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UNITED NATIONS INDUSTRIAL
DEVELOPMENT ORGANIZATION

DRAFT

PREPARATION OF CONSTRUCTION DOCUMENTATION FOR THE COMMON EFFLUENT PRE-TREATMENT PLANT (CEPTP)

UNIDO CONTRACT NO. 98/215 DG/PAK/99/006

FINAL COMPLETION REPORT

August 1999

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ABBREVIATIONS

CEPTP	Common Effluent Pre-Treatment Plant
EAD	Economic Affairs Division, GOP
EPB	Export Promotion Bureau
GoN	Government of Netherlands
GoP	Government of Pakistan
JFM	Joint Formulation Mission
KEIP	Kasur Environmental Improvement Programme
KTPCP	Kasur Tannery Pollution Control Project
KTWMA	Kasur Tannery Waste Management Agency
MCK	Municipal Committee, Kasur
NORAD	Norwegian Agency for Development Cooperation
STA	Small Tanners Association
TAD	Tanneries Association Dingarh
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization

SECTION – 1

GENERAL

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1.1 Background

Kasur, connected with Lahore by a 55 km long metalled road, is located in north east of Lahore. District of Kasur has a gross area of 981,702 acres, majority of which is cultivable land. In terms of employment, tanning industry is 2nd to the textile.

Tanning industry is located in south of Rohi Nullah, which passes through the city of Kasur. The tanneries as clusters, are located in Kot Abdul Qadir, Dingarh, Niaz Nagar & Younas Nagar. As a result of the last survey conducted in 1998, the total number of tanneries is around 240 including small & big tanneries. This number is the biggest in any area in Pakistan. These tanneries have a daily input of approximately 4,000 tons of wet salted weight comprising some 16,000 hides & between 25 to 30 thousand skins.

The effluent & solid wastes produced are not handled properly. Very little attention has been given to occupational health standards, protection from exposure to harmful chemicals & safety at work place. The effluent had been stagnant in the south of Kasur causing various kinds of diseases and contaminating the underground water.

Due to these reason Kasur was considered to be one of the most polluted cities in the world.

1.2 Financing

Three donors UNDP, Government of Netherlands (GoN) and Norwegian Agency for Development Cooperation (NORAD) together with UNIDO (as the implementing agency) fielded a Joint Formulation Mission (JFM). Later on GoN and NORAD pulled themselves out of this project and ultimately UNDP and GoP had to take initiative to solve the aggravating pollution problem.

According to the 1996 UNDP Project Document the original cost of the project was Rs 263.898 million (US$ 9.38 million). The revised PC-I for the project shows the current cost of the project is Rs 525.762 million (US$ 10.452). This increase is attributed to the escalation in prices. Present hard currency commitment from UNDP is 2.5 million US$ which is equal to Rs 125.75 million. Out of balance amount of Rs 400.012 million required for completion of project, present rupees component from various stakeholders is Rs 199 million (Govt. of Punjab: 86 million, EPB: 80 million, TA: 20 million and GoP: 13 million). A short fall of Rs 201 million is required to be arranged by the local stakeholders.

1.3 Project Objectives

A. Project Development Objective

The development objective of the project is to control the indiscriminate discharge of potentially harmful soil waste and heavily polluted waste water and improve the working and living conditions in Kasur, thus ensuring an environmentally sustainable social and economic development of the area. Achievement of the project objectives will also contribute to a successful implementation of the National Conservation study.

B. Immediate Objectives

The immediate objectives of the project are:

i. Containment of environmental degradation by the indiscriminate discharge of toxic effluent by Kasur tanning industry and creation of cost effective infrastructures for improvement of overall working conditions in Kasur.

The objective is to be achieved by:

a. Evacuation of stagnant pools of tannery effluent and to make the land ready for reclamation.

b. Establishment and operation of a tannery effluent drainage and collection system within the main tannery areas.

c. Establishment and operation of a common effluent pre-treatment plant (CEPTP) including a simple analytical laboratory with local staff trained in their operation & maintenance of the plant.

d. Establishment and operation of solid waste disposal system including a sanitary landfill for handling tanneries solid waste.

ii. Improvement of tanner's existing inadequate technical managerial and environmental knowledge and skills to create a sustainable development of tanning activities and enhance the quality of the leather industry, facilitating an improvement of the overall living and working conditions of the tanners in Kasur as well as the environmental awareness of the people at large.

This objective is to be accomplished through:

a. Introduction and demonstration of some low waste leather processing methods to be selected on the basis of their viability in Kasur tanning industry.

b. Installation and operation of a chrome recovery pilot plant (possibly combined with utilization / conversion of some types of solid waste) within the tanning area to demonstrate the possibility of recycling of chemicals such as chrome and conversion of tannery wastes such as fleshing into animal feed, gelatin and other by-products of commercial value.

c. Development of a comprehensive package of baseline data and measures designed to improve tanners occupational health and safety at works and to promote environmental awareness of the Kasur population at large.

iii. Creation of an enabling institutional environment facilitating provision of improved urban services, smooth project implementation and implementation of the "polluters pay" principle: and carrying out preparatory actions for the remainder Kasur Environmental Improvement Programme and other social improvement actions

This objective is to be achieved by:

a. Improvement of operational capabilities of Municipal Committee Kasur (MCK) to provide better urban services with respect to solid waste, drainage desludging and sewage.

b. Upgradation of 1981 outline Development plan for Kasur to the extent as to guide its urban development and preparation of specific detailed plan for an industrial zone identified to be set up on the freed stagnant pool area.

c. Establishment of systems to facilitate the applications of the "polluter pay" principle.

d. Conducting a feasibility study for the remainder of Kasur Environmental Improvement Project (KEIP) enabling investment and possible funding decisions.

e. Conducting three feasibility studies namely Women in Leather Industry, Children in Leather Industry and Health Monitoring in Kasur to facilitate follow up actions by concerned authorities and interest donors.

1.4 Facilities Constructed by KTWMA

As part of immediate objective 1.3 (B)(i)(b), KTWMA has constructed (completely or partially) the following facilities.

i. Dingarh Collector

ii. Dingarh Pumping Station

iii. Pressure Pipeline

iv. Younas Nagar Collector

v. Younas Nagar Pumping Station

vi. Storm Water Drain

vii. Pucca Drain

viii. Final Outfall

ix. Approach Road to Tannery Clusters

1.5 Conceptual Design of CEPTP

The conceptual design of the CEPTP was prepared by TEH Projekt (Bosnia) under a separate agreement. The concept of the project included.

i. Screening of the effluent through manual as well as automatically cleaned screens.

ii. Homogenization in concrete tanks by surface aerators.

iii. Pumping and delivery system of the homogenized effluent through pumps and delivery tanks.

iv. Sludge settlement in concrete settling tanks

v. Sludge stabilization with lime mixing

vi. Sludge pumping through pumps to the dedicated permanent sludge disposal lagoons.

vii. Natural aeration of effluent in facultative lagoons and finally disposal of treated effluent in the final outfall.

Handling of Solid Waste was not designed by TEH.

1.6 Role of IN CONSULT (Pvt.) Limited

IN CONSULT (Pvt.) Limited was hired after a competitive bidding and the contract # 98/215 was signed by UNIDO on 22.12.98 and by IN CONSULT on 30.12.98.

The main task of IN CONSULT was to prepare the design and construction documentation of the CEPTP (immediate objective 1.3(B)(i)(c) and Solid Waste Disposal Site (immediate objective 1.3(B)(i)(d)) and to prepare the As-Built drawings for facilities constructed under immediate objective 1.3(B)(i)(b). The detailed TOR is attached to this report as Annex-I.

1.7 Limits of this Report

This completion report only deals with the responsibilities of IN CONSULT (Pvt.) Limited under Contract # 98/215.

1.8 Responsibilities of IN CONSULT (Pvt.) Limited

As detailed in the TOR, the following were the responsibilities of IN CONSULT (Pvt.) Limited.

a. Study/review TEH PROJEKT conceptual documents and resolve/clarify all issue raised by KTWMA and local tanners representatives (through their associations). All aspects of construction and anticipated operations of the CEPTP with TEH Projekt. TEH design engineering will be available in Kasur / Lahore for one week for this purpose.

b. Prepare detailed construction drawings and tender documents for land preparation. Civil and mechanical engineering works to be undertaken by contractor in the process of constructing CEPTP.

c. Prepare detailed budget for civil, mechanical and electrical engineering (construction) and installation as well as work plan for coordination of activities of the contractors involved in the CEPTP construction.

d. Finalize specification of equipment to be purchased for the CEPTP, recommend suppliers for locally available items and rate their capabilities/references.

e. Recommend potential local contractors (firms, companies, consortiums) and collect information on their performance (references) and prepare short list of firms for construction of CEPTP.

f. Prepare detailed structural mechanical and electrical design and tender documents for civil works related to constructing the solid waste disposal site and its approach road(s). Studies prepared by various UNIDO contractors will be the basic framework for this activity.

g. Undertake geodetic survey of fully or partially completed civil works, prepare as built drawing and recommend measures to be taken for completing civil works.

The design of bridge over old Railway Track was not part of the responsibilities of IN CONSULT (Pvt.) Limited. However, during a meeting on July 16, 1999 KTWMA requested IN CONSULT to prepare design & Bill of Quantities for the bridge.

SECTION – 2

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PROJECT ORGANIZATION

2.1 Project Organization

The following organizations were involved in the project.

i.	Sponsors		UNDP/UNIDO
			Government of Pakistan (GoP)
			Export Promotion Bureau (EPB)
			Government of the Punjab
			Tanners' Association Dingarh (TAD)
			Small Tanners Association (STA)
ii.	Project Authority		Kasur Tannery Waste Management Agency (KTWMA)
iii.	Consultants		
	a.	Conceptual Design	TEH PROJEKT, Bosnia
	b.	Detailed design of CEPTP & Solid Waste Disposal Site	IN CONSULT (Pvt.) Limited, Pakistan
iv.	Contractors		
	a.	Solid Waste Disposal Site and Approach Road	Guarantee Engineers
	b.	CEPTP	To be decided
v.	Foreign Equipment Suppliers		To be decided

SECTION – 3

KEY PROJECT FEATURES

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3.1 Consultancy Agreement

a. Date of signing

i.	by UNIDO	22nd December 1998
ii.	by IN CONSULT	30th December 1998

b. Remuneration

i.	Original Agreement	US $ 53,032
ii.	Amendment # 1	To be decided

c. Duration of Agreement

i.	Original Agreement	December 30, 1998 – July 31, 1999

3.2 Documents Prepared by IN CONSULT

As part of their responsibilities, IN CONSULT prepared and submitted the following documents.

3.2.1 Topographic Survey Report

Survey was conducted in January 1999 so that area could be demarcated and profiles might be known enabling the consultants to complete the design of facilities. However the demarcation by KTWMA took longer and only in May 1999 it could be possible to finalize the availability of defined area earmarked for construction of facilities. The maps and drawings were finalized and submitted in May 1999. Delay in finalization of area reflected on the subsequent activities. Following documents with regard to Topographic Survey were submitted.

- Topographic Survey Report – March 17, 1999
- Topographic & Profile Maps – May 1999
- Geo-technical Investigation – January 1999
- Geo-technical Investigation – March 1999

3.2.2 Prequalification of Civil Contractor and Equipment Supplier

It was done in two parts (i) for civil contractors and (ii) for equipment suppliers.

i. Civil Contractors

Sequence of activities was as under;

a. Preparation & approval of prequalification forms
b. Preparation & approval of prequalification criteria
c. Invitation for prequalification applications
d. Evaluation & recommendation

ii. Equipment Suppliers

Sequence of activities was as under;

a. Classification of Equipment
b. Invitation to various equipment manufacturers/suppliers
c. Preparation of specifications for equipment
d. Evaluation of data & recommendations for shortlisting

iii. Documents prepared & submitted with respect to the prequalification/short listing.

a. Prequalification Document
b. Evaluation Report for prequalification of Civil Contractors
c. Evaluation Report for prequalification of Equipment Suppliers

3.2.3 Construction Documentation for Solid Waste Disposal Site and Approach Road

Following documents were prepared and submitted.

- Design Concept of Landfill for Disposal Site (it included a geological survey for finding out suitable clay for the landfill site).
- Design & Cost Estimate
- Tender Document – Volume I (Contractual Conditions)
- Tender Document – Volume II (Bill of Quantities)

- Tender Document – Volume III (Containing following drawings)

Dwg #	Description
AR-C-001	Layout Plan of Approach Road to Solid Waste Disposal (Sheet No. 1)
AR-C-002	Layout Plan of Approach Road to Solid Waste Disposal (Sheet No. 2)
AR-C-003	Layout Plan of Approach Road to Solid Waste Disposal (Sheet No. 3)
AR-C-004	Layout Plan of Approach Road to Solid Waste Disposal (Sheet No. 4)
AR-C-005	Layout Plan of Approach Road to Solid Waste Disposal (Sheet No. 5)
AR-C-006	Layout Plan of Approach Road to Solid Waste Disposal (Sheet No. 6)
AR-C-007	Approach Road to Solid Waste Disposal – Misc. Details
AR-C-008	Longitudinal Profile of Approach Road (Sheet No. 1)
AR-C-009	Longitudinal Profile of Approach Road (Sheet No. 2)
SW-C-001	Layout Plan of Solid Waste Disposal Site
SW-C-002	Solid Waste Disposal Site – Cross Section at Locations
SW-C-003	Solid Waste Disposal Site – Cross Section at Locations
SW-C-004	Solid Waste Disposal Site – Cross Section at Locations
SW-C-005	Solid Waste Disposal Site – Cross Section at Locations
SW-C-006	Solid Waste Disposal Site – Cross Section at Locations
SW-C-007	Solid Waste Disposal Site – Cross Section at Locations
SW-C-008	Solid Waste Disposal Site – Cross Section at Locations
SW-C-009	Solid Waste Disposal Site – Fencing Arrangement
SW-C-010	Solid Waste Disposal Site – Fencing Arrangement

Work for this part has been awarded to M/s. Guarantee Engineers and construction work was started on 7th August 1999. Target date for completion has been set as 31st December 1999.

3.2.4 Construction Documents for CEPTP

The following documents were prepared

- Design & Cost Estimate
- Tender Document – Volume I (Contractual Conditions)
- Tender Document – Volume II (Bill of Quantities)
- Tender Document – Volume III (including the following drawings)

Sr.#	Dwg #	Description
1	GL-G-001	General Location Plan
2	GL-G-002	General Layout of CEPTP
3	GL-G-003	General Layout - Part Plan of CEPTP
4	MI-G-001	Process Diagram
5	MI-G-002	Hydrology Profile - Effluent & Sludge
6	SC-S-001	Structural Details of Culvert for Kasur - Depalpur Road
7	SC-S-002	Supply Channel - Form Work
8	SC-S-003	Supply Channel - Reinforcement
9	SC-M-004	Supply Channel - Manual Screens
10	SC-M-005	Supply Channel - Flow Control Gates
11	SH-C-001	Screen House - Plan, Roof Plan, Elevation and sections
12	SH-C-002	Screen House - Foundation and Roof Slab details
13	SH-M-003	Automatic Fine Screen - Typical Arrangements
14	ET-S-001	Equalization Tanks - Formwork Plan
15	ET-S-002	Equalization Tanks - Formwork Sections
16	ET-S-003	Equalization Tanks - Reinforcements
17	ET-M-004	Equalization Tanks - Aerators Arrangement
18	ET-M-005	Equalization Tanks - Effluent Pumping Arrangements
19	ST-S-001	Settling Tanks - Form Work
20	ST-S-002	Lime Preparation and Slaking Tank
21	ST-S-003	Distribution & Delivery Tank Sludge Pumping Station - Form Work
22	ST-S-004	Settling Tank - Reinforcements
23	ST-S-005	Distribution & Delivery Tank sludge Pumping Station - Reinforcement
24	ST-M-007	Settling Tanks - Equipment Arrangement Plan
25	ST-M-008	Settling Tanks - Equipment Arrangement Sections
26	ST-M-009	Sludge Pumping Station - Equipment Arrangement
27	ST-M-010	Lime Preparation and Slaking Tank - Equipment Arrangement
28	ST-M-011	Sludge & Supernatant Pumping Station - Pipe Line Mounting Plan
29	FC-S-001	Flow Measuring Channel - Form Work
30	FC-S-002	Flow Measuring Channel - Reinforcement
31	FC-M-003	Flow Measuring Channel - Equipment Arrangement
32	EL-S-001	Effluent Treatment Lagoon 1 & 2
33	EL-S-002	Effluent Treatment Lagoon 3, 4, 5 & 6
34	EL-S-003	Effluent Treatment Lagoon 7, 8, 9 & 10

Sr.#	Dwg #	Description
35	EL-S-004	Effluent Treatment Lagoon 11, 12, 13 & 14
36	EL-S-005	Effluent Treatment Lagoon 13, 14, 15 & 16
37	EL-S-006	Effluent Treatment Lagoon - Misc. Details
38	EL-S-007	Effluent Treatment Lagoon - Sections
39	EL-S-008	Effluent Treatment Lagoon - Longitudinal Section of the Outlet Channel
40	SL-S-001	Permanent Sludge Lagoons - Plan & Sections
41	SL-S-002	Permanent Sludge Lagoons - Structural Details of Supernatant Pumping Station
42	SL-M-003	Supernatant Pumping Station - Equipment Arrangement
43	CB-S-001	Control Building & Generator Room - Excavation Plan & Footing Details
44	CB-S-002	Control Building & Generator Room - Reinforcement Details of 1st Floor, Roof Slab & Beams
45	CB-S-003	Control Building & Generator Room - Generator Foundation & Trench Details
46	CB-C-004	Control Building & Generator Room - Ground Floor Plan
47	CB-C-005	Control Building & Generator Room - First Floor & Roof Plan
48	CB-C-006	Control Building & Generator Room - Elevations
49	CB-C-007	Control Building & Generator Room - Sections
50	CB-C-008	Control Building & Generator Room - Schedule of Doors & Windows
51	CB-P-009	Control Building & Generator Room - Plumbing Layout Ground Floor Plan
52	CB-P-010	Control Building & Generator Room - Plumbing Layout First Floor Plan
53	CB-P-011	Control Building & Generator Room - Typical Details of Sewerage Appurtenances
54	CB-S-012	Substation Room - Foundation & Roof Plan Reinforcement Details
55	CB-C-013	Substation Room - Ground Floor Plan Elevations & Sections
56	MI-S-001	Parking Shed - Structural Details
57	MI-C-002	Underground Water Tank - Form Work & Reinforcement
58	MI-C-003	Storm Water Drainage & Fire Fighting System - Typical Details
59	MI-C-004	Fence - Typical Details
60	MI-C-005	Fence - Typical Details
61	MI-C-006	Date - Typical Details
62	MI-C-007	Process water Well
63	MI-C-008	Pavement inside CEPTP - Plan & Details
64	MI-C-009	Fuel Tank - Typical Details
65	MI-C-010	Steel Railings Etc. - Typical Details
66	MI-E-001	Legends - Electrical System

Sr.#	Dwg #	Description
67	MI-E-002	Single Line Diagram of HT/LT System
68	MI-E-003	External Electrification of CEPTP
69	MI-E-004	Control Building & Generator Room - Internal Electrification
70	MI-E-005	Substation Room & Screen House - Internal Electrification
71	MI-E-006	Single Line Diagram - Distribution Boards
72	MI-E-007	Single Line Diagram - Distribution Boards RO - 1
73	MI-E-008	Single Line Diagram - Distribution Boards RO - 2
74	MI-E-009	Single Line Diagram - Distribution Boards RO - 3
75	MI-E-010	Single Line Diagram, Layout- Control & Indications - Control Desk
76	MI-E-011	Typical Electrification Details
77	MI-E-012	Layout Plan - Cable Tray
78	MI-E-013	Supernatant Pumping Station - Power Supply Arrangement
79	MI-E-014	CEPTP Process Diagram – Automation Circuits

Status: Tenders have been evaluated and award of contract is being finalized.

3.2.5 Specification & Tender Documents for Procurement of Equipment

Following documents were prepared in this regard.

- Procurement Document for Foreign Equipment
- Procurement Document for Local Equipment

3.2.6 Geodetic Survey & As-Built drawings for fully and partially completed Civil Works

Following document were submitted:

- Geodetic Survey Report – Volume I including 57 photographs of various facilities
- As-Built Drawings – Volume II (containing 13 (thirteen) drawings for Geodetic Survey Plan of As-Built Facilities)

3.3 Additional Works

3.3.1 Bridge on Old Railway Track

Design of this facility was initially not part of the contract with IN CONSULT. However, upon the request of KTWMA, IN CONSULT designed this bridge and provided following documents.

i. Structural Design of the Bridge

ii. Bill of Quantities

iii. Drawings

The drawings and Bill of Quantities for bridge was made by KTWMA, part of the contract for Construction of Solid Waste Disposal Site and Approach Road.

3.3.2 Assistance in Evaluation of Tenders

i. Although not part of their contract, IN CONSULT assisted KTWMA upon their request, in preliminary examination of the tenders submitted by the Tenderers for Solid Waste Disposal Site and Approach Road.

ii. Similarly IN CONSULT assisted KTWMA in preliminary examination of tenders for construction of CEPTP.

Detailed evaluation of Tenders was however not carried out by IN CONSULT (Pvt.) Limited.

SECTION – 4

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CURRENT STATUS OF THE WORKS

4.1 Solid Waste Disposal Site and Approach Road

Work has been started by Guarantee Engineers and Target completion date is 31.12.99.

4.2 Common Effluent Pre-Treatment Plant including Sludge Lagoon

Tenders have been floated but job has not yet been awarded.

The target completion date for this activity, in accordance with the directive of Chief Minister Punjab, has been set as 31.12.99.

4.3 Procurement of Equipment

This is being taken care by UNIDO/UNDP.

SECTION – 5

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RECOMMENDATIONS FOR FUTURE PROJECTS

5.1 General

The Consultants have provided services during the detailed design phase only and for a short period (about seven months). During this short period the Consult's findings resulted in the following recommendations for future projects.

5.2 Results Monitoring

The results of this projects should be carefully monitored e.g. effect on ground water, emission of gas from landfill, effect on environment etc., after completion of the project. These factors shall have impacts on the future projects of similar nature.

5.3 Resources

The resources must be identified in advance just after the concept and cost estimation. Resources include finances, manpower, logistics and land etc. The contingencies should be kept in view and approvals from related authorities should be secured to avoid hurdles during completion of such projects. Frequent changes in staff and personnel should be avoided for continuity of the project.

5.4 Master Planning

Consultants find it appropriate to recommend preparation of a detailed master plan for tannery's pollution related projects as the locations are already identified. The projects should be prioritized so that adequate and timely financing may be arranged.

5.5 Scheduling and Monitoring

A comprehensive scheduling and monitoring system should be put in place for projects similar to this. It is observed that certain activities require completion in advance and their impact may force changes in design of the rest of the project e.g. water meters, chrome recovery plants, grit chambers etc.

5.6 Coordination

The staff responsible for implementation of the projects should be equipped with proper support for coordination of various activities, as such projects have various components (although small, yet important) to be taken care of.

ANNEX – 1

TERMS OF REFERENCE

Terms of Reference

for the subcontract
Preparation of Construction Documentation
for the Central Effluent Pre-treatment Plant (CEPTP)
in Kasur, Pakistan

1. Background

The town of Kasur is located about 55 km southeast of Lahore, in the province of Punjab, near the Indian border, where the river Sutlej enters Pakistan. Since antiquity Kasur has been known as a centre of trade, commerce and culture. The town is located on a NW-SE ridge, surrounded by a flat landscape. The low permeability of the top soil characterizes the land. Wind erosion and water logging deteriorates soil qualities and reduces land areas suited for agriculture. Farming relies on irrigation, using ground water and private tube wells. Intensive irrigation has changed the soil structure. Waterlogging and high salinity decreases the productivity of the agriculture sector. A *Salinity Control and Reclamation Programme (SCARP)* consisting of 12 wells and the drainage channel Pandoki Outfall were constructed to overcome these disadvantages. However, only one of these wells is currently in operation. The municipal boundary covers an area of about 2,335 acres, surrounded by agricultural land (wheat, grums, maize, rice and cotton). Mainly due to tannery effluent water, large land areas are presently under water, constituting the so-called stagnant lakes or pools, for which the town has become infamous during the last few years as one of the most heavily polluted in Pakistan.

The Kasur district covers a gross area of 981,702 acres of which 705,224 acres are classified as cultivable land. Under irrigated agriculture conditions, the soil is very productive. Rice, sugar cane, cotton, various fodder, maize and vegetables are the main crops in summer (kharif), while wheat is the only dominant crop in winter (rabbi). A former river, Rohi Nallah, meanders through the town. Natural effluent has been cut off and today the water in the river consists of the domestic sewage from the town and some of the waste water from the tanning industry. The river bed is also the dumping site for garbage and other solid waste. Farmers along the river use the mixed sewage for irrigation, watering buffaloes and washing clothes.

According to the last (1981) census, the number of inhabitants was about 155,500; for 1995 it is estimated to be about 280,000. The textile industry is the largest industry in Kasur in terms of employment, followed by the tanning industry. These industries dominate the town, with most of the population directly or indirectly depending on them.

Tanning has a long standing tradition in Kasur. Initially, rather primitive tanneries, in which all operations were carried out manually, and in which tree bark for tanning proper was used, had apparently been established in the Dingarh area on the bank of the Rohi Nallah. Subsequently, tanneries started spreading over a wider area south of the river and Kot Molvi, Abdul Qadir, Niaz Nagar and Younus Nagar agglomerations were gradually developed. With its 170 tanneries, Kasur is the biggest tanning concentration in number in the country.

According to data provided by the TANNERIES ASSOCIATION DINGARH, Kasur, the average daily input of all tanneries in Kasur is estimated to be over 180 tons of wet salted weight, comprising some 8,000 hides (cattle, buffaloes) and between 12,000 and 15,000 skins (sheep and goats) per day. The small-scale units mainly produce hides and/or skins up to the wet-blue stage only, as they do not have the facilities for finishing leather. They sell the semi-processed leather to tanneries in Karachi, Sialkot and other places, where the leather is finished for various end uses. Some small and medium-sized tanneries also produce vegetable tanned leather for sole leather and for other purposes.

The conventional pattern has been well preserved: except 3-5 larger and mechanized tanneries with a more or less industrial way of production, the other tanneries are small, family-owned units, employing up to ten workers. Traditional family-owned tanneries typical of Kasur are very basic. Most operations are still carried out with very limited use of machines and equipment. Sulphide supported unhairing by pulping for hides and by painting for skins are commonly used in liming. Chrome tanning has, to a great extent, replaced the slow vegetable tanning process, but the ancient bag-tanning method can still be seen. Some tanners still prepare their own chrome liquors from dichromate under poorly controlled conditions. Due to the unavailability of water supply, encouraged by its economic incentives, all the tanneries are presently using the underground water for their tanning activities.

Most medium-sized tanneries finish their chrome-tanned leather using only water-based coatings and hand-spraying techniques. The largest tannery has fully automated spraying units (two) for finishing the leathers produced and several other larger tanneries are also in the process of installing automated spraying units.

In contrast to the export oriented tanners of the Korangi industrial zone of Karachi, who operate large, well-equipped factories, Kasur has remained a hide processing centre, mostly catering to the needs of the local, low-price bracket leather footwear manufacturers. Profit margins are low andtheir access to capital and potential for modernization is limited. Many will find it difficult to survive in the increasingly competitive environment.

In view of its proximity to the large market of Lahore and the availabilityof leather and cheap labor in Kasur, it is somewhat surprising that no downstream manufacturing units (footwear, leather goods) have been established in Kasur; they remain within the Lahore area.

Sanitary conditions both within and outside tanneries are poor by any standard: few units are kept tidy. However, possibly due to the UNDP/UNIDO preparatory assistance project, an increasing awareness of the negative impact of tannery operations on the environment has been created among members of the tanning community. Little attention is given to occupational health standards, protection from exposure to harmful chemicals and to safety at the work place.

The well organized TANNERIES ASSOCIATION DINGARH, Kasur is the main driving force behind endeavors to catch up with more advanced tanners in the country and, in particular, to resolve the problems of treatment and discharge of tannery effluent which, sooner or later, is bound to paralyze the tanning operations in Kasur.

The three tannery clusters discharge 9,000 m^3 of heavily polluted tannery waste water per day. About 2,500 m^3 of the above tannery effluent together with domestic sewage is discharged into the Rohi Nallah. This is used for irrigation in the down stream parts of Rohi Nallah. The remaining amount is discharged to the stagnant pools permanently covering an area of 327 acres and another 311 acres during the monsoon period. The chemically polluted water affects the growth of crops, plants and crop yields; outputs from animals and their health; as well as induced social problems in the area.

A total of 100-150 tons/day of solid tannery waste and 150-200 tons/day of solid domestic waste is disposed of by casual dumping at various places, including the Rohi Nallah. Water supplies from hand pumps and tube wells, and foodstuffs produced in the area are contaminated with dissolved solids, especially sodium chloride and sulfides. The *Environmental Impact Assessment (EIA)* report made in February 1993, attributes the groundwater contamination to the tannery effluent, waste water and stagnant pools.

Improper use and handling of chemicals has subjected workers and residents to hazardous exposure. Respiratory disorders, skin infection related diseases, diarrhea/dysentery and typhoid are the most serious illnesses among the community, population etc. Currently 50,000 to 60,000 people are exposed to the environmentally polluted conditions. Most of the tanneries are small and their owners have limited knowledge of simple methods and ways of improving their tanning process and working situation.

The following is the amount of the tannery pollution load discharged into the environment (per annum): 4,000 tones of BOD, 11,000 tones of COD, 10,000 tones of solids in suspension in waste water and

effluent; 160 tones of Chromium and 400 tones of Sulphide (calculated on the basis of 13,000 m^3/day and 300 days per year). It should be noted that although being a primary treatment type, the proposed treatment plant is expected to eliminate 65% of the BOD, 55% of the COD, 95% of the suspended solids, 95% of the chromium and 98% of the sulphide.

The HOUSING, PHYSICAL AND ENVIRONMENTAL PLANNING DEPARTMENT (HP&EP) of the GOVERNMENT OF PUNJAB is administratively responsible for provincial policies and programmes in the area of environmental planning and the enforcement of standards, including the provision of water and sanitation services. HP&EP, acting through the KASUR DEVELOPMENT AUTHORITY (KDA), constituted the KASUR TANNERY POLLUTION CONTROL PROJECT (KTPCP) and established the KASUR TANNERY WASTE MANAGEMENT AGENCY (KTWMA) which are the national counterpart organization responsible for implementing the UNIDO project and later for operating the complex tannery effluent treatment system comprising chrome recovery units, channels and pump stations, the *Central Effluent Pre-Treatment Plant (CEPTP)* and activities related to the solid waste handling. KTWMA will delegate the direct responsibility for the promotion of in-house tannery technology improvements, operation improvements and the chrome recovery and by-products pilot plant to the KASUR TANNERY ASSOCIATION (KTA). In its capacity as national executing agency, HP&EP has appointed the *National Project Director (NPD)*, who is responsible for overall project development and liaison with concerned Government agencies and UNDP/UNIDO. KTPCP is headed by a professional *Project Manager (PM)* responsible for the implementation of the entire project.

Detailed designs and outline tender documents have been prepared in the techno-economic study of the preparatory assistance phase. These needed some modifications as a result of the change in the solid waste disposal site, including changes in the built-up area of the tannery clusters necessitating some minor changes in the lay-out of pumping stations. This task was carried out by TEH PROJEKT under a UNIDO sub-contract and the draft conceptual design adapted to the actual conditions (specified by the project authorities in Kasur) was submitted to KTPCP and local tanners for their substantive comments/evaluation by end 1997.

Contracts for civil works would be given by KDA/KTCPC/KTWMA through local competitive bidding. In order to speed up the implementation of the project and to avoid significant price increases, the civil works have been split into five smaller packages: drainage in tannery clusters, solid waste site plus lagoons, treatment structures, pump houses in clusters and the final outfall.

UNIDO provides technical backstopping support services related to introducing low waste technologies including chrome recovery and by-products, technical evaluation of equipment and training. Its services, in particular, do *not* include the overall project management and all construction works except *guidance* in the initial review and introducing minor modifications of designs made during the project preparatory assistance.

2. Project Objective

The overall objective of the project is to control the indiscriminate discharge of potentially harmful solid waste and heavily polluted waste water and improve the working conditions in Kasur, therebyensuring an environmentally sustainable social and economic development of the area. The present Phase I of the project is focusing on building infrastructure for transporting effluent from tanneries to the CEPTP and subsequently to transfer the treated effluent to the Sutlej river, introducing cleaner technology in local tanneries and handling solid waste. Phase II of the project will concentrate on constructing and starting up the CEPTP operation, establishing an effluent treatment laboratory and improvingworking conditions in the tanneries.

3. Responsibilities of the Contractor

The conceptual design and documentation prepared by TEH PROJECT (copies of the summary and the drawings are attached) serves as the basic input for the detailed (construction) documentation to be prepared by the contractor.

The contractor is required to setup fully operation design office in Kasur. The main duties to be undertaken by the contractor are as follows:

Detail Design Phase

3.1 Study / review TEH PROJEKT conceptual documents and resolve/clarify all issue raised by KTWMA and local tanners representatives (through their associations). All aspects of construction and anticipated operation of the CEPTP with TEH Projekt. TEH design engineering will be available in Kasur/Lahore for one week for this purpose.

3.2 Prepare *detailed construction drawings* and *tender documents* for land preparation. Civil and mechanical engineering works to be undertaken by contractor in the process of constructing CEPTP.

3.3 Prepare detailed *budget* for civil, mechanical and electrical engineering (construction) and installation as well as work plan for coordination of activities of the contractors involved in the CEPTP construction.

3.4 Finalize specification of equipment to be purchased for the CEPTP, recommend suppliers for locally available items and rate their capabilities/references.

3.5 Recommend potential local contractors (firms, companies, consortiums) and collect information on their performance (references) and prepare short list of firms for construction of CEPTP.

3.6 Prepare detailed structural mechanical and electrical design and tender documents for civil works related to constructing the solid waste disposal site and its approach road(s). Studies prepared by various UNIDO contractors will be the basic framework for this activity.

3.7 Undertake geodetic survey of fully or partially completed civil works, prepare as built drawing and recommend measures to be taken for completing civil works.

Constuction Supervision Phase

3.8 Provide construction supervision during the construction phase of CEPTP

Remarks: The cost of services specified under 3.6, 3.7 and 3.8 should be quoted separately. Final decision to include these in the overall scope of services will be taken by UNIDO at the time of contract negotiation/award.

4. Field of Expertise Required

Reputable (consulting) firm with design experience in sewerage disposal / tannery effluent treatment There are no restrictions imposed the consulting firm in terms of professional staff and man-power deployment; however *the firm must provide detailed construction documentation for the treatment plant by 31 December 1998.* Consultant should decide options for selecting their own professional and inputs to meet the time frame for the completion of this task by 31 December 1998.

5. General Time Schedule

The final time schedule and a detailed work-plan will be prepared as soon as the Contractor has been selected. The time schedule will be annexed to the contract and will form an integral part of the same. The

following tentative programme, subject to modifications is applicable for contract negotiations

2.1	Briefing of Contractor's team leader in Kasur	5 January 1999
2.2	Study the TEH-PROJEKT documentation, discuss technical aspects with TEH-PROJEKT engineers and finalize the work-plan	15 January 1999
2.3	Complete topographical survey of landsite for CEPTP and submit one set of maps for approval	15 February 1999
2.4	Compete detailed construction documentation BOQ and cost estimate for CEPTP	15 April 1999
2.5	Complete specifications for equipment BOQ tender documentation and work plan for installing and commissioning and submitting one set for approval (CEPTP)	31 May 1999
2.6	Identify potential equipment suppliers and construction firms, submit lists for approval	15 June 1999
2.7	Complete detailed design for civil works and tender documents related to solid waste disposal site, submit one set for approval	31 March 1999
2.8	Complete geodetic survey of completed and partially completed works and prepare "as built" drawings, recommend measures for completing such civil works, submit one copy for approval	30 June 1999

Reports:

- topographical survey of landsite for CEPTP	15 February 1999
- detailed construction documentation for CEPTP, detailed design for the solid waste disposal site	15 April 1999
- draft final report	30 June 1999
- Final Report	31 July 1999