk requirement per day would be 200,000 liters. Milk will be collected from specified spots in Khairpur, Shikarpur, Sukkur, Rahimyar Khan and Ghotki. The company has earlier carried out a survey for potential milk supply places, he informed.

Mr. Muhammad Pervaiz Hamayoun maintained that there would not be any significant environmental problems due to the Plant, as all relevant environmental laws would be strictly followed. Regarding waste disposal, he said that a treatment plant would be installed and operated.

b. Mr. Mastan Ali Kokhar, DO livestock

The purpose to meet the District Officer livestock was to get information on various ruminants in the district, recent livestock statistic, various breeds, and to inform him about EFL's proposed activities.

Mr. Mastan welcomed the idea and termed the venture as first of its kind not only in Sukkur but other surrounding districts as well. He opined that the required quantity of milk can be easily met from the various talukas of Sukkur district alone. He said that a recent survey suggests that milk prices in Sukkur and Rohri are the lowest and the quality of milk is good. He said that *Kundi* and *Ravi Neeli* breed of buffaloes are abundantly

found in the district. Similarly *Malini Ga* also produces above average milk and is found in good numbers in the district. He informed the survey team about a cattle colony, that was proposed in Bachal Shah in Sukkur. However, the proposal never materialised. There is still a plan to build a cattle colony near Abad bus terminal.

c. M. Yousaf Memon, X.En Design Division

The X.En was approached to ascertain the rules regarding water abstraction from Indus and its tributaries, water rates, the modus operandi for water withdrawal, disposing off waste water into the river, and different specifications of canals.

He was however of little help as he required that the proponent/consultant should approach the irrigation department through proper channel and provide something in writing to the Chief Engineer Sukkur Barrage. His staff were however helpful in providing the required specifications of various canals.

d. Abdul Jabbar, President NGOs Coordinating Committee

Mr. Abdul Jabbar was informed about the proposed activities in the capacity of representing all NGOs in the area.

The discussion mainly revolved around the present industrial practices, environmental problems due to industries in the area, environmental hazards specifically related to milk processing plants, concerns of civil society organizations on industrialization and various mitigation measures.

The president first spoke at length about the presence of different NGOs working in the area (the list of NGOs operating in the district is provided later in this report). He said that the NGO's had earlier worked with Engro in some community development drives, one of which, a blood bank, is still working. He appreciated the proponent's care of not only the environment but also its people-friendly policies. He added that all the environmental legislations and practices must be met by the proponent. He stressed that the company should:

- Provide maximum employment to locals
- Try to deliver maximum indirect benefits to the local communities
- Commence community development programmes in future
- Join hands with other industries and NGOs to make the city a model environment-friendly place

e. Mr. Shafeeq Khoso DCO Sukkur

The project team accompanied by one of the proponent's representative met the DCO at his office. The main purpose of the meeting was to apprise the DCO of the proponent's activities and to seek his advice on site selection. A range of issues came under discussion including inter alia, the future prospects and direction of city's

residential and industrial area's growth, the urban sewage systems, water supply schemes, road congestions and new road plans, waste disposal into the canals by various industries especially into the North-West Canal (Khirthar Canal), and various approvals required for installation of industries.

The DCO provided the team with feedback on every issue. He directed that the team should meet respective TMOs and TOs for infrastructure for site-specific discussions. He particularly stressed on the issue of 'sustainable development' in line with the area's culture and environment, people's wishes and fulfilling all the environmental legislations. He particularly stressed the following points;

- Every effort should be made to employ locals in various categories
- There must be a wastewater treatment plant for treatment of effluents.
- All environmental guidelines drafted by the Environmental Protection Agency should be strictly adhered to, and
- The proponent should invest in physical infrastructure (particularly roads) in the area of its operation.

f. Mulla Dad Durrani, Deputy Revenue Officer, Taluka Rohri

In the absence of taluka Mukhtiarkar Mr. Zahoor-ud-din Shah, the project team met the Niab Mukhtiarkar Mr. Mulla Dad. The discussion was focused on the proposed site in the Miani Baghat Deh. He was asked to opine if there were any plans of the taluka government to build a residential area or some other installations on the land proposed for the site, the land ownerships in the area, and contentious issues regarding the proposed site.

The Niab Mukhtiarkar dealt with all the issues in detail. He informed that the whole land belongs to individuals and has been officially distributed. This and some other adjacent land was acquired by the government for a housing colony in the 1980s. However, the rightful owners were either not paid or paid partially by the government. This started lengthy litigations between the owners and government. Now the locals had got back most of the lands in the deh and others are well on their way to acquire their lands back. He also said that a medical college (by the name of Sardar Ghulam Muhammad) was also proposed some times back in the area. He cautioned against buying of the land without going through the land records in detail.

g. Muhammad Khan Magsi, TMO Rohri

Mr. Magsi instantly welcomed the idea of a milk processing plant and termed it a wise investment, especially in the Rohri taluka. He termed the taluka as a gateway to the three provinces of Sindh, Punjab and Baluchistan.

Issues that were discussed included the present water supply schemes and sanitation in the taluka, various small, medium and large scale industries in Rohri, the taluka's traffic management and roads infrastructure, the likely direction of the physical development of the city in future, and various taluka level regulations and requirements for setting up of such an industry.

Mr. Magsi spoke at length about the location of the proposed site. He said that the TMA has plans to set up a housing society by the name of Saeedabad housing society in the Miani Baghat deh on an 80 acre piece of land. Similarly there is a long-time proposal to build a cattle colony in the same deh. He enumerated the big industries in the taluka as a flour mill, cotton ginning factories, oil and ghee industry and a cement factory. The whole town of Rohri has brackish ground water and the water supply scheme for the whole city of Rohri relies on the Indus River. This scheme has been recently upgraded by the taluka municipal administration.

He also said that there are no taluka level legislations for setting up of such industry. He, however, cautioned that the Pakistan Environmental Protection Agency's requirements should be met at any cost. Rohri has a big workforce of unemployed people and the biggest advantage of setting up of such industry would be the generation of local employment, he added.

h. Illahi Baksh (representative, goth Muhammad Liaq)

The community of Muhammad Liaq was visited and the people were informed about the proponent's proposed activities. None of the present people, led by Illahi Baksh raised any concerns. They rather appreciated the idea and showed interest by asking questions about the likely impacts. The people were fully taken into confidence and the discussion ended on a healthy note. The local's foresee employment opportunities, economic boom, betterment of physical infrastructure and help from the proponent in the delivery of various social services.

i. Mr. Hussain Buksh Bhaggat, Deputy Conservator-DC, Sindh wildlife department

A meeting was held with DC, SWD to inform him regarding the proposed project activities and discharge of effluent in the canal. DC told that discharge of industrial and domestic effluents in Indus and the canals has always been a problem in the Sukkur area. DC indicated that although the project area is out of any notified protected area, the effluent from dairy plant must treated to the acceptable levels (NEQS) before discharging into canal water. He also informed that Indus dolphin can travel into the canals to a fair distance and they have rescued 45-50 of them from Aug2004-Jan 2005. During this period 6 of them were rescued from Dadu canal, 3 from Rice canal, 21 from Khirthar (North West) canal, 5 from Rohri canal and 0 from Nara canal. Additionally, 15 dolphins were found dead at the time of rescue and 3 dolphins died during rescue operation. He also informed that in the past most of the dolphin have been rescued

from Dadu, Rice and North West canals in which the maximum tally was rescued from Dadu canal.

Exhibit 4-1: List of Stakeholders Consulted

S.No	Name	Designation	Department/Organization
1	Masood Khatri	Senior Sales Officer	Engro Foods Pakistan Ltd.
2	Mastan Ali Kokar	DO livestock (acting EDO Agriculture)	District Government
3	M. Younis Memon	X.EN Design division	Department of Irrigation
4	Abdul Jabbar	President	NGOs Coordination Committee (Districts Sukkur, Ghotki & Khairpur)
5	Mr. Shafeeq Khoso	DCO Sukkur	District Government
6	Mulla Dad Durrani	Niab Mukhtiarkar	Revenue Department, Taluka Rohri
7	Muhammad Khan Magsi	Taluka Municipal Officer	Taluka Administration, Taluka Rohri
8	Illahi Baksh	Representative	Goth Muhammad Liaq
9	Allah Dino Chachar	TMO	Taluka Administration, Taluka Sukkur
10	Javed Akhtar	Chief Officer	Taluka Administration, Taluka Sukkur
11	Zahoor Ahmad	TO Infrastructure	Taluka Administration, Taluka Sukkur
12	Sobdar Ali	TO Planning	Taluka Administration, Taluka Khairpur
13	Muhammad Farooqi	Naib Mukhtiarkar	Taluka Administration, Taluka Khairpur
14	Hussain Bux Bhagat	Deputy Conservator	Sindh Wildlife Department
15	Muhammad Pervaiz Hamayoun	Logistics and Engineering Services Manager	Engro Foods Private Limited

5 Baseline Environmental Conditions

5.1 Physical Environment

5.1.1 *Topography and Land Use*

The proposed site has a flat topography with poor natural drainage; partly affected by the black top road. Mean elevation of the area is approximately 70 m. The present land use at the site and surroundings is agriculture with a dense population of date palm trees. The Indus River flows at a distance of approximately 300m from the proposed site. Access to the site is via a black top road that runs between Rohri city and Sukkur barrage. This road was extensively used before the construction of Rohri bypass. At present the traffic load is negligible except on a single section near the *Khajoor Mandi*.

5.1.2 *Geology and Soils*

The area forms a part of the vast plain formed by the gradual filling up of the trough lying between the foothills of Himalayas and the central core of the subcontinent. The different parts of the plain have been deposited in different geological periods ranging from recent to sub-recent and early Holocene era. On regional scale the area is a part of the Indus basin and is composed of alluvial sediments deposited by ancestral and present rivers and their tributaries crossing the alluvial plain. The alluvium brought by the river Indus lies over the basement of tertiary shale's and limestone. The other contributing rocks are granites, schist's, gneisses and slates. The alluvium is quite rich in weathered minerals with soils deep and calcareous. Rohri is situated on the left bank of the Indus River, on a rocky eminence of limestone interspersed with flints

5.1.3 *Climate*

a. Meteorological Stations

The closest meteorological station is at Sukkur city. The meteorological information for the station is discussed below.

b. Climate

The climate of the area can be broadly described as hot and arid. As per Shamshad (1956) the climate of the area can be classified as 'Subtropical double season hotland.' The characteristic features of this climatic zone are low rainfall (less than 250 millimetres per annum), absence of a well-defined rainy season, and high temperature that increase from east to west.

c. Seasons

The sites lies in a region where monsoon rainfall is low, and the distinction between the summer and monsoon season is not very well marked. Broadly there are only two well defined seasons, hot and cold, but there are subtle variations as well and in a year with good monsoon rainfall the following four seasons prevail.

- *Winter:* winter sets in the area by the middle of December and may last till March. Western disturbances (or cyclones) originating from the Mediterranean Sea and Western Europe influence the weather during this period. The cyclones advance eastward over Saudi Arabia, Iran, Afghanistan and then to Pakistan. The mean monthly minimum and maximum temperatures are about 9°C and 26°C, respectively. Low intensity rainfall may occur in February and March with mean monthly values of 8mm and 5.7mm respectively.
- *Summer:* High temperatures and aridity are the main characteristics of this season. The hottest month is June, when the maximum daytime temperature exceeds 45°C. As the season approaches, pressure falls and a trough of low pressure develops over the region from April to May. The relative humidity varies from about 70 percent in the early morning to about 25 percent or less in the afternoon. Rainfall, again, is very occasional.
- *Monsoon:* The low pressure over the Indian Peninsula in May and June attracts winds from the Indian Ocean, which start blowing over the peninsula about the middle of June. These are the Southwest Monsoons. The monsoons spread northward, generally in a series of pulses. The area is not regularly influenced by the monsoons, though it is occasionally affected by associated rainfall in July and August. Monsoon rains are not evenly spaced but occur in short and intense spells.
- *Post-Monsoon Summer:* The period from the middle of September to November is a transition between the monsoon season and winter. In October, the maximum temperature varies from 34°C to 37°C. The weather becomes pleasant in November when the maximum temperature falls by several degrees. Due to the anti-cyclonic conditions, this period is very dry

d. Temperature

The area experiences extreme temperatures in summer. The annual average maximum temperature is approximately 34°C with mean daily maximum temperatures remaining above 40°C in May, June and July. June is the hottest month with highest recorded temperatures reaching up to 50°C. Daytime minimum temperatures even in winter remain above 22°C. Winters are mild and short with mean minimum temperatures not falling below 8°C.

e. Rainfall

The area is exceedingly dry with mean annual rainfall averaged over a thirty four year period less than 88mm. The available data indicates that there are two wet seasons: the first with low rainfall in February and March (with mean monthly rainfall of 5.9mm and

4.9mm respectively) and second with higher rainfall in the monsoon period of July, August, and September (with mean monthly rainfall of 44.6mm, 21.3mm and 10.5mm respectively). Approximately 78% of the mean annual rainfall occurs in the two wet seasons with 72% in monsoon. The heaviest recorded rainfall in a given day is 184.5mm in the month of July.

f. Wind Speed and Wind Direction

The wind direction is generally NE (November to April) in winter and SW in summer (May to September). Dust storms are not frequent in the area. Hot winds blow during the months of June and July.

5.1.4 *Air Quality and Noise*

The proposed site is located in a sparsely populated area with no significant source of air or noise pollution. The nearest sources of air and noise pollution include a flour mill (approximately 1.8 km away); Khajoor Mandi (0.5 km away) and a cement plant (3 km away); however emissions from these sources are not reported to reach or affect the proposed site's air quality. Most of the commercial activity in the area takes place at the Khajoor Mandi. It is reported that strong winds in the area also lead to high levels of airborne dust and occasionally give rise to short-duration dust storms.

5.1.5 *Water Resources*

a. Indus River

The major surface water feature in the area is the Indus River. The Indus drains an area of about 950,000 km² which generates a mean annual discharge of 6,682 m³/s (236,000 cusecs). The mean annual flood at the Sukkur Barrage is 18,100 m³/s (640,000 cusecs). The hydrograph of the river is strongly seasonal with a long low water season between October and March and a high water season between April and September – driven primarily by snowmelt in the upper catchment and monsoon rainfall. The river usually peaks in mid August or early September.

The river carries large sediment loads due to widespread and rapid erosion in its upper catchment. It is estimated that about 1 billion m³ of sediment is deposited in its floodplain each year. As a result of this continuing deposition, the river has developed natural levees along its length.

Morphologically, the Indus takes the form of an anastomosing river over most of its course in Sindh. An anastomosed river is a multi-threaded river like braided rivers. However in an anastomosed river the channels distinct, sinuous and separated by large, semi-permanent, vegetated islands capped by fine grained sediments such as silts and clays. These islands are usually at a similar level to the surrounding flood plain and are much more stable than the typical sand bars of a braided stream even at bank full stage.

Analysis of floodplain forms and features indicates clearly that the Indus River has historically shifted across the entire flood plain.

Water quality in the Indus has been continuously monitored since 1973 at Sukkur, Kotri and other locations. Water quality data at Sukkur Barrage from 1973 to 1991 has shown yearly averages of TDS to vary from 165 to 290 mg/l, with relatively higher TDS in the months of January to May (200 - 300 mg/l) and lower from June to December (100 - 200 mg/l). Indus River water quality has also been studied at the Dadu Moro Bridge and Kotri Barrage, with nitrate levels at 1.1 and 7.5 mg/l, phosphate at 0.02 and 0.3 mg/l, BOD at 2.4 and 4.1 mg/l, and faecal coliforms at 50 and 400 per ml⁴.

b. Barrages and Canals

Three barrages Guddu, Sukkur, and Kotri regulate river flows in Sindh. The proposed site is located just upstream of the Sukkur barrage. Sukkur Barrage was constructed in 1932. It is among the largest barrages in the world, and has a maximum design discharge of 1.5 million cusecs. The total designed withdrawal for canals is 47,530 cusecs. The barrage has 54 bays, each 60 feet wide.

There are no canals at the proposed site. The closest canal is the Nara canal that lies approximately 1km south-west of the proposed site. The Nara canal originates from the Sukkur barrage and is one of Sindh's fourteen main irrigation canals. The canal has a design discharge of 13,650 cusecs. The canal is perennial except for a closure/maintenance period of 15 days in January. Highest discharges in the Nara are recorded in May, June and July. Minimum discharge is reported in the month of August. The average monthly recorded discharges of Nara canal are graphically shown in Exhibit 5-4. Some of the physical features of the canal are provided in Exhibit 5-5.

c. Lakes or *Dhanda*s

There are no lakes or *dhanda*s (local names for lakes) in the area.

d. Groundwater

Pakistan's groundwater resources comprise a vast aquifer underlying the Indus Basin, recharged by the river flows, irrigation water and precipitation. According to a study, the safe groundwater yield in Pakistan is of the order of 55 MAF. An estimated 41.6 MAF of groundwater is pumped annually in Pakistan (more than 90% of it is utilised for irrigation). Most of the groundwater abstraction occurs in Punjab⁵.

The distribution of groundwater within the Indus Basin is not uniform. In Sindh, only 28% of the area is underlain by fresh groundwater (IUCN 1992⁶) where with the exception of a small strip along the Indus River, groundwater supplies are saline. The supplies are even less in the eastern deserts (such as Nara, Cholistan and Thar) and the

⁴ Pakistan Water Gateway at <http://www.waterinfo.net.pk>

⁵ www.waterinfo.net.pk/pdf/isp.pdf

⁶ Water for the 21st Century, a strategy paper for the NCS

western limestone ridges bordering the Indus Plain⁷ (such as Khirthar Hills). Generally, ground water between Kashmore and Hyderabad is fresh but becomes saline downstream of Hyderabad. On the left bank of the Indus, the width of fresh water zone varies between 30-40 miles from Guddu Barrage to Hyderabad, where it narrows down to about 20 miles width. It is also narrow near Rohri (where the proposed site is located) due to presence of Eocene Series of hills.

Discussions with district administration and local population reveal that in the project area bedrock is encountered at 30-40ft and groundwater quality is generally brackish. However, freshwater pockets can be expected as the site lies close to the Indus and the Nara Canal and a few hand pumps were also observed at a community nearby. Further studies and electrical resistivity surveys will be required to confirm presence of sweet groundwater in the area. The reason for current low groundwater reliance, maybe the proximity to the perennial surface water resources. The water supply for Sukkur and Rohri cities is also from the Indus. Raw water after being uplifted from Indus is stored in settling ponds and thereafter pumped into an over head tank from where water is supplied to the Rohri city and surrounding villages. The pH of this water (which is raw water abstracted from Indus) is around 8.7 with a TDS of approximately 200 mg/l.

5.2 Biological Environment

5.2.1 Habitats and Flora

The project site lies amidst agriculture lands and flanked by Indus River in the west and the Nara canal in the south. The Rohri Hills lie north of the proposed site.

The areas along the Indus and the Nara canal have dense growth of hydrophytic plants including *Salvadora oleoides*, *Tamarix indica*, *Saccharum spontaneum*, *Alhagi maurorum*, *Tamarix dioica*, *Saccharum spp.* and other reed vegetation like *Typha*. Common myna, Bank myna, Common babbler, Collared dove, and White-checked bulbul are quite common in the area.

The agricultural lands cover a major portion of the proposed site. Mostly weed species are found in the cultivated fields in addition to cultivated crops. Besides the weed species, plant species like *Dalbergia sisso*, *Eucalyptus spp.*, and *Acacia nilotica* trees are scattered around the edges of the agricultural fields, these species are introduced by the farmers for their use in daily life. Other common species include *Zizyphus numularia*, *Calotropis procera*, *Alhagi maurorum*, *Saccharum bengalensis*, *Prosopis cineraria*, and *Prosopis juliflora*.

⁷ Groundwater Resource Management in Pakistan

5.2.2 *Birds*

A total of 28 bird species were recorded in the area during the field survey, the list of species observed is given in Exhibit 5-6. The categorisation of species can be made as follows:

- 25 species are resident
- 3 species are migratory
- 18 species are abundant
- 10 species are common

Hunting of four species including Marsh harrier, Black kite, Indian crow pheasant, and Pond heron is prohibited under the Sindh Wildlife Protection Ordinance, 1972.

The commonly found birds are Cattle egret, Common babbler, Common myna, Bank myna, Crested lark, House crow, House sparrow, and Indian roller. Marsh harrier, Log-tailed grass warbler and Rose-ringed parakeet are less common in the area.

5.2.3 *Mammals and Reptiles*

Only 4 species of terrestrial mammals and 1 species of reptile were recorded from the area during the field visit. The species recorded include Asiatic jackal, Five-striped palm squirrel, Red fox, Indian crested Porcupine, and Indian monitor. Sporadic sighting of Wild boar in thickly vegetative areas cannot be ruled out as they are common in areas along the Indus River.

Indian monitor was recorded in areas close to the water channels within the agricultural fields. This species is protected under the Sindh Wildlife Protection Ordinance, 1972. It is expected that other species of reptiles and rodents will also be present in the area.

5.2.4 *The Indus Dolphin*

The 170km reach of the Indus River between Guddu and Sukkur barrage is a designated game reserve providing a home to the Indus dolphin (*Platanista minor*), a blind cetacean endemic to this river. The game reserve was declared in 1974.

The Indus Blind Dolphin is probably the most specialized of the world's fresh-water dolphins. Head and body length is 1.75-2.75 meters. Its rostrum is very narrow proximally, 21-30 teeth on each side of jaw. Once common in Indus, it is now confined only to the central stretch of Indus. It is quite social in nature and has schools up to 10 animals. Since this species of dolphin is blind, it uses echo-location for navigation.

As per observations of different scientists, the Indus dolphins start their courtship in March and early April, the gestation period is approximately 10-11 months. According to a survey conducted by Worldwide Fund for Nature (WWF) the total population of Indus

dolphin is more than one thousand in Pakistan. More than 60% is in the Indus Dolphin Game Reserve (between Guddu and Sukkur Barrages).

During flood season in the Indus, the dolphins are pushed into the canal system from the barrage gates. These stranded dolphins sometimes get killed by fishermen. Sindh Wildlife Department with the help of WWF Pakistan and Lahore Zoo has started a rescue programme under which these stranded dolphins are captured from canals and released back to Indus River.

5.3 Socio-economic and Cultural Environment

5.4 *Study Methodology*

This section describes the socio-economic and cultural environment of the project area. It presents information on the pertinent socio-economic parameters of the area and includes *inter alia* its location, the generic characteristics of nearby communities, religious affiliations, cultural conditionings, indigenous coping patterns as well as the health, economy, lifestyle and the use of resources by the local community.

Various stakeholders including the local communities, local leaders, representatives of local government, NGOs and others were consulted in detail about the proponent's likely activities in the area. Their concerns and suggestions were recorded and are presented in the stakeholders' consultation portion of the report. Semi-structured questionnaire and in depth formal and informal interviews were administered to collect data on important socio-economic parameters. Focused group discussions were carried out to arrive at community needs and their concerns regarding the proposed activities. Data from other published literature sources and the district census report have also been used.

5.5 *Location and Surroundings*

As per the present administrative divisions of Sukkur District, the proposed site lies in Deh Miani Baghat, Union Council Loung Bhatti of the Rohri Taluka.

The site is bounded by Indus River and Nara canal in the north, west, and south directions and by the Pakistan Railway track in the east. The site is used for agriculture with scattered small goths about 1km away from the site.

The site is serviced by the old Rohri-Sukkur black top road. The *Khajoor Mandi* lies approximately 500m from the site. Present industrial activity in the area includes a cement factory, a floor mill, and a small soda water bottling factory.

5.5.1 *Demographics*

The Miani Baghat Deh, however, has a very small population of only 349 people with 55 households. The male to female ratio is 1.23. The majority of the population in the deh

is Muslim and belongs to the Sunni sect. Major caste in the area are Bhatti, Bhutto and Solangi.

5.5.2 *Housing and Living patterns*

The area has more of an urban rather than a rural character; the main reason being its proximity to Sukkur and Rohri cities. Houses observed were with large living rooms and open courtyards. Most of the houses have a guest house which has an entrance from the main street. The living is very simple and is manifested in their eating habits and social ceremonies.

The 1998 census report shows that there are 12 pacca houses, 11 semi pacca and 32 kacha houses in the whole deh (see Exhibit 5-7). Facilities of kitchen and lavatories are present inside most of the houses.

5.5.3 *Social organization*

The social fabric in the area is constantly in transition from a rural disposition to an urban one. The presence of agriculture, semi pacca houses, nuclear family system etc on the one hand and the absence of jirga system and caste hierarchy on the other suggest amalgamation of rural and urban characteristics.

For those who live in joint or extended families, the economic resources are not pooled together as such. For example, there would be separate kitchens for four married brothers living inside one housing compound. On the other hand, there are collective lands and livestock, an ambivalent behaviour of strong brother's ties and corresponding cousin rivalries, inter-clan marriages and other customs of cooperation which are all hallmarks of rural societies.

Like all other societies, family holds the key to child socialization. In addition to informal learning of the cultural and societal norms, the child is sent to religious institutions (madrassas) for getting religious education. Formal schooling is also stressed to a greater degree. Most of the old men are uneducated but they seriously pursue their children education. The lack of school in the project area is much stressed by the locals.

People firmly follow the religious injunctions. Religion manifests in their day to day lives whether they are doing business, maintaining relations with family members, neighbours or friends, or taking care of the poor. People in the area fervently participate in daily prayers, zakat, fasting and pilgrimage to Makkah.

People in the project area are highly hospitable and caring. Although the presence of Otaks is limited, they serve their guests in front of their houses in a shaded area (usually below a tree).

5.5.4 *Education*

The literacy ratio of Miani Baghat is reported to 39.6% in 1998 with only 14 males and no females having passed matriculation. The only village near the proposed site has no school. Most of the school-age going children and none of the female children are not attending any school. Those who are getting education go to the main high school at Rohri. There are also a few private English Medium schools at Rohri, but no child from the villages was reported to be attending these schools.

5.5.5 *Health*

There is no health facility in the vicinity of the proposed site. People have to go the Rohri taluka hospital for treatment. Common diseases include seasonal fever, malarial fever and cough. Services of the district hospital Sukkur are also utilised in case of severe emergencies. There are also private hospitals and clinics at the district headquarter.

5.5.6 *Potable water*

The project team was informed by the TMA, Rohri that the underground water in almost the whole of taluka is brackish and surface water is used for drinking. However, at Goth Muhammad Liaq, five hand pumps of depths up to 50ft were observed. In addition, there are two hand pumps at the lone household belonging to Sobidhar Ali. The water was categorised as “drinkable” by the locals.

5.5.7 *Communication, Physical Infrastructure, and Energy*

The proposed site is accessible via a blacktop road that runs along the Indus and connects Rohri and Sukkur cities. This road now has minimal traffic. The nearest railway station is at Rohri and the airport at Sukkur.

Electricity is available in Goth Muhammad Liaq and the adjacent scattered households. Locals however complained of extended load shading especially during summers. In the absence of electricity, wax and kerosene oil lamps are used for lighting. There is no piped gas facility in the village and thus wood is predominantly used for cooking purposes. Some of the households do have LPG gas cylinders but their use is very limited due to high prices of LPG and ready availability of raw wood. “Owing to consistent sharp increases in the prices of LPG gas, we are again resorting to excessive wood use” commented Illahi Baksh at Goth Muhammad Liaq.

There is no telephone facility in the surveyed villages. However, due to proximity to Sukkur and Rohri, the proposed site and its surroundings have mobile phone coverage.

5.5.8 *Markets*

The main markets are Rohri and Sukkur only. Access to these markets is easy as public transport frequently ply on the roads. The *Khajoor Mandi* is a famous trading place for dates.

5.5.9 *Economy*

The economy is predominantly based on agriculture. In the project area, wheat and rice are the major crops. Due to the abundant availability of water, which locals take directly from Indus through lift pumps, rice production is good. Small orchards of dates were also observed near the project area. Women work shoulder to shoulder with their male counterparts in farming.

5.5.10 *Livestock*

In the project area, there is a very thin ruminant population. The primary reasons are the lack of open rangelands for free grazing. People usually keep a buffalo or a cow for household dietary needs. There are cattle colonies in Sukkur and Rohri which supply milk and milk products to the market.

5.5.11 *NGOs*

Although there are some NGOs operating in other parts of the taluka, none are directly working in the project area.

5.5.12 *Cultural Environment*

There are no sites of archaeological or cultural significance observed or reported in or around the project area. According to old records by lieutenant Twemlow, John Tate, and other historians, Rohri was the hub of civilization at the times of Neolithic⁸ man. It is said that 'from a very early period, Rohri acquired a sacred character, which was enhanced when the Saiyids who had settled in Bukkur (Sukkur) were removed by Shahbeg Arghun and compensated with land and privileges at Rohri'. The sacredness of the town is enhanced by the presence of innumerable new and old mosques⁹. In order of sacredness, a mosque having the Moo-e-Mubarak (a hair of the beard of the Holy Prophet P.B.U.H.) and another grand Jama Masjid erected in 1583 are important. There are also old shrines and graveyards.

⁸ The Neolithic era is generally understood as that time period during which people began to settle into small agricultural communities and eventually formed cities. Various artistic expressions developed as people required permanent dwellings (architecture), furniture and utensils (wood crafts and pottery), a fixed location for gods and goddesses (temple building and religious objects) and secure places for the bodies of the deceased (tombs, ossuaries and urns). This era also coincides with the *Bronze Age* where metals usage begun.

⁹ According to Thornton, more than a century ago around 40 functional and 80 ruined mosques were present in and around Rohri.

Opposite to Rohri is a small island with enclosed walls containing the shrines of Khawaja Khizer and Jind Pir. Both Muslims and Hindus come in large numbers to honour their respective saints.

Exhibit 5-1: Mean of Monthly Maximum Temperature for Sukkur Station

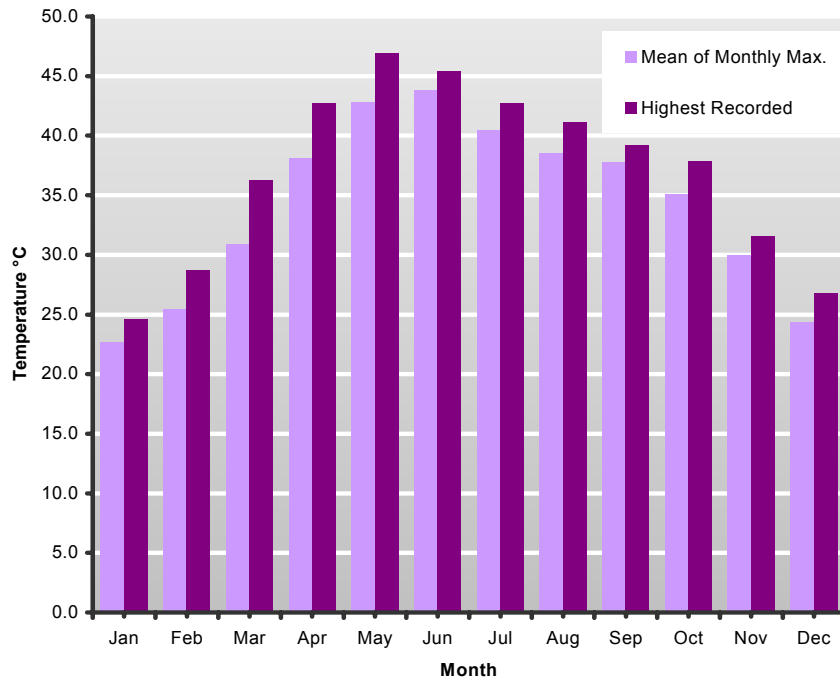


Exhibit 5-2: Mean Monthly Minimum Temperature for Sukkur Station

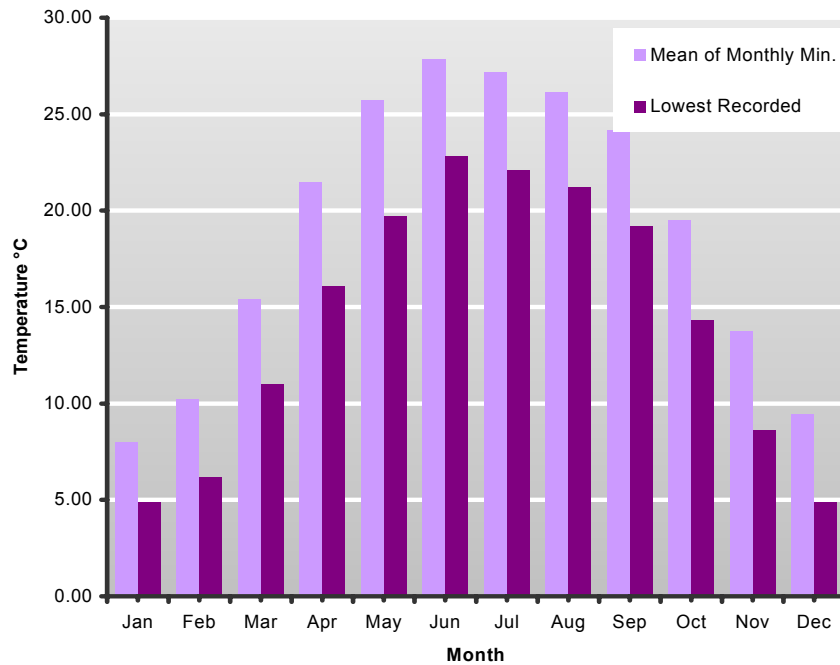


Exhibit 5-3: Rainfall Data for Sukkur Station

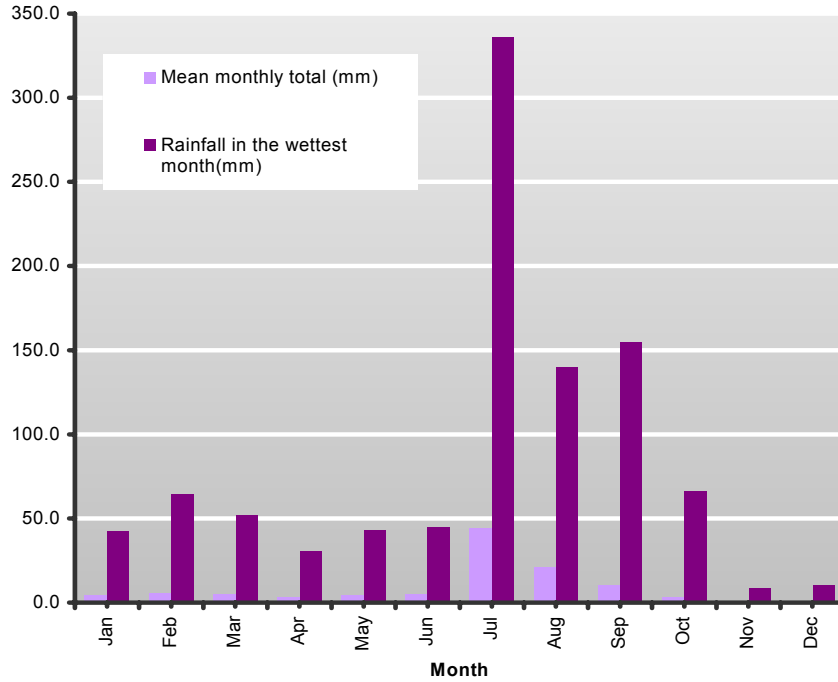


Exhibit 5-4: Average monthly discharges in Nara Canal

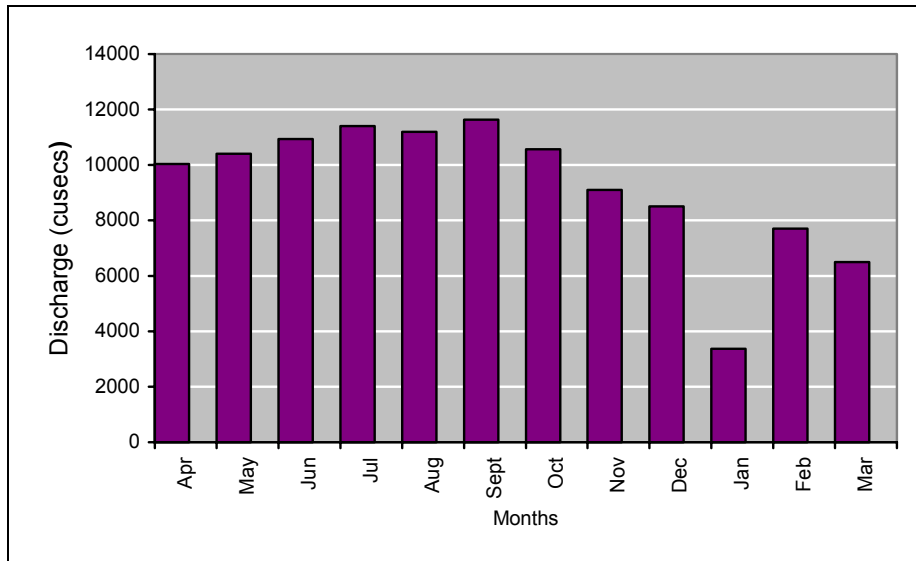


Table 5-5: Key physical features of the Nara canal

Feature	Details
Length	361.6 km
Width	90-135 m
Water Depth	7.5 m
Design Discharge	13,649 cusecs
Actual Discharge (in August 2001)	10,991 cusecs
Gross Command Area (GCA)	2.73 million acres
Cultivable Command Area (CCA)	2.46 million acres

Source: Irrigation Department (Sukkur Barrage)

Exhibit 5-6: Bird species recorded from the area

S.No.	Common Name	Scientific Name	Migratory	Resident	Common	Abundant	Less Common	Protection Status
1	Bank Myna	<i>Acridotheres ginginianus</i>		x		x	-	
2	Indian mayna/Common Myna	<i>Acridotheres tristis</i>		x		x	-	
3	Paddy Bird/Indian Pond Heron	<i>Ardeola grayii</i>		x		x		Protected under SWPO
4	Cattle Egret	<i>Bubulcus ibis</i>		x	x			Protected under SWPO and included in App. II of CITES
5	Indian Crow Pheasant	<i>Centropus sinensis</i>		x	x		-	
6	Marsh Harrier	<i>Circus aeruginosus</i>	x		x			Protected under SWPO and included in App. II of CITES
7	Blue Rock Pigeon	<i>Columba livia</i>		x		x		Included in App. III of CITES
8	Indian Roller	<i>Coracias benghalensis</i>		x	x		-	
9	House Crow	<i>Corvus splendens</i>		x		x	-	
10	Common Quail	<i>Coturnix coturnix</i>	x		x		-	
11	Indian Tree-Pie	<i>Dendrocitta vagabunda</i>		x	x		-	
12	Black Drongo / King Crow	<i>Dicrurus macrocercus</i>		x		x	-	

S.No.	Common Name	Scientific Name	Migratory	Resident	Common	Abundant	Less Common	Protection Status
13	Crested Lark	<i>Galerida cristata</i>		x		x	-	
14	Black-winged Stilt	<i>Himantopus himantopus</i>	x		x			Included in App. II of CMS
15	Red-wattled Lapwing	<i>Hoplopterus indicus</i>		x		x	-	
16	Rufous-backed Shrike	<i>Lanius schach</i>		x	x		-	
17	Little Green Bee-eater	<i>Merops orientalis</i>		x		x	-	
18	Black Kite	<i>Milvus migrans</i>		x		x		Protected under SWPO and included in App. II of CITES
19	Purple Sunbird	<i>Nectarinia asiatica</i>		x	x		-	
20	House Sparrow	<i>Passer domesticus</i>		x		x	-	
21	Long-tailed Grass Warbler	<i>Prinia burnesii</i>		x			x	Rated as Near Threatened in IUCN Red List
22	Rose-ringed Parakeet	<i>Psittacula krameri</i>		x		x		Included in App. III of CITES
23	Red-vented Bulbul	<i>Pycnonotus cafer</i>		x		x	-	
24	White-cheeked Bulbul	<i>Pycnonotus leucogenys</i>		x		x	-	
25	Pied Bushchat	<i>Saxicola caprata</i>		x		x	-	
26	Collared Dove	<i>Streptopelia decaocto</i>		x		x	-	

S.No.	Common Name	Scientific Name	Migratory	Resident	Common	Abundant	Less Common	Protection Status
27	Little Brown Dove	<i>Streptopelia senegalensis</i>		x		x		Included in App. III of CITES
28	Common Babbler	<i>Turdoides caudatus</i>		x		x	-	

Exhibit 5-7: Pertinent Statistics of Miani Baghat Deh

Parameter	Details
Number of Households	55
Population	
Male	193
Female	156
Literacy ratio	39.6
Electricity (number of households)	38
Type of households	
Pacca	12
Semi-pacca	11
Kaccha	32

Exhibit 5-8: NGOs Working in Khairpur, Sukkur, and Ghotki Districts

S. No	Name of NGO	Rural/Urban	Thematic Areas	District
1.	Shah Abdul Latif Bhattai Social Welfare Organization	Both	Education, Health	Sukkur
2.	Latif Social Welfare Association	Both	Education, Health, Infrastructure	Sukkur
3.	Welfare of Mankind and Nation (WOMAN)	Both	Health, Education	Sukkur
4.	Sukkur Blood & Drugs Donating Society (SBDDS)	Urban	Health	Sukkur
5.	Shah Latif Social welfare Association	Both	Health, Education	Sukkur
6.	Decent Welfare Association	Urban	Education, Infrastructure	Sukkur
7.	Gorgaje Social Welfare Association	Both	Education, Health	Sukkur
8.	Nuajanwan Sangat	Both	Health, Education, Environment	Ghotki
9.	Haidari Welfare Association	Rural	Education, Environment	Ghotki
10.	Shah Abdul Latif Development Organization	Rural	Education and Health	Ghotki
11.	Young Ghoti Welfare Association	Both	Education and health	Ghotki
12.	Al-Mehran Social Welfare Association	Both	Health, Education	Ghotki
13.	Sanwal Social Welfare Organization	Both	Health	Ghotki
14.	National Commission on Human Development (NCHD)	Both	Education	Ghotki
15.	Sindh Education Environment Development Association	Both	Education, Environment	Khairpur
16.	Sachal Samaji Sangat	Rural	Social Mobilization, Education	Khairpur
17.	Umang Development Society	Both	Development	Khairpur
18.	All Pakistan Woman Association (APWA)	Both	Women Development, Education	Khairpur
19.	Al-Mustafa Welfare Association	Both	Education, Environment	Khairpur
20.	Mehran Social Welfare Association	Rural	Education, Health	Khairpur
21.	Thardeep Rural Development Programme (TRDP)	Rural	Potable Water, Micro Credit	Khairpur

Exhibit 5-9: Photographs of the Proposed Site and Surroundings



Agricultural fields around the proposed site



Water courses within agricultural fields



Nara Canal



A hand pump in an area close to the canal



Settling basin for Rohri water supply



Rohri water supply from Indus



Robri water supply pumping station



A floor mill approx. 1.8km from proposed site



Black top road in front of the proposed site



Khajoor Market closed on a holiday



A hut used by haris



A village closest to the site

6 Potential Impacts and Mitigation

6.1 Introduction

The potential impacts related to the proposed project have been identified through professional judgement, experience, process understanding, and field observations. Impact significance has been assessed using a risk assessment approach based on the severity and likelihood of the potential impact. Mitigation measures are proposed based on regulatory requirement and industry guidelines.

A summary of the impact significance is provided in Exhibit 6-1 below where the impacts have been categorised as Low, Medium or High. None of the impacts fall in the High significance category. Low significance impacts are those that have either low severity or low likelihood of occurrence and can be controlled by standard mitigation practices. Medium significance impacts would need close attention and special mitigation and monitoring.

Exhibit 6-1: Impact Significance Matrix

No.	Potential Impact	Significance		
		Low	Medium	High
1	Landform and soils			
2	Air quality			
3	Noise			
4	Water abstraction			
5	Wastewater disposal			
6	Solid waste disposal			
7	Chemical and oil handling and storage			
8	Flora and fauna – general			
9	Flora and fauna – protected species			
10	Flora and fauna – Indus dolphin			
11	Socio-economic – positive impacts			
12	Land use and land acquisition			
13	Environmental quality and nuisance			

No.	Potential Impact	Significance		
		Low	Medium	High
14	Social services and utilities			
15	Traffic congestion and road safety			
16	Cultural environment			
17	Flooding and Fire			

6.2 Potential Impacts and Mitigation – Physical Environment

6.2.1 Landform and Soils

The proposed site occupies a fairly levelled land with mainly clayey or silty soils. The construction of the plant at the proposed site will not lead to any significant alterations in the existing land form or topography. The dust generated during earthworks at the site (land levelling, clearing and excavations) and runoff from any unpaved or uncovered areas after construction will have the potential to increase the sediment load of the surrounding water bodies (Indus River being the nearest water body from the site). This impact will however, be minimal compared to the existing sediment load of the Indus River and will not alter the water quality of the River (or any other water body in the vicinity). The impact is therefore assessed to have low significance and will be controlled by the following mitigation measures.

- Unnecessary dust generation during construction will be avoided
- During construction earthworks will be limited to within the demarcated plant area, unnecessary land uptake and clearing outside of the plant area (for parking etc) will be avoided
- The plant level will be set such that cut and fill operations are minimised and excavations are used as fill material
- The plant will have a storm water collection system with a settling basin so that the storm water effluent has minimal sediment load

6.2.2 Air Quality

There will be five sources of air emissions during the construction and operation of the plant. Impacts from each source and proposed mitigation measures are discussed separately below.

1. Dust - during construction (and especially during earthworks) dust will be generated which can be potentially harmful to human health (both for the workers and the surrounding population). There are no major communities in the immediate

surroundings of the proposed site; however, the construction workers will be exposed to dust. The exposure of construction workers to dust will be minimised by provision of dust masks and avoiding unnecessary exposure to dust.

2. Flue gases - The generators and boilers used during the operation will emit exhaust emissions including particulate matters and oxides of nitrogen, sulphur, and carbon. All of these pollutants can potentially affect human health. Potential receptors to these pollutants will be the permanent residents at the plant and the plant workers. To minimise impacts generators and boilers will be kept well maintained, emissions will be monitored to comply with NEQS limits, and the emissions will be vented through vertical stacks to minimise exposure at ground level to workers.
3. Milk powder particulates - During the production of milk powder, particulates of milk powder are entrapped within the hot air used for drying of the condensed milk. These particulates will be removed by cyclones or bag filters before the air is vented to the atmosphere. The World Bank recommended standard for concentration of these particulates in the emissions is 50mg/Nm³.
4. Fugitive emissions of hydrogen peroxide and cooling agents – hydrogen peroxide used for sterilization of tetra packs will be scrubbed with water and effluent drained to the wastewater treatment plant. Non-CFC gases will be used as a cooling agent for cooling of chilled water and cold storage areas. The emissions of these may occur in the form of leakages or during maintenance operations. These fugitive emissions will be avoided by following a robust leak detection and maintenance programme.
5. Open burning of domestic and industrial wastes – open burning of certain types of solid wastes such as aluminum foils and plastics can generate undesirable gaseous by products. All solid wastes at the plant and the residential colony will be segregated and plastics, aluminum foils, glass, metal etc will be provided to local contractors from where they will be sent to the local recycling and reuse industry. Only combustible and non-recyclable solid waste including paper, cloth etc will be burnt and that too in a burn pit located away and downwind of the plant and the residential colony.

6.2.3

Noise

Noise levels in most parts of dairy plants are reported to be high (ETPI 2000¹⁰). The noise values at different locations of dairy plants measured by ETPI (2000) are as follows:

- Generator room: 104-110 db(A)
- Ammonia compressor: 91-93 db(A)
- Pasteurisation section: 87-92 db(A)

¹⁰ Dairy Sector Environmental Report, ETPI, November 2000

- CIP room: 90-97 db(A)
- UHT section: 92-97 db(A)
- UHT control room: 87-92 db(A)
- Tetra pack filling section: 83-89 db(A)
- Air heater room: 88-91 db(A)
- Milk evaporator section: 79-97 db(A)
- Boiler house: 89-93 db(A)

The OSHA standard for exposure to occupational noise (29 CFR 1910.95) specifies a maximum noise level of 90 dB(A) for a duration of eight hours per day. Hence in areas with higher noise levels or longer shifts ear plugs and ear muffs will be provided to workers. Since there are no communities or other receptors within close proximity to the proposed plant site it is also expected that World Bank standards for noise at property boundaries will be met, however, these will be monitored during the plant operation and any mitigation measures required will be taken. The noise producing machinery will be subjected to a regular maintenance programme to avoid producing unnecessary noise; where possible silencers will be fitted with noise producing equipment; additional controls such as damping, screening or lagging will also be used where required.

6.2.4

Water Abstraction

Approximately 850 m³ of water will be required on a daily basis. The main water consumption will be for washing and cleaning of the plant equipment and milk supply tankers, cooling water, steam generation, and domestic use.

Industry currently uses only 2% of the total water consumption in Pakistan. Most industrial water is derived from privately owned wells, although a substantial amount is also taken from the canal system (National Water Policy 2000). The National Water Policy encourages the decision makers to make available and reserve sufficient supplies of water for industry on priority basis to promote industrial development and economic growth. The Policy also requires that a water licensing system and water rates be formulated for the industry so that there is efficient use of the water resource by the industry and also calls for urgent attention to the need for industrial wastewater treatment prior to discharge in freshwater bodies.

For the proposed project there are three options for water abstraction, these are discussed as follows:

- Indus River: mean annual maximum and minimum discharges downstream of Guddu Barrage are 687,000 cusecs and 17,000 cusecs respectively (Agricultural Statistics of Sindh 2001). The river hence shows strong seasonal variation, affected

by snowmelt and monsoon. The reduced water availability in Indus, its strong seasonality and low flows downstream of Kotri Barrage are a concern these days for water users and water management agencies. However the National Water Policy envisages still an increased water demand till 2025 and recommends construction of additional storage areas (amongst other management and conservation recommendations) to meet this increased demand. The expected project water consumption, which is 850 m³/day or 0.35 cusecs, is nominal in terms of the river discharges (even the minimum river discharge) and hence the project if seen in individuality will not have any impacts on water availability in the region. However, consent and approvals of the relevant departments (irrigation department or IRSA) will be sought prior to abstraction of water from the river. One of the operational and design constraints in abstracting water from the Indus will be its strong seasonality which will require an intake system that can abstract water or reach out to the main river during periods of low flows.

- Nara Canal: the average monthly discharges in the Nara canal have been shown in Exhibit 5-4, these vary between 6,000 cusecs and 10,000 cusecs. Whereas the abstraction of 0.35 cusecs of water per day for the project will not pose any significant impacts on water availability the presence of numerous water users or farmers associations and sharing of water with these farmers will be a problem.
- Groundwater: groundwater at the proposed site is reported to be saline, however, freshwater pockets are expected in areas close to the Nara Canal. The areas close to the Nara canal are recharged by canal water (about 35% of the irrigation water is lost through seepage to groundwater aquifers) and hence have ample quantity of water with limited use especially in the upper reaches by the local communities. Groundwater studies in even the lower reaches of the canal in Khairpur district have shown surplus groundwater availability (Halcrow 2002¹¹)

To control and monitor water usage and avoid wastage the following measures will be taken:

- Efficient and low water consumption technology will be selected for the plant
- Approvals will be obtained from relevant authorities or associations if surface water is to be used
- Groundwater wells, if installed, will be spaced more than 300m from surrounding wells
- Discharge from groundwater wells (if installed) will be measured on a monthly basis, any significant reduction will indicate low water availability and hence over abstraction in which case alternatives will be sought e.g. use of surface water with reduced abstraction of from groundwater wells etc.

¹¹ Environmental Baseline Study of Nara Game Reserve, Halcrow 2002

- Water consumption will be metered and monitored so that excessive water usage can be noted and rectified
- For water conservation the following measures will be taken
 - ▶ Avoiding water leakages in pipes, pumps, tanks etc
 - ▶ Installation of water guns/valves with the washing hoses at the tanker and floor washing areas (so that water can be turned off when not in use)
 - ▶ Washing only the milk carrying tanks instead of the whole tanker body
 - ▶ Possibly recycling rinse water in tanker cleaning, last rinse from previous tanker for first rinsing of next tanker
 - ▶ Floor washing will be kept to the minimum required and spills, leakages of materials that further require floor washing will be minimised
 - ▶ Using dry mopping for floor cleaning where feasible instead of cleaning by running water
 - ▶ Cleaning trays and other utensils in rinsing baths
 - ▶ Reusing cooling and utility water for general cleaning operations
 - ▶ Reusing milk evaporator discharge as feed water for the boiler
 - ▶ Minimising water requirements during CIP by reducing rinsing times

6.2.5

Wastewater

The rate of wastewater production per day from current dairy plants in Pakistan varies from 5.5 to 30 times the milk processed (ETPI 2000). However, with newer and more efficient technologies this rate can be brought down to 3 times the milk processed per day, which EFL will use in the proposed plant. Hence, the total wastewater generation will be approximately 600 m³/day. Wastewater generated from dairy plants is mostly alkaline and contains BOD, COD, TSS, TDS, TKN, and chlorides as pollutants. Typical ranges of these pollutants and their comparison with NEQS limits are provided below.

Exhibit 6-2: Typical concentration of pollutants in dairy wastewater

S.No.	Parameter	Concentration	NEQS
1	BOD ₅ mg/l	150-1400	80
2	COD mg/l	500 – 4000	150
3	Oil and Grease mg/l	20-400	10
4	Sulphate mg/l	300-1200	600
5	pH	7-10	6-9
6	TSS mg/l	200-3000	200
7	TDS mg/l	800-5000	3500

S.No.	Parameter	Concentration	NEQS
8	TKN mg/l	7-30	-
9	Chloride mg/l	100-1700	1000

Source: ETPI 2000

The direct discharge of untreated pollutants into any freshwater body can harm the aquatic life, the water quality and the health of the end users. EFL will install a wastewater treatment plant based on the activated sludge technology and supplemented by balancing tanks and oil and grease traps to treat the wastewater to the NEQS limits. The NEQS, however, do not specify limits for microbial content, for which World Bank standard of 400 MPN of Coliform bacteria/100ml will be used and achieved.

EFL will also self-monitor the treated effluent and submit quarterly reports to the SEPA as per the self-monitoring and reporting regulation. The treated effluent after meeting the NEQS (for discharge into inland waters) will be discharged into the Nara canal, which is allowed as per the local laws, where the effluent will receive more than the minimum 10 times dilution as required by the NEQS. Achieving the NEQS limits and more than the minimum 10 times dilution in the receiving body will ensure that the water quality is not affected. Achieving the NEQS will also mean that the disposal of the treated wastewater does not contravene with the provisions of the Sindh Irrigation Act, 1879 and the Canal and Drainage Act, 1873 (amended in 1952, 1965, 1968 and 1970).

At present all domestic and most of the industrial sewage in the Sukkur district is being disposed off into either the Indus River or the canals (directly or indirectly) without any treatment.

Mitigation measures for wastewater reduction, treatment, reuse and disposal are as follows:

- All mitigation measures related to water conservation and minimization will indirectly result in minimizing wastewater discharge
- The wastewater will be treated using activated sludge treatment supplemented by dis-infection, balancing tanks and oil and grease traps
- The NEQS limits of disposal into inland waters and World Bank limit for bacteriological content of 400 MPN/100ml will be achieved
- The wastewater treatment system will be designed to ensure that it can handle average and peak daily flows from the plant. To cater for peak flows, balancing tank will be used.
- The sludge from the activated sludge treatment system or balancing or sedimentation tanks will be dried, disinfected/matured and disposed into municipal landfills.

6.2.6 *Solid Wastes*

Solid wastes production will include paper, packaging materials, metals scrap, construction materials etc. Issues related to burning of solid wastes and associated air emissions have already been discussed in the chapter. If left in the open and disposed properly these wastes can reduce the environmental and aesthetic quality of the area. To minimise such impacts, all solid wastes will be segregated and reuse and recycled where feasible.

Mitigation measures related to solid waste management include:

- Solid wastes will be segregated and stored in sheds
- Reusable and recyclable wastes will be provided to local contractors
- All non-combustible and non reusable or non recyclable wastes will be sent to the nearest municipal landfills
- Plastics, aluminum foils or packing, and other similar material will not be burnt
- Combustible wastes will be burnt in a designated area which is at a safe distance and downwind of the plant, residential community and nearby settlements

6.2.7 *Chemicals and Oil Handling and Storage*

Chemicals and oil usage in the project is discussed in Chapter 2. These will be handled with care and stored inside bunded areas to contain any accidental spills. The spilled material may be recovered for reuse or drained with the wastewater streams and treated through the wastewater treatment plant.

Mitigation measures that will apply include:

- All chemicals and oils will be stored in non-leaking containers or packaging and will be stored inside bunded areas with no ingress of water or direct exposure to rainfall
- The bunded areas will have capacity equivalent to 120% of the product storage
- All storage areas will have concrete flooring
- MSDS will be kept available at site and instructions related to handling and storage will be followed
- Spilled material will be collected and reused if possible. If reuse is not possible the spilled material will be disposed after treatment.
- Fuel and oil tanks will be regularly checked for leakages
- Drip trays will be used where required and feasible
- Any soil contaminated from minor spills will be collected, washed and then disposed and the wastewater drained for treatment through the wastewater treatment plant

6.3 Potential Impacts and Mitigation – Biological Environment

6.3.1 *General*

The proposed plant site lies in a non-protected wildlife area. The present land use is agriculture and hence there exists human presence and activity. The bird species and terrestrial mammal and reptile species common to the area have a fair spatial presence throughout the country and hence impacts on these species due to land uptake and acoustic and sensory disturbance will not be significant.

6.3.2 *Protected Species*

The species that are protected under the Sindh Wildlife Protection Ordinance and/or international conventions include Indian pond heron, Cattle egret, Marsh harrier, Blue rock pigeon, Black-winged stilt, Black kite, Long-tailed grass warbler, Rose-ringed parakeet, Little brown dove, and Indian monitor. The species are not endemic to the proposed site neither is the site of any special significance to these species and hence impacts on these species will be minimal. Furthermore hunting, trapping or trading of these species will be prohibited in respect of the legal restrictions.

6.3.3 *The Indus Dolphin*

The 170km reach of the Indus River between Guddu and Sukkur barrage is a designated game reserve providing a home to the Indus dolphin (*Platanista minor*), a blind cetacean endemic to this river. The game reserve was declared in 1974. The proposed site lies outside the Game Reserve and therefore no restrictions on the conduct of the proposed operation apply. However, due to the close proximity of the Game Reserve to the proposed site, precautions and controls will be taken including controlled and monitored water abstraction from the Indus. It is expected that with these mitigation measures in place no impacts on the Indus Dolphin due to the project will occur. However, for monitoring and verification of the mitigation measures and any residual impacts visits of SEPA and Sindh Wildlife Department will be encouraged.

6.4 Potential Impacts and Mitigation – Socioeconomic and Cultural Environment

6.4.1 *Macro Level Socio-economic Impacts*

The proposed project investment is significant. It will improve the investment scenario in the district and the province and will also provide direct and indirect benefits to the suppliers and contractors. The project is also in line with the country's strategy for the improvement and enhancement of the dairy sector and will provide the general public access to hygienic milk and milk products. It will also reduce the import of powder milk and other related products and will also possibly open up similar investments by other parties in the dairy sector. The dairy farm industry and the business of the suppliers of raw milk will also benefit from the project.

6.4.2 *Socio-economic Impacts Specific to the Project Area*

a. Land acquisition and changes in land use

Up to 15-20 acres of land will be required for the proposed plant and ancillary operations and facilities. The present land use is agriculture and the land ownership is with local people. EFL will acquire land from the local owners and pay them compensation as per the prevailing market rates. The land use for only the amount of land acquired will change to industrial from agriculture; the remaining land use in the surroundings will remain the same i.e. agriculture. There is no other land use planned for the proposed site. A park and then a cattle colony were once planned in the area, but as per discussions with the district and taluka administration these plans have been abandoned.

b. Local economy, employment and household income

The local economy will benefit from the development of the proposed project since it will utilise local services (skilled and unskilled labour, contractors etc), materials, and equipment. The project will also generate employment opportunities for local communities and will improve household incomes in the nearby settlements.

c. Environmental quality and nuisance for local residents

Presently there are no major settlements within approximately 900m of the proposed site (there are only 2-3 huts approximately 500m from the site used by local haris) and based on discussions with the district government it is not expected that any housing scheme will be developed in the near future in the area. However, air emissions, noise, wastewater, solid wastes, dust etc can be a source of deteriorated environmental quality and increased nuisance for the public. Dust, particulates of milk powder, spills, and wastewater overflows can have an affect on the surrounding land use. This will be avoided by adhering to the mitigation measures already proposed in the EIA.

d. Social services and utilities

The project is not expected to compete with the locals in the available social services and utilities. The plant will have its own water supply, electricity supply, wastewater treatment systems, and basic medical facilities. The water abstraction by the plant is assessed to have no impacts on the water availability in the area. However, water intake system from the Indus will be designed to ensure that it does not reduce water intake of farmers in the area.

e. Traffic congestion and safety of road users

The present traffic load on the road servicing the proposed site is low. Considering that there will be only up to 90 tankers reaching the site every day no significant traffic congestion is anticipated. However, the plant will have its own parking area so that the tankers do not park on the main road. The drivers will look out for any hazards, respect

driving regulations, and will also reduce speed at any critical sections to avoid any road accidents.

6.4.3 *Cultural Environment*

There are no protected or otherwise sites of cultural or archaeological significance at the site or within 1km surroundings and hence no related impacts will occur.

6.5 **Emergencies and Hazards**

6.5.1 *Flooding*

The proposed site is not known to be flooded with Indus flows in the recent times as there is an existing protection bund/wall. The wall is 3 ft above the highest flood level recorded at the Sukkur Barrage from 1970 to 1999. As per discussions with the XEN Sukkur Barrage, in case of any eminent threat of flooding the Ali Wahan Bund is broken so that the flood water can by pass the Rohri city. However, EFL will liaise with the XEN Guddu and Sukkur barrages during potential periods of flooding (i.e. mainly monsoon season) so that any emergency evacuation, if required, can be done. Since, except for small quantities of chemicals and fuel and oil for daily operational use, no hazardous material will be used on site any eventuality in case of flooding will not have a significant environmental impact.

6.5.2 *Fire*

Like for any industrial plant, robust and comprehensive fire prevention and control measures will be implemented.

7 Environmental Management Plan

7.1 Objectives of the EMP

The EMP provides a delivery mechanism to address potential impacts of the project activities, to enhance project benefits and to introduce standards of good practices in all project activities. The EMP has been prepared with the objectives of:

- Defining roles and responsibilities of the project proponent for the implementation of EMP and identifying areas where these roles and responsibilities can be shared with other parties involved in the execution and monitoring of the project
- Developing a monitoring mechanism and identifying requisite monitoring parameters to confirm effectiveness of the mitigation measures recommended in the EIA
- Defining the requirements necessary for documenting compliance with the EMP and communicating it to all concerned regulatory agencies
- Prescribing the mechanism with which consultation with stakeholders during the project will be maintained.

7.2 Structure of the EMP

The EMP consists of the following:

- Organisational Structure and Roles and Responsibilities;
- Environmental Monitoring Programme
- Communication and Documentation
- Stakeholders Consultation Programme
- Change Management Plan

7.3 Roles and Responsibilities

7.3.1 *General*

a. Roles and responsibilities of EFL

As project proponents, EFL will be responsible for ensuring the implementation of the EMP. The Director Supply Chain of EFL will be responsible for the overall environmental performance during the proposed project. He can delegate his responsibilities to Safety Manager, who will have functional responsibilities on site for health, safety, environmental, and social matters.

b. Roles and responsibilities of contractors

For the proposed project, EFL may appoint contractors for the construction, commissioning, and maintenance of the plant. The contractors will be responsible for implementation of, or adherence to, the provisions of the EIA relevant to their respective areas of services.

7.3.2 *Planning and Design of the Operation*

a. Design of the Operation

Design of the operation includes the activities described in the EIA. Following approval of the EIA, any changes in the operation or the requirements of the EIA will be handled through the Change Management Plan provided in the EMP.

b. Approvals

Obtaining No objection Certificate (NOC) from SEPA will not relieve EFL or its appointed contractors or suppliers of any other relevant legal obligations and hence EFL and its contractors and suppliers will obtain all other relevant clearances and necessary approvals required by the Government of Pakistan prior to commencing or during the project.

c. Contractual Provisions

Adherence to the requirements of the EIA and EMP in terms of environmental mitigation will be required from all project contractors and suppliers and thus EMP will form part of their contracts with EFL.

7.3.3 *Implementation of the Operation*

a. Co-ordination with Stakeholders

EFL will ensure that co-ordination required with the project stakeholders on environmental and social matters as required by the EMP is maintained throughout the operation.

b. Environmental Management Systems

EFL and the contractors will ensure that the mitigation measures mentioned in the EIA are adhered to and organisational HSE Management Systems are implemented during the proposed project. The contractors will abide by the relevant contractual provisions relating to the environment.

c. Monitoring

EFL and its contractors and suppliers will ensure that monitoring of the project activities is carried out according to the monitoring programme given in the EMP.

d. Emergency Procedures

EFL will prepare contingency plans to deal with any emergency situation that may arise during the operation and communicate these to the regulatory agencies if required by these agencies.

e. Training

EFL and its contractors and suppliers will be responsible for the selection and training of their staff who are capable of completing the project activities in an environmentally safe manner. EFL and its contractors and suppliers will be responsible for providing induction to their staff members on the EIA, the EMP and their implementation. provided in the EMP.

f. Communication and Documentation

EFL will ensure that the communication and documentation requirements specified in the EMP are fulfilled during the operation.

7.4 Environmental Monitoring

7.4.1 Objectives

The objective of environmental monitoring will be as follows:

- To check compliance with the EMP by self-monitoring or inspecting activities of the project on a daily basis. This will be called Compliance Monitoring
- To monitor and report effluents and emissions from the plant operations
- To monitor actual impacts of the project on selected sensitive receptors so that impacts not anticipated in the EIA or impacts which exceed the levels anticipated in the EIA can be identified and appropriate mitigation measures can be adopted in time. This objective will be achieved through Effects Monitoring

7.4.2 Compliance Monitoring

Compliance Monitoring will be carried out to ensure compliance with the requirements of the EIA. EFL staff and contractors will carry out the inspection on a routine basis.

7.4.3 Effluents and Emissions Monitoring

EFL will monitor and reports its effluents and emissions, as per the local self-monitoring regulations and report these to the SEPA. The sampling and testing will be done through a environmental laboratory certified by SEPA.

7.4.4 Effects Monitoring

Considering the environmental conditions of the project area and the assessment of potential impacts of the project made in the EIA, the following monitoring programme will be undertaken:

- Water abstraction and consumption – the water abstraction will be metered and monitored and in the event of any unusually high water abstraction a water audit will be conducted to identify high water consumption areas, reasons thereof, and measures to reduce the high water consumption. In case groundwater wells are installed, reduced discharges will be noted and alternative strategies might be used such as using a combination of ground and surface water. When water is being withdrawn from the Indus, any complaints from local communities with regards to reduced water availability at their respective intake structure or lift pumps will be addressed.
- Noise – EFL will measure noise levels within the plant on a quarterly basis (and earlier in case of complaints by workers or local communities) and the surrounding properties to ensure that the OSHA standards are being met.

7.5 Environmental Reporting

The requirements related to environmental reporting after approval of the EIA are as follows:

- After receiving approval from SEPA, EFL will acknowledge acceptance of the conditions of approval by executing an undertaking in the form prescribed in Schedule VII of the 2000 Regulations.
- After the end of construction phase of the project, EFL will obtain a confirmation from SEPA 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.
- EFL will prepare and submit an annual report each year to SEPA summarizing the production details, any plant modifications or extensions, details of the effects monitoring and environmental performance of the plant operations etc
- EFL will furnish self-monitoring reports to SEPA for liquid effluents and gaseous emissions on a quarterly basis.

7.6 Public Consultation

7.6.1 EIA Disclosure

After submission of the EIA to SEPA, SEPA will advertise in a newspaper a public notice indicating a date for a public hearing and the place where copies of the EIA can be found for review purposes. Any interested party can also contact EFL at the following address for electronic copies of the EIA report:

Shamsuddin A. Shaikh
Director Supply Chain,
Engro Foods Private Limited
PNSC Building,

M.T.Khan Road
P.O. Box 5736
Karachi 74000.
Tel: 92-21-5611060-69
UAN: 111-211-211
Fax: 92-21-5610688, 5610401
Email: sashaikh@engro.com

7.6.2 *Public Hearing*

In pursuance to clause 10 of the 2000 Regulations, SEPA after receiving the subject EIA from the proponent and issuing the confirmation of completeness will publish in national English and Urdu newspaper, a public notice mentioning the type of the project, its exact location, the name and address of the proponent, and the places at which the EIA can be accessed. The notice will fix a date and time and place for the public hearing for any comments on the project or the EIA. Any comments received by the SEPA during or before the public hearing will be collated, tabulated and duly considered by the SEPA in granting its decision on the EIA.

7.6.3 *Post EIA Approval Consultation*

After approval of the EIA, EFL will report environmental performance of its project to SEPA as per the EMP and applicable laws. This would serve as a communication channel with SEPA. EFL will also encourage any visits by Sindh Wildlife Department or other interested stakeholders to review and verify adherence to mitigation measures related to impacts on physical, biological or socio-economic receptors of the area.

7.7 **Plant Upgrades**

The future demand scenario may necessitate up-gradation of the plant and increase in plant capacity or the products. The increased plant capacity or product range would mean increased water consumption, increased effluent discharge etc. which will need a re-evaluation of environmental impacts. However, the scale of the impacts will depend on the scale and nature of up-gradation. Based on the review of potential impacts it is believed that any increase in capacity up to 50% of the currently proposed capacity will not have any significant impacts. However, any increase in capacity above 50% or any addition of product will require a re-evaluation of impacts, which may be done in the form of a brief report and submitted to SEPA as an addendum to the EIA. The SEPA will review the addendum and extend its decision on the same within 15 working days.

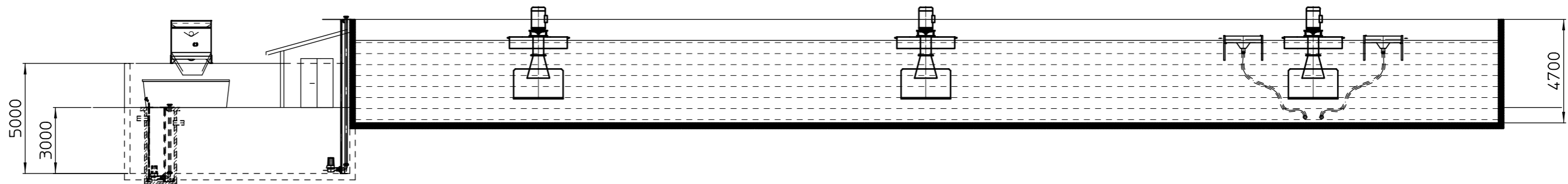
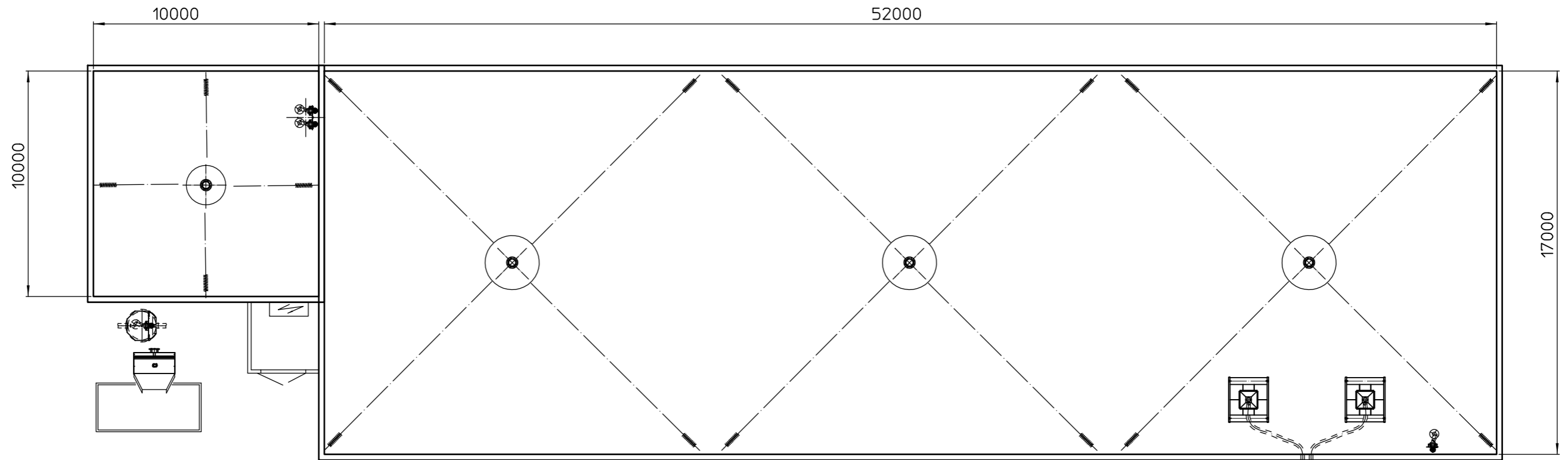
7.8 **Site Inductions**

For the EMP to be implemented, EFL staff and required staff from EFL contractors and suppliers will be given induction trainings on the contents, purpose and implementation mechanism of the EMP.

8 Conclusions

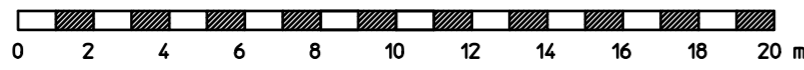
The EIA has fully examined the project activities, the background environmental conditions of the project area and the impacts likely to arise from the project activities. Mitigation measures to help minimise the identified impacts have been recommended and an EMP has been provided for the implementation of these mitigation measures. On the basis of the above the conclusion of this EIA is that the residual impacts of the proposed operation will be of minor significance and careful implementation of the EMP will ensure that environmental impacts are managed and minimised and all statutory requirements are met by the project proponent.

Appendix A Layout of Wastewater Treatment Plant

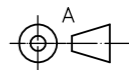


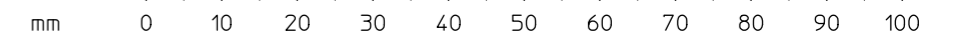
Engro Chemicals Dairy Inc.
Karachi Pakistan

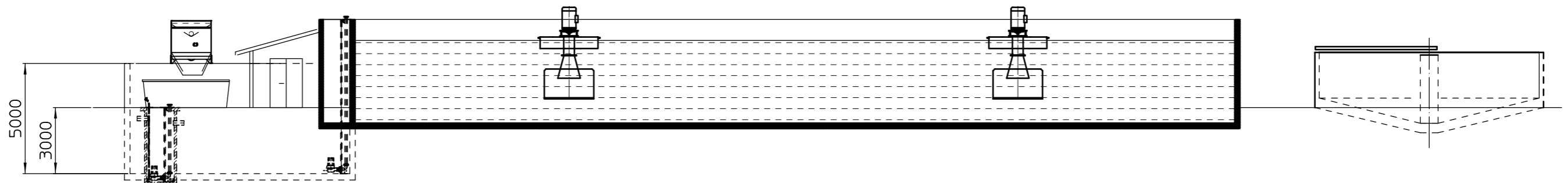
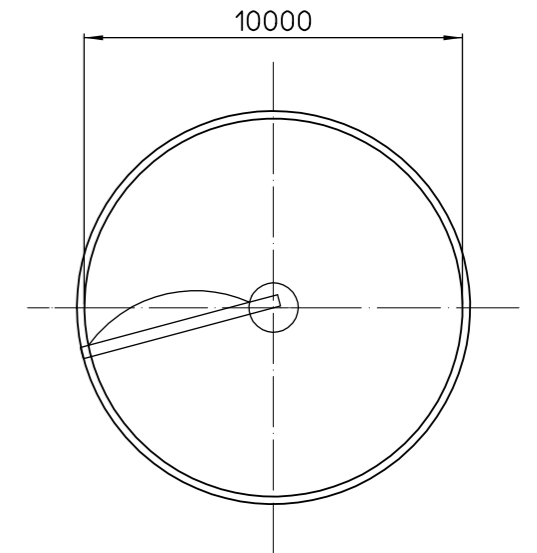
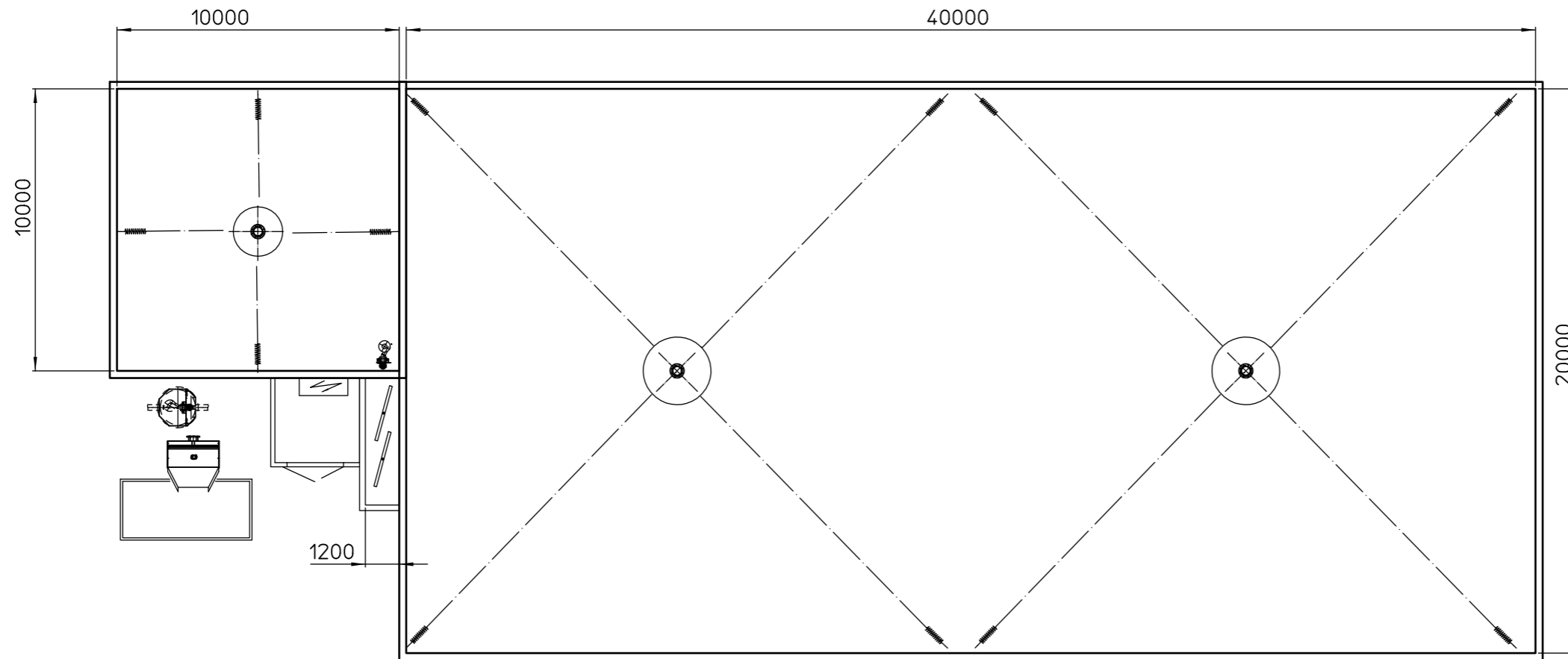
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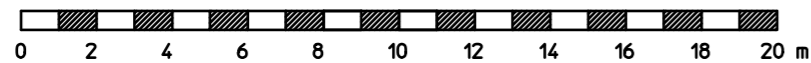
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	Drawn 11-03-2005	A.H.			
By	Check		Customer ----- Non-tolerated dimensions ±0,5mm		
	Size A3	Scale 1:50			
Date	AQUA <small>STORK equipment</small> industrial watertreatment AQUA Industrial Watertreatment B.V. P.O. Box 160 7130AD Lichtenvoorde, The Netherlands Phone:(31)544-390500, Fax:(31)544-375255 E-mail:engineering@mps-aqua.nl		Proj.Meth. ISO 128 	Drawing Number 1014863	Revision -
	Rev.	1		© AQUA Industrial Watertreatment B.V. Status: <i>preliminary</i>	Filename



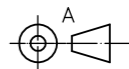


Engro Chemicals Dairy Inc.
Karachi Pakistan

Quotation 2005/WB/0480



CAD-drawing

Revision Info	Date	Name	Description LAYOUT WWTP BIOCLAR			
	Drawn 11-03-2005	A.H.				
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	Size A3	Scale 1:50				
Date	AQUA <small>STORK equipment</small> industrial watertreatment AQUA Industrial Watertreatment B.V. P.O. Box 160 7130AD Lichtenvoorde, The Netherlands Phone:(31)544-390500, Fax:(31)544-375255 E-mail:engineering@mps-aqua.nl		This drawing constitutes intellectual property rights of AQUA Industrial Watertreatment B.V. and may not be copied or made available for whatever purpose to any third party without our prior written consent. © AQUA Industrial Watertreatment B.V.	Proj.Meth. ISO 128 	Drawing Number 1014864	Revision -
	Rev.	1		Reference .	Status: preliminary	Filename

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Appendix B Environmental Laws and Institutions in Pakistan

B.1 Brief History of Environmental Law in Pakistan

Environment as a direct concern of the Government of Pakistan dates back to the UN Conference on Human Environment held in Stockholm in June 1972. Until that time, environmental protection was the concern of weakly enforced indirect provisions in local, provincial, and federal laws. These provisions were mainly designed to improve civic and factory conditions and the management of canals, forests, and wildlife.

The 1973 Constitution (which came shortly after the 1972 Stockholm Conference) was the first to formally recognise the subject of “Environmental Pollution and Ecology” and placed the subject on the Concurrent Legislative List¹.

In 1974 the federal cabinet directed the drafting of “an overall legislation for pollution”. In the same year, the Agrovilles Division² of the federal government was renamed as Environment and Urban Affairs Division. The Division enjoyed considerable international exposure leading eventually to the election of Pakistan to the membership of the Governing Council of the United Nations Environment Programme (UNEP), the institution heir to the Stockholm Conference. The role of the Division, or the concept of environment however, continued to be restricted to the living conditions and planning and housing sector. Under the 1975-76 Annual Plan, the Division was made part of the Physical Planning and Housing Sector, rather than a separate Ministry of Environment as suggested by the development perspective for 1975-80 prepared by the Planning Commission.

The most notable achievement in the 1980s was the enactment of the Pakistan Environmental Protection Ordinance (PEPO) on December 31, 1983. The PEPO envisaged Pakistan Environmental Protection Council (PEPC) as a policy making body and the Environmental Protection Agencies (EPA’s) for implementation of the Ordinance. Neither the PEPO nor the PEPC or the EPA’s operationalised for quite some time. The PEPC met for the first time in 1991 and the Pakistan Environmental Protection Agency, though toothless and scantily staffed, was set-up for the first time in 1984.

In 1992 the Federal Cabinet approved the National Conservation Strategy (NCS), the first ever-environmental policy of the Government of Pakistan. Following the NCS there was significant progress towards the creation of institutions and adoption of policy measures for the environment sector: reactivation of the Pakistan Environmental Protection Council (PEPC); endorsement of the PEPO by the Parliament in 1997;

¹ Allows jurisdiction to the federations as well as the provinces.

² The Agrovilles Division of the federal government was created in 1971 to provide urban amenities to rural centers.

establishment of federal and provincial Environmental Protection Agencies (EPA's), approval of National Environmental Quality Standards (NEQS), and the initiation of Provincial Conservation Strategies.

B.2 Key Institutions and their Roles

B.2.1 Environment

Headed by a federal minister, the Ministry of Environment, Local Government and Rural Development is the main government organization responsible for the protection of environment and resource conservation. The Ministry works with the Pakistan Environmental Protection Council (PEPC) and the Federal and Provincial EPA's.

The PEPC is a high-level committee comprising the President of Pakistan (or someone appointed by the President) as the Chairperson; governors; federal and provincial ministers and secretaries of the relevant departments; heads of the federal and provincial EPA's; environmentalists and community representatives. The functions of the Council include policy formulation and approval of standards.

A respective Director General heads the Federal and provincial EPA's. The EPA's have wide-ranging functions including the preparation and co-ordination of national environmental policy for approval by the PEPC, administering and implementing the PEPA 1997 and preparation, revision or establishment of NEQS.

B.2.2 Biodiversity

The National Council for Conservation of Wildlife (NCCW) is responsible for formulation of national wildlife policies; co-ordination with provincial wildlife departments on the implementation of these policies; and co-ordination with international organisations on matters related to international treaties. The NCCW works under the Ministry of Environment, Local Government and Rural Development and is headed by the Inspector General Forests (IGF). The IGF office has ongoing responsibilities for policy formulation, implementation, monitoring, technical assistance, and research and development. NCCW comprises of an advisory council, which is chaired by the Minister of Environment and includes representatives from provincial wildlife departments, NGO's, members of civil society and other ministries. A NCCW secretariat based in Islamabad handles the day-to-day affairs, the implementation of the policies and recommendations of the advisory council. At provincial level each province has wildlife and forest departments and related laws. Each department is headed by a Conservator and comes under the control of the relevant ministry.

B.2.3 Cultural Heritage

The Department of Archaeology and Museums under the Federal Ministry of Culture and Sports is the custodian of the nation's cultural heritage. The main functions of the Department are as follows:

- Preservation and conservation of historical and archaeological monuments
- Exploration and excavation
- Collaboration with foreign archaeological missions working at various sites in Pakistan
- Control of movement of cultural property
- Establishment and maintenance of museums
- Treatment and restoration of antiquities
- Administration of Antiquities Act, 1975
- Research on epigraphy, numismatics, and other relevant fields of archaeology
- Organisation of seminars, symposia, and workshops at the national and international level

Since 1985, the Provincial governments have created their own departments of Archaeology and have been listing monuments as “Special Premises” in the Punjab and “Protected Heritage” in the Province of Sindh. The N.W.F.P government has not yet, enacted laws governing archaeological and historical sites in the province, although they have created their own Department of Archaeology and are engaged in excavations of sites. Balochistan does not have a department of archaeology.

B.2.4 *Others*

Other government institutions with designated responsibility for natural resource management are sectorally organised, in line with the general arrangements for administration and development between the federal, provincial and local governments.

B.2.5 *NGO's*

Numerous NGO's are active in Pakistan in the tradition social sector: emergency support, rehabilitation, health, and education. Other areas include income generation, poverty reduction, vocational training, nutrition and food security, and maternal, child health and family planning. There are five different laws under which NGO's in Pakistan can be registered¹. The UNDP suggests that the number of registered NGOs under the five different laws is from 8,000 to 16,000.

B.3 Judiciary, Enforcement Mechanism and Penalties

The enforcement mechanisms contained within the Pakistan Environmental Protection Act, 1997 quantify a measurable degree of administrative penalties and pollution charges as well as environmental protection orders for offences and violations of any of the rules

¹ The Societies Registration Act of 1860, the Trust Act of 1882, the Cooperative Societies Act of 1952, the Voluntary Social Welfare Agencies Ordinance 1961 and the Companies Ordinance of 1984

contained within the Act. The enforcement mechanism and penalties are comprehensively described in Qadar (2002)³.

Apart from the Pakistan Environmental Protection Act, the Pakistan Penal Code of 1860 and the Criminal Procedure Code of 1898 cover environmental offences of the nature of water pollution, and pollution to the atmosphere. However due to the nature of the time frame they were written they are too broadly focused which has espoused the GoP to enforce and implement several provincial and federal environmental policies and laws since then under the umbrella of the PEPA 1997.

B.4 Environment Related Laws in Pakistan

The Pakistan Environmental Protection Act, 1997 is the basic environmental law in Pakistan. The act is a replacement of the Pakistan Environmental Protection Ordinance, 1983, which was considered narrow in scope and had some deficiencies. Various regulations relating to the environment have been promulgated under PEPA 1997 and to date some are still under review.

Various other laws cover different facets of environmental protection, biodiversity, cultural heritage, and natural resources exist. A summary of these laws is provided later in this document (**Exhibit A-1**).

B.5 International Conventions

Pakistan is a signatory to a number of international and regional treaties. Global and regional treaties are, in principle, binding in the first instance on national governments, which are obliged to implement such arrangements through national legislation. The speed and timing of implementation at the national level maybe slow and not all international treaties might have a local legislation to support their implementation at the national level. A summary of the international conventions is provided in **Exhibit A-2**.

³ Pakistan Environmental Laws and their Compliance, Shoaib Qadar and Athar Rafique Dogar, 2002, Lahore Law Times Publication, Lahore

Exhibit A-1: Summary of Environment Related Laws in Pakistan

1	Environmental Assessments
1.1	<p><i>Pakistan Environmental Protection Act, 1997 and IEE and ELA Review Regulations, 2000</i></p> <p>As per clause 12 of PEPA 1997 and clause 3 and 4 of the IEE and Review Regulations all upstream projects outside environmentally protected areas require an IEE and all projects in environmentally sensitive areas require an EIA.</p>
2	Environmental Monitoring, Sampling, Testing, and Reporting
2.1	<p><i>IEE and ELA Review Regulations, 2000</i></p> <p>As per clause 19 of the IEE and EIA Review Regulations, 2000 proponents of all projects are required to monitor their projects and submit reports to the concerned EPA.</p>
2.2	<p><i>National Environmental Quality Standards (Self Monitoring and Reporting by Industry) Rules, 2001</i></p> <p>The rules establish pollution limits for industries in Pakistan under an honor-based self-monitoring system obliging all industries to submit environmental monitoring reports to the federal EPA timely and correctly</p>
2.3	<p><i>Industrial Pollution Charge (Calculation and Collection) Rules, 2001</i></p> <p>These rules ensure the correct calculation, reporting and payment of pollution charges by polluting/industrial units. Pollution units per unit of production are the basis for calculation of the pollution charge by the industrial unit</p>
2.4	<p><i>Environmental Sample Rules, 2001</i></p> <p>These rules regulate the procedure for obtaining samples from polluting industries, their tests and analysis by the environmental laboratories as well as seeking recourse for the contravention of the above procedures</p>
2.5	<p>National Environmental Quality Standards (Certification of Environmental Laboratories) Rules, 2001</p> <p><i>These rules were established as checks to the environmental laboratories for safety purposes. The standards prescribe for the procedure for certification encompassing the terms and conditions for the function of an environmental laboratory</i></p>
3	Soils and Landscape
3.1	<p><i>Punjab Land Preservation Act, 1900</i></p> <p>This act aims at protecting the ground water, and preventing any land erosion by prohibiting tree felling, land clearing for agriculture, quarrying of stones, and transit of forest produce. This act requires landowners to carry out anti erosion work at their own cost. Penalties for breach of regulation, and payment of cash compensation are provided in this act</p>
3.2	<p><i>The Punjab Soil Reclamation Act, 1952</i></p> <p>The Punjab Soil Reclamation Act of 1952 governed the preparation of drainage schemes and other drainage related works. The Act was later extended to cover the whole country</p>

...Exhibit A-1, Continued

4 Air quality

4.1 *The Motor Vehicle Ordinance 1965 and The Motor Vehicle Rules, 1969*

Rule 155 requires every motor vehicle to be so constructed or equipped that the exhaust gases from the engine are not discharged downwards so as to impinge on the road surface

Rule 163 requires every motor vehicle to be so constructed, maintained and driven and used that smoke, visible vapour, grit, sparks, ashes, cinders or oily substance is not emitted

4.2 *The Pakistan Penal Code, 1860*

Section 278 prohibits vitiating the atmosphere in any place so as to make it noxious to the health of persons in general dwelling or carrying on business in the neighbourhood or passing along a public way.

4.3 *The Punjab Local Government Ordinance, 1979*

The Ordinance requires Zila Council and Urban Local Council to prepare and implement schemes for the prevention of air pollution emitted by automobiles, engines, factories, brick kilns, crushing machines and such other sources as the bye-laws may provide

4.4 *The Factories Act, 1934*

The factories Act of 1934 governs the effective disposal of solid waste, and effluents, from industries

4.5 *The Lahore Development Authority Act, 1975*

Enacted in 1975 the Act oversees the development, operations and maintenance of water-supplies of sewerage and drainage systems within the greater Lahore Metropolitan Area

4.6 *PEPA 1997 and NEQS*

As per clause 11 of PEPA 1997, no person shall discharge gaseous emissions in excess of the NEQS or any other standards developed specifically for the industry or sector

5 Noise

5.1 *The Motor Vehicle Rules, 1969*

Rule 155 requires all vehicles to be fitted with silencers to reduce noise. Rule 158 requires all motor vehicles to be maintained in condition not to cause noise when in motion. Rule 154 (1) bars the use of horns that produce harsh, shrill or alarming noise. Rule 252 prohibits the use of horns or other audible warding devices, except to avoid imminent accident

5.2 *The West Pakistan Regulation and Control of Loudspeakers and Sound Amplifiers ordinance (II), 1965*

Stipulates that no person shall use a loudspeaker in a public place so as to cause “annoyance or injury” to the residents of the locality. The use of loudspeakers is prohibited near offices, courts, hospitals or places of workshops

5.3 *PEPA 1997 and NEQS*

PEPA 1997 prohibits noise from motor vehicles to exceed 85 dbA when measured from 7.5 m from the source

...Exhibit A-1, Continued

6 Pollution and Waste Management

6.1 PEPA 1997 and NEQS

Clause 11 of PEPA 1997 prohibits discharge of effluents in excess of the NEQS. NEQS are separate for discharge into inland waters, sewage treatment, and sea. The NEQS disallow the dilution of effluents with freshwater. Effluents that meet NEQS when discharged into the recipient body should meet a 1:10 dilution (i.e. for every 1 cum of effluent there should be 10 cum of water in the recipient water body) otherwise more stringent NEQS may apply.

6.2 *The Canal and Drainage Act, 1873 (amended in 1952, 1965, 1968 and 1970)*

Prohibits corrupting or fouling of canal water, which maybe used for domestic purposes.

6.3 *The Punjab Minor Canals Act, 1905*

This act governs and administers the operation, maintenance and water allocation rules for canal irrigation

6.4 *Sindh Fisheries Ordinance, 1980*

Prohibits the discharge of untreated sewage into water

6.5 *The Punjab Local Government Ordinance, 1979*

Under Section 61 the urban local council may require the owners, tenants or occupiers of commercial and industrial concerns to have at their own cost prepared and implement a scheme for the safe drainage and disposal of their wastes and effluents of the quality permitted under the rules or the bye-laws

6.6 *The Factories Act, 1934 including the Provincial Factories Rules*

Requires effective arrangements to be put in place in every factory for the disposal of waste and effluents

6.7 *The Pakistan Penal Code, 1860*

Section 277 prohibits corrupting or fouling the water of any public spring or reservoir so as to render it less fit for the purposes for which it is ordinarily used

6.8 *Balochistan Water and Sanitation Authority Ordinance, 1988*

This Act authorizes the development of water supply, sewage and sanitation facilities, and to control disposal of industrial wastes

6.9 *The Hospital Waste Management Rules*

These rules fall under the PEPA 1997, whereby, every hospital has to apply to the federal EPA for a license for the proper management of waste and disposal and for hospitals generating risk waste

7.0 Forests

7.1 *The Forest (West Pakistan Amendment) Act, 1964*

This amendment to the 1927 Forest Act extends to all provinces (except Hazara district in NWFP and Tribal Areas). The amendment makes it easier to recover encroached land in Reserved and Protected forests, but the amendment did not change the situation much.

...Exhibit A-1, Continued

7.2	<i>Reserved Trees Act 1966</i>	The Juniper tree has been declared a reserved tree by The Reserved Trees Act, 1966, and the Balochistan Forests Amendment Act, 1974. These prohibit the cutting and removal of Juniper trees from all areas, irrespective of ownership without the permission of forest officers. So far no enforcement mechanism has been put in place by the forest department.
7.3	<i>The Cutting of Trees (Prohibition) Act, 1975</i>	Cutting of trees without approval can result in fine or 3 years imprisonment
7.4	<i>The West Pakistan Firewood and Charcoal (Restriction) Act, 1964</i>	This Act covers all the provinces except Tribal Areas. It restricts the burning of firewood and charcoal and brick and limekilns in factories. Its purpose was to reduce the use of firewood and stabilize its price.
7.5	<i>The Forest Act, 1927</i>	The Forest Act empowers provincial governments to prohibit the cleaning of forest for cultivation, grazing, hunting, removing forest produce; quarrying and felling, lopping and topping of trees, branches in reserved or protected areas.
8	Wildlife	
8.1	<i>Northern Areas Wildlife Preservation Act, 1975</i>	The Kashmir Affairs and Northern Areas Affairs Ministry published the Northern Areas Wildlife Preservation Act, 1975 after having it approved by the competent authority. This Act extends to the whole of Northern Areas. Under this Act, three major categories of protected areas are managed in addition to the Community Controlled Hunting Areas where local communities are empowered to manage their natural resources and to get 80% income from hunting.
8.2	<i>Islamabad Wildlife Protection, Preservation, Conservation, and Management Ordinance, 1979</i>	This Ordinance was issued to provide protection, preservation, conservation and management of wildlife and setting up of a National Park (Margalla Hills National Park) in the Islamabad Capital Territory. Under this Ordinance, all the area under the Capital Territory was divide into three types of protected areas.
8.3	<i>N.W.F.P. Wildlife (Protection, Preservation, Conservation and Management) Act, 1974</i>	The Governor of North West Frontier Province (N.W.F.P) assented to the N.W.F.P Wildlife Protection Act, 1975 after having been passed the N.W.F.P Wildlife (Protection Preservation, Conservation and Management) Bill by the Provincial Assembly of N.W.F.P 29 July 1975. This Act is applicable to all of N.W.F.P except the tribal areas for protection, conservation and preservation and management of wildlife. In addition to the three major categories of protected areas, there is provision of private and community controlled conservation areas under this Act.
8.4	<i>Balochistan Wildlife Protection Act, 1974</i>	The Governor of Balochistan assented to the Balochistan Wildlife Protection Act, 1974 after having been passed the Balochistan Wildlife Protection Bill by the Provincial Assembly of Balochistan on 22 July 1974. This Act is applicable to whole of the Balochistan Province except the tribal areas for protection, conservation and preservation and management of wildlife.

...Exhibit A-1, Continued

8.5 Sindh Wildlife Protection Ordinance, 1972

The Sindh Wildlife Protection Ordinance was approved in pursuance of the Martial Law Proclamation of 25th March, 1969, read with the Provisional Constitution Order, and in exercise of all powers vested with the Governor of Sindh and Martial Law Administrator. This Ordinance is applicable for the whole of the Sindh Province. Under this Ordinance, three types of the protected areas viz. National Park, Wildlife Sanctuary and Game Reserve have been notified for protection, conservation and preservation and management of wildlife

Exhibit A-1, Continued

9 Land Acquisition, Compensation, Resettlement

9.1 The Land Acquisition Act, 1894

This act is the legal umbrella under which the government or private parties, subject to certain conditions and procedures, may in the interest of the public undertake compulsory acquisition of land. The land may be acquired for use in development activities or projects, which directly or indirectly promote the general welfare of the public

10 Community Development

10.1 *Pakistan Model Petroleum Concession Agreement*

The Model Petroleum Concession Agreement reflects a number of fiscal and operational incentives to the investors to attract investment in petroleum exploration and production sector as enshrined in the new Onshore Petroleum Exploration and Petroleum Policy 2001 approved by the Cabinet in May 2001

11 Culture and Heritage

11.1 *The Antiquities Act, 1975*

The Antiquities Act of 1975 is the principle national legislation that deals with the protection and preservation of Pakistan's archeological heritage

11.2 *The Sindh Cultural Heritage (Preservation) Act, 1994*

This provincial act empowers the Government of Sindh to preserve and protect any premises or objects of archeological, architectural, historical, cultural, or national interest in Sindh by declaring them protected; compulsorily purchasing them; or making arrangements to restore and maintain the object or premises

11.3 *The NWFP Antiquities Act, 1997*

The Antiquities Act of 1997 is the principle national legislation that deals with the protection and preservation of NWFP's archeological heritage

11.4 *The Punjab Special Premises Preservation Ordinance, 1985*

This provincial act empowers the Government of Punjab to preserve and protect any premises or objects of archaeological, architectural, historical, cultural, or national interest in Sindh by declaring them protected; compulsorily purchasing them; or making arrangements to restore and maintain the object or premises

12 Hazardous Materials

12.1 *The Hazardous Substances Rules, 1999*

The hazardous substances rules of 1999 provide licensing for the import and transport of hazardous substances in accordance with the provisions of PEPA 1997.

Exhibit A-2: Summary of International Conventions

1 International Conventions

1.1 *The Convention on Conservation of Migratory Species of Wild Animals, 1979*

The Convention requires countries to take action to avoid endangering migratory species. Species covered in the Convention should be given special attention during EA and monitoring, and any impacts identified should be mitigated to acceptable levels. Mitigation measures should be allowed in projects to ensure that for all species in Appendix I of the Convention habitats of the species are conserved; there is prohibition on the hunting, fishing, capturing, harassing and deliberate killing of the species; and the project activities do not seriously hinder migration of the species.

1.2 *Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)*

The convention requires the signatories to impose strict regulation (including penalisation, confiscation of the specimen etc.) regarding trade of all species threatened with extinction or that may become so, in order not to endanger further their survival. In view of the threats to the species covered in the Convention, all upstream projects should evaluate impacts of individual projects on the species and adopt mitigation measures necessary to bring the impacts to acceptable levels

1.3 *1992 Climate Change Convention*

The convention aims at stabilizing greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. To achieve the objective of the convention, all parties are generally required to develop national inventories of emission; formulate and implement national and regional programs of mitigation measures; all developed country parties and the EC were specifically obliged to take measures to limit greenhouse gas emissions by the year 2000 at 1990 levels

1.4 *1992 Biodiversity Convention*

The objectives of this Convention, to be pursued in accordance with its relevant provisions, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.

1.5 *The Rio Declaration*

The Rio Declaration comprises twenty seven principles which address such important issues as: sustainable development to integrate environmental protection into the development process; common but differentiated responsibilities to conserve, protect and restore the earth's ecosystems; public participation and information access at the national level, reduce and eliminate unsustainable patterns of production and consumption

1.6 *Agenda 21*

Agenda 21 is a blueprint and action plan for international cooperation towards sustainable development. Agenda 21 explains that population, consumption and technology are the primary driving forces of environmental change. It lays out what needs to be done to reduce wasteful and inefficient consumption patterns in some parts of the world while encouraging increased but sustainable development in others. It describes some of technologies and techniques that need to be developed to provide for human needs while carefully managing natural resources. Agenda 21 provides options for combating degradation of the land, air and water, conserving forests and the diversity of species of life.

...Exhibit A-2, Continued

1.7 *1985 Vienna Convention on the Protection of the Ozone Layer and its Protocols*

The Parties to this Convention are aware of the potentially harmful impact on human health and the environment through modification of the ozone layer and recall the pertinent provisions of the Declaration of the United Nations Conference on the Human Environment, and in particular principle 21, and are also mindful that measures to protect the ozone layer from modifications due to human activities require international co-operation and action and should be based on relevant scientific and technical considerations

1.8 *Convention on Biological Diversity*

The Convention on Biological Diversity was negotiated under the auspices of the United Nations Environment Programme (UNEP). It was opened for signature at the June 1992 UN Conference on Environment and Development (UNCED) and entered into force on 29 December 1993, ninety days after the 30th ratification. Article 25 of the CBD establishes a Subsidiary Body on Scientific, Technical and Technological Advice to provide the COP with "timely advice" relating to implementation of the Convention. The second session of SBSTTA took place from 2-6 September 1996 in Montréal, Canada. The agenda included issues such as the monitoring and assessment of biodiversity, practical approaches to taxonomy, economic valuation of biodiversity, access to genetic resources, agricultural biodiversity, terrestrial biodiversity, marine and coastal biodiversity, biosafety and the CHM.

1.9 *Conventions on Wetlands (Ramsar Convention)*

The broad aim of the Convention on Wetlands (Ramsar, Iran, 1971) is to halt the worldwide loss of wetlands and to conserve those that remain through wise use and management. This requires international cooperation, policymaking, capacity building and technology transfer. Contracting Parties have made commitments to:

- Designate at least one site that meets the Ramsar criteria for inclusion in the List of Wetlands of International Importance
 - Protect the ecological character of listed sites
 - Include wetland conservation within their national land-use planning
 - Establish nature reserves on wetlands and promote wetland training
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