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Kurram Tangi Dam Construction

Annex III: Waste Management Plan
Final Report

December, 2013
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Map to Kurram Tangi Dam Project Documents

Shown below is the suite of documents submitted to USAID under Contract AID-391-C-13-00002 for the KTDP. This report is shaded in red in order to show its relationship to the full set of documentation.

ENVIRONMENTAL ASSESSMENT	
	VOLUME I: MAIN REPORT
	VOLUME II: PROJECT ECONOMIC BENEFITS
	VOLUME III: MAPS
ENVIRONMENTAL MITIGATION AND MONITORING PLAN	
	MAIN REPORT
	ANNEX I: HEALTH AND SAFETY PLAN FRAMEWORK
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LAND ACQUISITION AND RESETTLEMENT	
	RESETTLEMENT POLICY FRAMEWORK
	RESETTLEMENT ACTION PLAN (COMPONENT 1)
CULTURAL HERITAGE PRESERVATION PLAN	
VULNERABLE TRIBES PLAN	
GENDER PLAN	
KEY SUPPORTING TECHNICAL REPORTS	
	SUPPLEMENTAL REPORT ON GEOLOGY
	SUPPLEMENTAL REPORT ON GEOTECHNICAL ASPECTS
	SUPPLEMENTAL REPORT ON SEISMIC HAZARD
	SUPPLEMENTAL REPORT ON HYDROLOGY
	SUPPLEMENTAL REPORT ON CLIMATE CHANGE

All documents may be read as stand-alone documents, but the reader should be aware of the full set of documents available. Any one document may reference other documents in the suite in order to avoid duplication.

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Kurram Tangi Dam Construction

Annex III: Waste Management Plan

USAID Environmental Assessment of Kurram Tangi Dam Construction

Contract Number: AID-391-C-13-00002

From MWH Americas, Inc.
To USAID/Pakistan Energy Office
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Author: MWH Americas, Inc.

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List of Acronyms

Acronym	Term
AOI	Area of Influence
EA	Environmental Assessment
EMC	Environmental Monitoring Cell
E&ST	Environmental Social Team
EMMP	Environmental Management and Monitoring Plan
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization
GIIP	Good International Industrial Practice
HSE	Health, Safety and Environment
KP	Khyber Pakhtun Khwa
KTDC	Kurram Tangi Dam Consultants
KTDP	Kurram Tangi Dam Project
MSDS	Material Safety and Data Sheet
MWH	Montgomery Watson Harza
NEQS	National Environmental Quality Standards
Pak-EPA	Pakistan Environmental Protection Agency
PEPA	Pakistan Environmental Protection Act 1997
PERSUAP	Pakistan Pesticide Evaluation Report and Surface Use Action Plan
PPE	Personal Protective Equipment
PPERSUAP	Pakistan Programmatic Umbrella Pesticide Evaluation Report and Safer Use Action Plan
PWMP	Project Waste Management Plan
SC	Supervisory Consultant
USAID	United States Agency for International Development
WAPDA	Water and Power Development Authority
WMP	Waste Management Plan

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Waste Management Plan

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EXECUTIVE SUMMARY

The Project Waste Management Plan (PWMP) has been prepared as a special annex to the (Environmental Mitigation and Monitoring Plan (EMMP) because of the importance of the subject.

The PWMP provides an overview of the Kurram Tangi Dam Project in terms of the scope of each project component, a summary of relevant legislation, standards and guidelines and a framework for waste management.

The frame work for waste management provides:

- Goals, objectives and scope for waste management
- A preliminary assessment of the sources of waste, waste types and classification, materials recovery opportunities and disposal requirements
- A preliminary assessment of waste quantities
- Good practice references for waste management including waste minimization activities
- An overview of project roles and responsibilities with respect to waste management and minimization
- Quality assurance procedures in terms of health and safety, training, and monitoring, reporting and auditing;
- An overview operational phase solid waste and wastewater management; and
- Project waste management plan objectives, policies and procedures.

The proposed goals for the Kurram Tangi Dam Project (KTDP) for waste management and minimization are:

- Goal 1 – to avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities
- Goal 2 – to promote more sustainable use of resources, including energy and water.

These goals are based objectives given in the IFC Performance Standard 3 Resource Efficiency and Pollution Protection.

Waste management objectives are based on the (Draft) Guidelines for Solid Waste Management developed by Pakistan Environmental Protection Agency (Pak-EPA). The objectives under Goal 1 are:

- Objective 1.1: Facilities and operations provide for the management and minimization of waste
- Objective 1.2: Waste management facilities and services are operated to avoid or mitigate any adverse public health and environmental effects
- Objective 1.3: Waste management and minimization operations and other activities are safe.

The objectives under Goal 2 are:

- Objective 2.1: Facilities and operations provide for minimising waste and the harmful impacts of waste
- Objective 2.2: The contractor improves the efficiency of resource use.
- Objective 2.3: WAPDA provides leadership in waste minimisation.

Schedules provide details on:

- Definitions of Waste and Landfill Types
- Staff Training for waste management and minimization
- Waste Management and Minimisation System Monitoring and Audit Requirements.

The KTDP Waste Management Plan provides a foundation upon which waste management and minimization planning should continue during the pre-construction, construction and operational phases of the KTDP.

1 INTRODUCTION

1.1 Overview

This Project Waste Management Plan (WMP) has been prepared as a part of the Environmental Assessment (EA) of the Kurram Tangi Dam Project (KTDP), a multipurpose water development project that will provide both power and irrigation benefits. The Project is located on the Kurram and Kaitu Rivers in northwest Pakistan, with its principal structure, Kurram Tangi Dam, about 30 kilometers north of Bannu City. This PWMP is a guidance and reference document for the Construction Contractor and Water and Power Development Authority (WAPDA) for Waste Management during the Construction and Operational Phases of the proposed Project. This plan covers the various types of liquid and solid waste which are likely to be generated during construction and operational activities of the KTDP and the avoidance or minimization of waste and adverse impacts of waste.. The term waste is commonly used in the PWMP to refer to either solid or liquid waste or both. The term recovered materials is used for materials that, if not for waste minimization measures, would become waste.

1.2 Purpose

This PWMP is a framework waste management program and provides general procedures or guidance for the management and minimisation of waste generated during construction and operations of the project. Furthermore, it contributes to ensuring that the capacity and the nature of the collection and treatment systems are appropriate for the waste to be managed and recovered materials to be managed..

The Plan provides:

- A primary waste management and minimization reference document for the KTDP.
- A basis for the construction contractor to develop a construction waste management plan (CWMP) for the construction and for WAPDA to develop a WMP for operations.
- A training tool.
- A ccompliance bench mark.

This PWMP should be reviewed and updated by the WADPA as more information becomes available throughout the life of the project. All revisions should be documented and additional task specific training should be provided to personnel that may be involved with waste management and minimization. .

1.3 Current Waste Management Status

A detailed description of the status of waste management practices is presented in Section 4.2.6 of the EA. The key points are briefly summarized below. In general, available reports indicate that waste management practices are under capacity but they are also being carried out through unsanitary procedures in the project area of influence (AOI). Table 1-1 below summarizes baseline conditions which were established based on the literature review carried out during the preparation of the EA. The principal documents containing information relevant to waste management are the Initial Environmental Examination (USAID, 2012), the Feasibility Study Report (Kurrum Tangi Dam Consultants (KTDC), 2004) and the Khyber Pakhtun Khwa (KP) Environmental Protection Agency (EPA) approved Environmental Impact Assessment and Resettlement Action Plan (Chapter 9 in KTDC, 2004).

Field studies were conducted to supplement the literature review. Despite data collection being constrained by the unstable security situation it has been possible to evaluate the existing waste management practices in the project AOI Details of the field work and sites studied are presented in Section 4.2.6 of the EA. The key findings are presented in Table 1-2 below.

Table 1-1: Evaluation of Existing Documents

Sr. No.	Project Stage	Baseline Data
1.	Policy	There is no waste management policy in the project area.
2.		There is no project agreement signed with any responsible body for implementation of a Solid Waste Management Plan (SWMP).
3.		There is no project agreement for waste management compliance with environmental legislation.
4.	Procurement	There is no responsible body for evaluation of the materials to be procured w.r.t over-ordering and waste reduction.
5.		There is no responsible body that will consider less waste generating construction methods.
6.	Project Planning and Design	Only the waste that will be generated from construction camps and excavated material is identified. There is no quantification. Only possible disposal options for the excavated material from the dam are presented.
7.		No specific location is designated for the construction camps in Spaira Ragha and Bannu.
8.		The workforce is estimated to be at least 1,000 workers during construction and 400 during operations.
9.		Construction camps within the project area will produce about 400 kg/day of solid waste. During operations office buildings and staff colonies will generate about 160 kg/day.
10.		Construction activities, i.e. curing, soaking of bricks, pilling etc. will generate about 9,500,000 gallons of wastewater for the entire project. Domestic wastewater from construction camps will be about 32,000 gallons per day. During operations office buildings and staff colonies will generate about 12,800 gallons/ day.
11.		Currently a waste management plan has yet to be prepared for the project.
12.		No waste disposal site has been identified for project waste disposal.
13.		There is no layout plan of natural water bodies of the project area.
14.		There is no layout plan of borrow areas in the project area.
15.	Project EA	There are no water quality data for water bodies for the parameters of BOD, COD, TSS, TDS etc.
16.		Sensitive receptors are not identified.

Table 1-2: Key findings: Waste Management Field Studies for EA Baseline

Component	Waste Sources	Solid Waste Constituents	Solid Waste Management	Wastewater Management	Sensitive Receptors
Component 1	Houses, clinics, shops, workshops, domestic wastewater and irrigation run-off	Paper, plastic, organic wastes (food, garden and animal wastes)	Open dumping (including of medical waste and used oils). Solid waste dumped in open drains	No responsible authorities. No solid waste management system. No sewerage system, only open drains. Discharge into fields and water bodies.	None identified
Component 2	Domestic activities, dairy farming	Paper, plastic, organic wastes (food, garden and animal	Open dumping. Solid waste dumped in open drains	No responsible authorities. No solid waste management	None identified

		wastes)		system. No sewerage system, only open drains. Discharge into fields	
Component 3	Commercial activities, dairy farming, domestic activities, agricultural activities, markets, service stations, fodder sellers, shops.	Paper, plastic, glass, organic wastes (food, garden, and animal wastes).	Municipal Committees are responsible authorities. Three waste management sites. Waste disposal practices poor - open dumping, direct disposal in Kurram River	Local Government (Municipality) is responsible authority Wastewater is disposed of in Kurram River, Nullahs and Chashma stream	Kot Barara Kurram River Domail Bazar, Sarai Norang and Chashma Streams

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2 KURRAM TANGI DAM PROJECT

2.1 Project Works Description

For ease of planning and execution, the project has been divided by WAPDA into three major Components that are briefly described below. A detailed project description is presented in Chapter 3 of the Environmental Assessment.

2.1.1 Component 1: Kaitu Weir, Power and Irrigation

The principal infrastructures that will be constructed during Component 1 are as follows:

- Kaitu Weir, a 18-foot roller-compacted concrete weir that will be located about 400 feet upstream of the Mirali -Thal Road Bridge near Spinwam. From the Kaitu Reservoir, there will be two separate off-takes for the Sheratalla and Spaira Ragha Irrigation Canals
- Sheratala Canal System, comprising 16 miles of main, minor and distributary canals with a command area of 12,300 acres. This canal divides into two canals, one of which will have a 55-foot lift and will use electricity produced from Powerhouse V.
- Spaira Ragha Canal System, on the left bank of the Kaitu River will comprise eight miles of canals with a command area of 4,080 acres. Water will be fed to the canal from a pumping station.
- Pumping Stations.
- Powerhouse IV, located in the Kurram River watershed will receive water from a third off-take from the Kaitu Reservoir. Powerhouse IV and its associated waterways (sediment excluder, feeder channel and tunnel, headrace and penstock) will divert Kaitu River flows in excess of irrigation requirements at the Spira Ragha and Sheratala systems for storage in the Kurram Tangi Dam and generate a maximum of 18 MW of hydropower.
- Powerhouse V will be constructed along the Sheratalla Canal for recovery of energy from the gravity flow of the Sheratalla Canal. Associated waterways consist of a feeder tunnel, headrace channel and two parallel penstocks.
- Ancillary works such as roads and transmission lines, such as that between Powerhouse V and the Spaira Ragha Canal Pumping Station. The Mirali-Thal Road and the bridges along the road will be upgraded. Upgrades may also be required to the Spinwam Bridge, and Bannu-Thal road.

The proposed schedule for Component 1 plans for construction to occur over three years. Key features of the construction that are relevant to waste management include the following:

- A central construction camp near the weir housing about 400 workers. A second 100-person camp may be needed for the tunnel, powerhouse, and ancillary structures of Powerhouses IV and V. In addition canal construction crews will likely live in tents along the right-of-way, provided with food, water, fuel and other amenities from the central camp near the weir. Currently the number of security staff is unknown. Allowance for waste generation by security personnel will have to be made in future waste management planning by WAPDA and the contractor.
- Construction material quantities shown in Table 2-1 below

Table 2-1: Construction Material Quantities for Component 1

Excavation	53 million cubic feet
Filling	176 million cubic feet

Concrete	6.5 million cubic feet
Steel Reinforcement	7.3 million lbs
Cement	900,000 bags

2.1.2 Component 2: Kurram Tangi Dam and Related Structures

Component 2 comprises the Kurram Tangi reservoir and dam, a saddle dam on the southeast arm of the reservoir, three powerhouses (I, II and III), and a transmission line to the Domail Substation. The basic purpose of the proposed Kurram Tangi Dam, a 322-ft high Concrete Faced Rockfill Dam, is the storage of water for irrigation and power generation. A main powerhouse with an installed capacity of 38 MW is proposed at the foot of dam, and two additional powerhouses with a capacity 10.4 and 16.5 MW are proposed between the Kurram Tangi Dam and Kurram Garhi Headworks.

These three powerhouses will be connected by a new transmission line to the existing substation at Domail. The distances are as follows:

- Powerhouse I to II: 132 kV, 2 miles.
- Powerhouse II to III: 132 kV, 4 miles.
- Powerhouse III to Domail SS: 132 kV, 13 miles.

Two weirs (Weirs II and III) will be constructed along the Kurram River downstream of the main Kurram Tangi Dam. Weir II and Weir III will be 20-ft high and 75-ft high respectively.

Improvements to the roadway from Bannu to Mir Ali to Spinwam, and a new access road from Spinwam to the dam site roads will be required for construction of the main dam to allow for heavy vehicles and increased traffic during the construction phase. New access roads will be needed from the dam site to powerhouses II and III.

Current estimates are that construction of Component 2 will take about four years.

Additionally, a structure will be constructed before start of dam construction for transportation of light equipment, men and material from left bank to right bank or vice versa. A temporary steel structure is suggested for the purpose and may be constructed by the main dam contractor during his mobilization.

Two colonies for 200 engineers and support staff are proposed; one at a site in the Spaira Ragha Plain about 5 miles from the dam site with reasonable amenities and the other at Bannu with all amenities available in the city. A contractor's camp housing up to about 1100 persons will be required.

It is estimated that sufficient rock fill material for the main dam will be available from the required excavations for the spillway, powerhouse, diversion works and main dam foundation. Additional sandstone is also available in sufficient quantity in the vicinity of the dam site to meet any shortfall, and any excess excavated material from the Component 2 may be diverted for filling borrow areas for Component 1. The fine filter material (sand) and the coarse filter material (fine gravels) for the main dam will be obtained from the river alluvium, which will need proper processing and crushing.

The quantities for the major construction material needed during the construction of Component 2 are listed in Table 2-2

Table 2-2: Construction Material Quantities for Component 2

Excavation	250 million cubic feet
Filling	4.5 million cubic feet
Concrete	20 million cubic feet
Steel Reinforcement	40 million lbs
Cement	4 million bags

2.1.3 Component 3: New Thal Canal and Command Area

Component 3 consists of the new Thal Canal and rehabilitation and upgrade of the existing Civil Canals to improve the water conveyance performance of the present systems. A new head regulator will be constructed at the existing Kurram Garhi Headworks to service the new Thal Canal. The main canal will be 48 miles in length with the canal system distributaries, minors, and sub-minors totaling about 73 miles. The canal system will irrigate a command area of 69,000 acres.

About 200 miles of old canals, collectively called Civil canals, built by landowners, with a command area of approximately 107, 000 acres, and the Marwat Canal, with a command area of 170,000 acres, will also be upgraded.

The proposed construction schedule indicates that construction will take four years. The quantities of the major construction material needed during the construction of Component 3 are shown in the table below.

Table 2-3: Construction Material Quantities for Component 3

Excavation	125 million cubic feet
Filling	160 million cubic feet
Concrete	17 million cubic feet
Steel Reinforcement	36 million lbs
Cement	4 million bags

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3 LEGAL AND REGULATORY REQUIREMENTS

3.1 National Rules and Regulations and Institutions

3.1.1 Environmental Protection Act 1997

Section 11 of the National Environmental Protection Act 1997 (PEPA) prohibits discharge of liquid waste in an amount of concentration that violates the National Environmental Quality Standards (NEQS). Currently there are no NEQS for solid waste.

3.1.1.1 Hazardous Substances Rules, 2003

The rule describes the procedure of handling, transportation and disposal of hazardous substances and hazardous waste. *Inter alia*, general safety precautions for handling hazardous substances as well as safety precautions for workers, and notification requirements in the event of an accident are described in these rules. Requirements for project waste management plans are also defined. These include a requirement for updating the plan every three years, the need to provide for management of hazardous waste in a manner that will prevent adverse environmental impacts and to ensure that hazardous and non-hazardous waste are not mixed.

3.1.2 Hospital Waste Management Rules, 2005

In these rules, handling, transportation and disposal of hospital or clinical waste is described.

3.1.3 Guidelines for Solid Waste Management, 2005

A draft guideline for solid waste management was drawn up by the Pakistan Environment Protection Agency (PEPA), Japan International Cooperation Agency and United Nations Development Program in 2005. The guideline defines different types of waste and their handling and disposal procedure. Data regarding the waste generation and collection in big cities of Pakistan is included in the guideline. Suggestions were also made in the guideline to improve the waste management system of Pakistan. Guidelines are provided for landfills, incineration and hazardous waste disposal. Landfill guidelines include, but are not limited to the following:

- Site selection guidelines include recommendations for weighting of geotechnical, environmental, socio-economic, and technical/operational characteristics as well as investment and operating costs when evaluating potential sites.
- Environmental and socio-economic requirements (distance from water bodies, airports/airbases and residential/commercial areas, separation from high water table etc.) including monitoring during operations and for 15 years after closure.
- Design and operational criteria covering liners, leachate capture and treatment, daily operational procedures, minimum on-site equipment requirements, drainage management *inter alia*.

The hazardous waste guidelines describe treatment options, disposal methods including design, management and closure criteria for hazardous waste landfills.

3.1.4 Pakistan Environmental Protection Agency (PEPA)

PEPA was established under section (5) of the Pakistan Environmental Protection Act, 1997. Basic functions of PEPA are as follows:

- Administer the Environmental Protection Act, 1997.
- Implement national environmental policies.
- Prepare and publish an annual National Environmental Report.
- Prepare or revise and establish National Environmental Quality Standards (NEQS).
- Approve environmental impact assessments or delegate authority to a Government Agency to approve EIAs.

To date, PEPA has drawn up NEQS for municipal and industrial effluents, ambient air, noise, drinking water, motor vehicle exhaust and noise and gaseous emissions.

PEPA can delegate power to provincial EPAs to manage the environmental concerns of their respective provinces, which in the case of the KTDP is KP-EPA for Bannu, Lakki Marwat and Karak districts. KP-EPA has drawn up guidelines for sanitation schemes and canal cleaning amongst others.

3.2 World Bank Group Standards and Guidelines

3.2.1 Strategic Planning Guide for Municipal Solid Waste Management, 2001

This guideline is published by WB. The guide aims to provide information, supporting methodologies and tools to assist development of Strategic MSWM Plans at the local and regional level. The primary target audience is local and regional authorities in developing countries and economies in transition, but much of the material in the Planning Guide will be relevant and of use to all countries.

3.2.2 International Finance Corporation (IFC) Performance Standards, 2012

The IFC Performance Standards (PS) aim at avoiding generation of hazardous and non-hazardous wastes, and where avoidance is impossible, reducing waste generation and recovery and reuse of waste in a way that is safe for human health and the environment Disposal of ultimate wastes must be carried out in an environmentally sound manner. Hazardous wastes must be managed according to good international industrial practice (GIIP).

A specifically applicable standard is Performance Standard 3 Resource Efficiency and Pollution Prevention

3.2.3 IFC Environmental, Health and Safety (EHS) Guidelines, 2007

The IFC's EHS Guidelines are technical reference documents which present both general and industry specific examples of GIIP. They set out performance levels that should be achieved, As far as the KTDP is concerned the EHS General Guidelines, the EHS Guidelines for Water and Sanitation, and the EHS Guidelines for Waste Management Facilities should be used as reference documents in the absence of specific Pakistan standards or USAID requirements.

Specifically applicable guidelines are:

- IFC Environmental, Health and Safety (EHS) Guidelines, 2007
    - 1.5 Hazardous Material Management
    - 1.6 Waste Management
    - 4.0 Construction and Decommissioning
    - Environmental, Health and Safety Guidelines for Waste Management Facilities

3.3 Other Standards and Guidelines

3.3.1 United States EPA 40 CFR Part 258

These regulations are for municipal solid waste landfills and include location restrictions, operating and design criteria, ground-water monitoring and closure and post-closure requirements. The EA recommends their use in design of the project landfill.

3.3.2 Pakistan Pesticide Evaluation Report and Surface Use Action Plan (PERSUAP) and 2013 Pakistan Programmatic Umbrella PERSUAP

All pesticides must be checked against the PERSUAP and 2013 PPERSUAP to determine restrictions on their use as well as for guidelines on their disposal. USAID/Pakistan prohibits the procurement with USAID-provided funds of pesticides restricted by this PERSUAP. The Mission also prohibits the use of pesticides restricted by the PERSUAP and 2013 PPERSUAP in the implementation of USAID-funded activities.

3.3.3 European Waste Catalogue

The European Waste Catalogue (EWC) classifies waste materials and categorizes them according to what they are and how they were produced.

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4 FRAMEWORK FOR WASTE MANAGEMENT

4.1 Introduction

The section provides a context for the application of the objectives, policies and methods of the PWMP. It addresses:

- Goals, objectives and scope.
- Roles and responsibilities.
- Preliminary assessment of waste types and quantities.
- Waste minimization.
- Resource recovery systems.
- Waste management systems.
- Performance monitoring and quality assurance.

4.2 Goals, Objectives and Scope

The proposed goals for the project in terms of waste management are:

- Goal 1 – to avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities
- Goal 2 – to promote more sustainable use of resources, including energy and water.

These are the first and second objectives of the IFC Performance Standard 3 Resource Efficiency and Pollution Prevention.

The (draft) Guidelines for Solid Waste Management, 2005, PEPA, provides objectives for solid waste management as:

1. To upgrade waste collection and treatment - To achieve efficient, effective and sustainable municipal waste collection systems
2. To improve waste disposal and treatment - To provide properly controlled disposal sites for all urban centres and to reduce air pollution
3. To reduce waste and maximise waste recovery - To achieve efficient, safe and sustainable reuse and recycling of waste
4. To improve hazardous waste management - To achieve safe collection, disposal and treatment of hazardous waste including clinical waste
5. To achieve sustainability and cost recovery - To reduce costs of solid waste management and to increase revenue in order to make the systems financially sustainable
6. To strengthen institutional and organisational capacity - To make institutional and organisational capacity more efficient and effective and improve working conditions in solid waste management
7. To increase involvement of key stakeholders and raise awareness - To involve as many stakeholders as possible, especially disadvantaged groups in order to establish SMW systems that are socially acceptable and affordable.

Whilst these objectives are for municipal solid waste management, as opposed to project specific waste management, they have been taken account of in proposed project objectives.

The PWMP is to address waste management relating to KTDP activities and not to other activities in the locality of the project.

4.3 Waste Generation

4.3.1 Sources and Types of Solid Waste

A preliminary assessment of the sources and types of waste generated by the project are presented in Table 4-1. The term "municipal landfill" used below refers to the **type** of landfill as defined in Schedule A and not to a landfill run by a municipality or local authority.

Table 4-1: Preliminary Assessment of Sources and Types of Waste

Source of Waste	Waste Types / classification	Material recovery	Disposal
Construction Activities			
• site clearance material	Vegetation / non hazardous	Reuse of wood as fuel / composting	Municipal landfill
• earthworks	Soil / inert	Cut to fill	cleanfill
• quarrying, tunnelling and foundation excavation	Soil & rock / Inert (if confirmed by geochemical testing).	Concrete aggregate, road aggregate	cleanfill
• concrete manufacture & use	Excess concrete / set concrete inert	Crushing and reuse of materials Water recovery and reuse Roading and pavements	Construction and demolition landfill
	Concrete washings / potentially toxic in receiving environment	Water recovery and reuse	Treat wash water by pH correction & evaporation in lined pit; construction and demolition landfill
• Excess material management	Iron & scrap steel / non hazardous	Segregated according to EWC code and stored for reuse or market	
	Non-ferrous metal / non hazardous	Segregated according to EWC code and stored for reuse or market	
	Bricks and tiles / non hazardous	Segregated according to EWC code and stored for reuse or market	
	Packaging / non-hazardous	Segregated according to EWC code and stored for reuse or market	
	Pallets / non hazardous	Segregated according to EWC code and stored for reuse or market	
	Glass / non hazardous	Segregated according to EWC code and	

Table 4-1: Preliminary Assessment of Sources and Types of Waste

Source of Waste	Waste Types / classification	Material recovery	Disposal
		stored for reuse or market	
	Plastics / non hazardous	Segregated according to EWC code and stored for reuse or market	
	Paper and cardboard / non hazardous	Segregated according to EWC code and stored for reuse or market	
	Timber untreated	Segregated according to EWC code and stored for reuse or market	
	Timber treated / potentially hazardous	Segregated according to EWC code and stored for reuse	Municipal landfill
	Paints and chemicals / hazardous	-	Stored in sealed containers in bunded storage / disposal in licensed facility
• Contaminated soil from hydrocarbon or chemical spills	Contaminated soil / hazardous	-	Municipal landfill
Support services			
• Health care	Pharmaceuticals, dressings, / hazardous	-	Municipal landfill or incinerator
• Canteen	Foods, packaging, end of life crockery and cutlery / non hazardous	Segregated according to EWC code and stored for recycling market if available	Municipal landfill
• Workshop	Batteries / hazardous	Segregated according to EWC code and stored for recycling market if available	Municipal landfill
	Florescent tubes / hazardous	Segregated according to EWC code and stored for recycling market if available	Municipal landfill
	Oils & lubricants / hazardous	Segregated according to EWC code and stored for recycling market if available	Stored in sealed containers in bunded storage / incinerator fuel
	Oil contaminated clothes and rags		Municipal landfill
	Tyres / potentially	Segregated according	Municipal landfill

Table 4-1: Preliminary Assessment of Sources and Types of Waste

Source of Waste	Waste Types / classification	Material recovery	Disposal
	hazardous	to EWC code and stored for recycling market if available	
	Contaminated soil	-	Municipal landfill
• Pest control	Chemicals / hazardous	-	Stored in sealed containers in bunded storage / disposal in licensed facility
	Chemicals containers / potentially hazardous	-	Triple rinse treatment / Municipal landfill
Residential activity (construction camps and housing)	Paper, plastics, glass, organics, metals, end of life products, household hazardous waste	Segregated according to EWC code and stored for reuse or market	Municipal landfill

4.3.2 Quantities of Waste

Section 5.2.2.1 of the EA lays out the basis on which waste quantities were estimated for the different components of the project. The figures for domestic solid and liquid wastes are summarized in Table 4-2.

Table 4-2: Domestic Solid and Liquid Waste Generation KTDP

Component	Source	Solid Waste	Wastewater
Component 1	Construction camps	200 kg/day	16,000 gallons per day
Component 2	Construction camps	520 kg/day	41,600 gallons per day
Component 3	Construction camps	80 kg/day	6,400 gallons per day
Total project	Operations offices and colonies	160 kg/day	12,800 gallons per day

The bill of quantities from the tender documents for Component 1 indicates that 31,707, 685 cubic feet of overburden spoil and 23,729,530 cubic feet of rock spoil will be generated by construction activities. Total excavation for Components Two and Three are estimated at 250 million cubic feet and 125 million cubic feet respectively. However, plans are to use much of the excavated material for construction and or to rehabilitate borrow areas. As the quantities of excavated spoil that will be used in construction and rehabilitation have yet to be determined, it is not possible to estimate the volume of residual spoil material that will have to be permanently stored.

Table 4-3 presents an estimation of the amount of wastewater that will be generated during construction. It has not been possible to break this down component wise

Table 4-3: Construction Liquid Waste Generation KTDP

Description	Waste water
Source Point	curing, soaking of bricks, pilling etc.
Total Volume of construction material involving above activities	891, 450 m^3
Water Consumed for above construction activities	40% x 891,450 = 356,580 m^3 or 95,000,000 gallons
Estimated amount of solid waste/wastewater	10% x 356,580 = 35,658 m^3 or 9,500,000 gallons (approx.)

There is insufficient data to allow accurate determination of the amount of construction waste that will be generated. Nevertheless, ranges of waste quantities for steel reinforcement and concrete were estimated in the EA. These are shown in Table 4-4 below.

Table 4-4: Approximate KTDP Construction Solid Waste Quantities

Component	Steel Reinforcement	Concrete
Component 1	33 – 300 metric tons	5,000 – 45,000 metric tons
Component 2	180 – 1,600 metric tons	5,900 – 53,000 metric tons
Component 3	160 – 1,500 metric tons	1,900 – 17,000 metric tons

4.4 Good Practice

Good practice for the PWMPs includes:

- IFC Performance Standard 3 Resource Efficiency and Pollution Prevention, January 1, 2012
- IFC Environmental, Health and Safety (EHS) Guidelines, 2007
    - 1.5 Hazardous Material Management
    - 1.6 Waste Management
    - 4.0 Construction and Decommissioning
    - Environmental, Health and Safety Guidelines for Waste Management Facilities
- United States EPA 40 CFR Part 258 Criteria for Municipal Solid Waste Landfills
- The European Waste Catalogue (EWC)

- Schedule A Definitions of Waste and Landfill Types.

Material Safety Data Sheet (MSDS) of the materials or products contain information on the hazardous or non-hazardous nature of the products as well as indications for their disposal. These should be prominently displayed at material storage areas and personnel should be familiar with their contents.

4.5 Waste Management and Minimization

All project-related Waste Management Plans (WMPs) should ensure that surplus materials generated by the KTDP are segregated and managed appropriately in order to maximise re-use and recycling and overall waste minimisation. The WMPs should ensure that residual waste requiring disposal is managed according to good practices of the industry.

Effective materials use is a fundamental aspect of waste minimisation and the construction management practices and WMPs need to provide for this.

The following key steps will need to be considered for each WMP.

- assign clear roles and responsibilities
- Identify the types and quantities of waste produced during construction, operation and decommissioning
- Identify waste management options - where hazardous wastes will be generated, pay particular attention to procedures for identifying and managing such waste;
- Identify and secure suitable landfill sites
- Training - all staff must be trained to ensure they understand the requirements of the WMP;
- Establish indicative quantities of the waste quantities to be produced over the life span of the project;
- Measure and record the quantities of waste produced and materials recovered on a monthly basis; and
- Monitor waste management and minimization activities to ensure compliance with the WMP;
- Hazardous Classes – hazardous waste should be classified according to the EWC or national requirements
- Management of hazardous waste should be compliant with the Hazardous Substance Rules, 2003.

4.5.1 Materials Storage, Handling and Use

Good practice waste minimization begins with waste prevention and minimisation which is achieved through the efficient storage, handling and use of raw materials. Material use and handling measures should include.

- re-using materials on the project wherever possible, which includes designing cut-fill balances
- instituting good housekeeping and operating practices, including inventory control to reduce the amount of waste resulting from materials that are out-of-date, off-specification, contaminated, damaged, or excess to plant needs
- instituting procurement measures that recognise opportunities such as ordering the correct amount of materials to be delivered when needed, reducing the amount of packaging used by suppliers and establishing a take back system with suppliers
- seeking ways to reduce raw material consumption through efficiency audits in the operational phase; and

- substituting raw materials or inputs with less hazardous or toxic materials wherever economically and technically feasible.

4.5.2 Waste Management

Surplus or waste materials arise from either the materials imported to the site or from those generated on site. The contractor should store and dispose of each waste stream in accordance with the measures detailed in the WMP.

Contractual agreements should be entered into with suppliers of hazardous substances obliging them to provide appropriate supply and waste material storage areas and containers, and to take back hazardous substance packaging and containers and residues and dispose of them in an a manner that is environmentally sound and safe for human health.

Oil suppliers should contractually agree to provide collection containers for used oil, develop an appropriate storage area and remove the used containers when they are full. The contract should oblige the supplier to recycle used oils where possible and to dispose of non-recyclable material in an appropriate manner.

4.5.3 Temporary Waste and Recovered Material Storage and Segregation

On-site storage facilities should be provided for secure, short term storage for all for waste and recovered material generated by the KTDP prior to their collection by relevant carriers for final disposal or resource storage. Each waste or recovered material type should be stored in the segregated waste storage facilities provided to allow recycling and reuse where appropriate. Any hazardous waste should be segregated and securely stored separately to non-hazardous waste. An inventory and tracking system should be maintained for all hazardous waste.

Construction WMPs should include maps that show the correct waste and recovered material storage locations.

Recovered material and waste bins should be kept clean and clearly marked in order to avoid contamination of materials.

As construction proceed and new waste and recovered material streams arise then the construction WMP should be updated.

4.6 Institutional Framework

The overall institutional implementation framework is provided in the Environmental Management and Monitoring Plan (EMMP). Implementation and operation of the Project is the core responsibility of WAPDA. The EMMP proposes that WAPDA establish an Environmental Monitoring Committee (EMC) comprising a Health, Safety and Environment (HSE) department and an Environment and Social Team (E&ST). These entities will work closely with the Contractor and Supervisory Consultant (SC).

As part of the proposed setup for waste management, WAPDA and the EMC need to coordinate with the District Government in the cities and District Councils and/or Political Agent in the rural areas of KTDP AOI for the identification of waste disposal sites.

The key role players and their responsibilities with respect to waste management are presented in **Table 4-5** below.

Table 4-5: Roles and Responsibilities for implementation of WMP

Organization	Designation	Responsibilities
WAPDA	Project Director (Bannu)	▪ Overall in-charge and responsible for supervision of waste management activities. ▪ Will ensure the project's compliance with the

		Environmental Protection Act, 1997 and other national environmental regulations and standards. ▪ Will ensure stakeholder participation in waste management issues during construction. ▪ Liaison between the SC and Contractors through EMC on matters related to waste management.
WAPDA EMC E&ST	E&RT	▪ Obtain necessary approvals for items such as the disposal site identification from the district councils and municipal committees and relevant government or provincial agencies as the case may be. ▪ Obtain approval for the selling of recyclable and re-usable waste to local waste dealers by the Contractor from the relevant departments. ▪ Establish a grievance mechanism. ▪ Carry out consultation with local residents with regard to social issues related to waste disposal that may arise.
Supervisory Consultant		▪ Ensure the implementation of the waste management mitigation measures in the EMMP. ▪ Ensure all the contractual provisions for waste management are fulfilled by the contractor. Review contractor monthly reports concerning waste management. ▪ Ensure implementation of corrective and preventive actions related to waste management. ▪ Prepare reports on contractor performance with respect to waste management. ▪ Monitor construction activities and ensure that they are carried out in an environmentally and socially sound and sustainable manner. ▪ Liaison with EMC. ▪ Supervise contractor's activities and make sure that all the contractual obligations related to the environmental and social compliance are met. ▪ Approval of contractor's waste management plan in coordination with EMC. ▪ Develop and conduct environmental training for contractors
Contractor(s)	HSE Department	▪ Prepare a waste management plan for the hazardous waste, domestic waste, construction and other waste. ▪ Implementation of waste management system in consultation with SC and EMC. ▪ Operation of site restoration plan and

		identification of waste disposal sites. ▪ Arrangement of resources related to waste management. ▪ Preparation of monthly waste management reports for submission to SC and EMC.
		▪ Implementation of all the monitoring programs described in the EMMP and its associated plans (mitigation and monitoring tables, health and safety plan, emergency preparedness, waste management plan etc.). ▪ Ensure health & safety of site workers. ▪ Training of workers.

4.7 Quality Assurance

4.7.1 Health and Safety

Health and safety practice should conform to the requirements of the Health and Safety Framework Plan, the Factories Act 1934, Hazardous occupation Rules 1963, the Health and Safety Plan Framework for the Project (EMMM Annex 1) and the IFC General EHS Guidelines and the EHS Guidelines for Waste Management Facilities.

4.7.2 Training

Broadly, training of employees of both WAPDA and its agents and the contractor should be provided on the matters of:

- **health and safety including hazards, hazards identification and hazardous management**
- **waste management and minimization systems**
- **each component of each waste management and minimization system (i.e. temporary storage, collection, landfills, and recovered materials management),**
- **operational monitoring**
- environmental monitoring.

The training program should include:

- A list of employees to be trained
- Specific training objectives
- Mechanisms to achieve the objectives
- The means to determine whether the training program is effective
- Training procedures for new hires and refresher courses for existing employees

Requirements with respect to training are provided in Schedule B.

4.7.3 Monitoring, Reporting and Auditing Requirements

Monitoring, reporting and auditing are required continually throughout the project construction and operation for:

- Planning and design activities.
- Operational activities

- Health and safety.
- Training.

The Construction Contractor will keep accurate records that track the amount of waste generated and the disposal method used, and materials recovered and their subsequent use. All waste generated will be tracked on the Waste Tracking Log. Particular attention should be paid to tracking hazardous waste.

Requirements with respect to monitoring, reporting and auditing are provided in Schedule B.

4.8 Operation Phase Solid Waste Management

It is the responsibility of WAPDA to manage and dispose of the solid waste produced during operational phase of the project with the exception of waste from canal maintenance. The Irrigation Department Bannu will be responsible for managing the waste from canals. Both departments will arrange the disposal of non-recyclable waste at an appropriate landfill. It is recommended that the landfill built during project construction be maintained as the project landfill during operations. Hazardous waste should be disposed of at incinerator or other appropriate waste disposal site.

Waste management during operations should be based on the general guidelines for the construction phase described in Section 7.4 above.

4.9 Operational Phase Wastewater Management

WAPDA should provide wastewater treatment units at offices and colonies. The wastewater will be treated up to a minimum of secondary level. Depending on local environmental and conditions tertiary level treatment may be necessary. Treated effluent from the wastewater treatment units can be utilized for local irrigation, provided it meets the FAO standards for irrigation.

4.10 Project Waste Management Plan Objectives, Policies and Methods

Objectives, policies and methods for achieving waste management and minimization within the KTDP are presented in terms of:

- Goal 1 –to avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities - in Table 4-6
- Goal 2 – To promote more sustainable use of resources, including energy and water- in Table 4-7.

Goal 1: avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities

Table 4-6: Objectives, Policies and Methods for achieving Goal 1

Table 4-7: Objectives, Policies and Methods for achieving Goal 1

OBJECTIVE (project stage)	POLICY (activity)	METHOD
Preconstruction	**Planning**	
	WAPDA implements the Project WMP in coordination with other project activities	Policies and methods of the Project WMP are given effect in other KTDP plans and policies.
Objective 1.1 Facilities and operations provide for the management and minimisation of waste. Explanation: the provision of facilities and construction operations for waste management and minimisation avoid or reduce the adverse impacts of waste and provide benefits through the more sustainable use of resources.	**WAPDA determines land area requirements and optimum locations for the purpose of waste management and resource recovery activities**	WAPDA carries out an assessment of the types and quantities of materials that will be generated as waste or as recoverable resources during each component of the project. For each components of the project, the KTDP determines the land area requirements and locations for: • municipal landfills, construction and demolition landfills, and cleanfills • wastewater treatment plants. WAPDA will consider contract interfaces amongst the contracts for each component of the project including operation in terms of optimising use of waste management facilities. WAPDA will consider the establishment of one municipal landfill that serves each component of the project and a period of operation of 20 years following completion of Component 1. WAPDA will record the results of the above methods in a Waste

Table 4-7: Objectives, Policies and Methods for achieving Goal 1

OBJECTIVE (project stage)	POLICY (activity)	METHOD
		Disposal Facilities Plan.
	Land Procurement and Land Use Approval	
	WAPDA secures land and approvals for the purpose of establishing and operating a municipal landfill Explanation: The KTDP will generate waste that should be disposed in a municipal landfill. Typically, there is a lead time of some years to identify a site and secure the site and required regulatory approvals.	WAPDA will carry out a site selection study that identifies possible sites for a municipal landfill and determine a preferred site/s using the site selection criteria given in Schedule A WAPDA will secure the preferred site/s for a municipal landfill/s using the site selection criteria given in Schedule A WAPDA will obtain these necessary approvals for developing and operating a municipal landfill/s at the secured site/s using the site selection criteria given in Schedule A
Objective 1.1 Facilities and operations provide for the management and minimisation of waste	**WAPDA secures land and approvals for the purpose of establishing and operating construction and demolition waste landfills.** Explanation: The KTDP will generate waste that should be disposed in a construction and demolition landfill. Typically, there is a lead time to identify sites and secure the required regulatory approvals	WAPDA will carry out a site selection study that identifies possible sites for a construction and demolition landfill and determine preferred sites. WAPDA will secure the preferred sites for the construction and demolition landfills. WAPDA will obtain these necessary approvals for developing and operating the construction and demolition landfills.
	WAPDA secures land and approvals for the purposes of establishing and operating cleanfills. Explanation: The KTDP will generate excess spoil from earthworks and tunnelling that should be disposed in a cleanfill. Typically, there is a lead time to identify sites	WAPDA will carry out a site selection study that identifies possible sites for cleanfills and determine preferred sites. WAPDA will secure the preferred sites for the cleanfills WAPDA will obtain these necessary approvals for developing and

Table 4-7: Objectives, Policies and Methods for achieving Goal 1

OBJECTIVE (project stage)	POLICY (activity)	METHOD
	and secure the required regulatory approvals	operating the cleanfills at the secured sites.
	WAPDA secures land and approvals for the purpose of establishing and operating wastewater treatment plants.	WAPDA will carry out a site selection study that identifies possible sites for wastewater treatment plants (WwTP) and determine preferred sites WAPDA will secure the preferred site for the WwTPs WAPDA will obtain these necessary approvals for developing and operating the WwTPs at the secured sites.
	Procurement of Construction Services	
Objective 1.1 Facilities and operations provide for the management and minimisation of waste	**WAPDA assigns waste management and minimisation responsibilities to the contractor**	WAPDA will require that the contractor prepares a Contract WMP that incorporates all policies and methods given in the Project WMP assigned to the contractor. A separate Contract WMP will be prepared for each component. WAPDA will define contract interfaces amongst the contracts for each component of the project including operation in terms of optimising use of waste management facilities in accordance with the Waste Disposal Facilities Plan.
	WAPDA assigns land it has secured for the purpose of waste and wastewater treatment and disposal to the contractor	WAPDA will make the land that it has secured for the purpose of waste treatment and disposal available to the contractor and assign responsibilities associated with the land and its designated use to the contractor. WAPDA will consider the application of a performance bond or other security on the land it makes available to the contractor for the

Table 4-7: Objectives, Policies and Methods for achieving Goal 1

OBJECTIVE (project stage)	POLICY (activity)	METHOD
		performance of the contractor in meeting conditions of land use and compliance with regulatory approvals.
Construction	**Planning**	
	The contractor undertakes waste management and minimisation planning **The contractor undertakes wastewater management planning**	The contractor will carry out an assessment of the types and quantities of materials, (including hazardous materials) that will be generated as waste or as recoverable resources during the contract. Quantities will be determined as those generated annually, and as weekly averages and weekly peaks. The assessment will separately address those materials in terms disposal method ie material destined for cleanfill, construction and demolition landfills, and municipal landfill. The contractor will carry out an assessment of the quantities and character of wastewater that will be generated during the contract. Quantities will be determined as those generated as daily averages and peaks. Where required under its contract with WAPDA, the contractor will extend the assessment to include the types and quantities of waste generated during construction or operation from other components of the project. The contractor will develop a Contract WMP that incorporates all policies and methods given in the Project WMP assigned to the contractor, and takes account of: • the assigned land use responsibilities and regulatory approvals • the assessments of solid waste and wastewater

Table 4-7: Objectives, Policies and Methods for achieving Goal 1

OBJECTIVE (project stage)	POLICY (activity)	METHOD
		• relevant Pakistan legislation and regulatory requirements, • good practice as identified in the Project WMP • monitoring and control of waste and wastewater quantities and material classification and characterisation. The Contract WMP will detail the engineering criteria that will be used for design.
Objective 1.1 Facilities and operations provide for the management and minimisation of waste	**WAPDA will audit the contractors Contract WMP**	The contractor will submit a draft Contract WMP to WAPDA for review. WAPDA will review the Contract WMP and advise the contractor of the results. The contractor will finalise the Contract WMP taking account of WAPDA review requirements.
	Design	
	The contractor designs waste management and minimisation systems	**Cleanfill material** With respect to bulk earthworks and tunnelling waste, the contractor will optimise cuts and fills in order to minimise waste. **Construction and Demolition material** The contractor will design separate systems for storing, collecting and disposal of construction and demolition waste material and storing, collecting and management of recoverable construction and demolition material.

Table 4-7: Objectives, Policies and Methods for achieving Goal 1

OBJECTIVE (project stage)	POLICY (activity)	METHOD
Objective 1.1 Facilities and operations provide for the management and minimization of waste		The systems will be designed with capacity for handling weekly peaks in these materials. The design for the collection facilities will include: • methods of temporary storage of surplus construction and demolition materials separated according to material type eg separated reusable or recyclable materials and waste material • Method of collection • Locations of bins or stock piles • frequency of emptying bins or removing stockpiles • times for emptying bins or removing stockpiles taking account of activities that generate the waste • Types and capacities of bins. The design will avoid harbouring or scavenging by animals or vectors such as insects. The contractor will design construction and demolition material landfills according to the good practice identified in the Project WMP. The contractor will design recovered construction and demolition material storage depots according to the good practice identified in the Project WMP. The contractor will make the most effective and efficient use of landfill space by methods that include: • Avoiding the intake of waste that could go to a lower class of landfill • Optimising the use of cover material • maintaining tipping faces that are a practicable minimum

Table 4-7: Objectives, Policies and Methods for achieving Goal 1

OBJECTIVE (project stage)	POLICY (activity)	METHOD
Objective 1.1 Facilities and operations provide for the management and minimization of waste		• optimising the compaction **Municipal landfill material** The contractor will design separate systems for storing, collecting and disposal of municipal waste material and storing, collecting and management of recoverable material that would otherwise become municipal waste. The systems will be designed with capacity for handling week/y peaks of these materials. The design for the collection facilities will include: • methods of temporary storage of surplus construction and demolition materials separated according to material type eg separated reusable or recyclable materials and waste material • Locations of bins • frequency of emptying bins • times for emptying bins taking account of activities that generate the waste • Types and capacities of bins. The contractor will design recovered municipal material storage depots according to the good practice identified in the Project WMP. The design will avoid harbouring or scavenging by animals or vectors such as insects. The contractor will design the municipal landfill according to the good practice identified in the Project WMP.

Table 4-7: Objectives, Policies and Methods for achieving Goal 1

OBJECTIVE (project stage)	POLICY (activity)	METHOD
		The contractor will make the most effective and efficient use of landfill space by methods that include: • Avoiding the intake of waste that could go to a lower class of landfill • Optimising the use of cover material • maintaining tipping faces that are a practicable minimum • optimising the compaction. **Hazardous waste** The Contractor will provide facilities and services for hazardous waste management The contractor will prepare a waste manifest system that details procedures for the identification, treatment and disposal of hazardous waste.
Objective 1.1 Facilities and operations provide for the management and minimization of waste	**The contractor designs wastewater treatment and disposal facilities.**	The contractor will design the wastewater treatment plants: • with capacity for the assessed flows and loads • to meet the discharge requirements of the regulatory approvals. The Contractor will dispose of wastewater treatment plant sludge at the municipal landfill.
	The contractor monitors the quantities and types of solid waste material and recovered materials.	The designs of the waste management and material recovery systems will incorporate facilities and / methods for the measurement of the types and quantities of waste collected and disposed and recovery materials collected, stored and either utilised on the project or

Table 4-7: Objectives, Policies and Methods for achieving Goal 1

OBJECTIVE (project stage)	POLICY (activity)	METHOD
		marketed outside the project.
	The contractor monitors the quantities and character of wastewater	The designs of the wastewater treatment plants will incorporate facilities and / methods for the measurement of the quantities and characteristics of wastewater discharged into the plants and discharged from the plants.
	WAPDA will audit the contractors designs	The contractor will submit draft design documentation to WAPDA for review. WAPDA will review the draft design documentation and advise the contractor of the results. The contractor will finalise the design documentation taking account of WAPDA review requirements.
Objective 1.2 Waste management facilities and services are operated to avoid or mitigate any adverse public health and environmental effects.	**The Contractor develops and operates its waste, resource recovery, and wastewater facilities and operations in accordance with good practice.** Explanation: Landfills have discharges of leachate and landfill gas that, if not appropriately managed, may have adverse environmental impacts.	The contractor will prepare management plans for the waste management and resource recovery facilities (including closed landfills). Each plan will identify actions and responsibilities associated with the land, the facility development, the operation, and operational and environmental monitoring. The plans will be based on regulatory and project approvals, and good practice. The plans will provide for the monitoring, recording and reporting of waste, recovered resources, and wastewater quantities and characteristics. The contractor will monitor its facilities including any closed landfills in accordance with the requirements of the management plans and

Table 4-7: Objectives, Policies and Methods for achieving Goal 1

OBJECTIVE (project stage)	POLICY (activity)	METHOD
Explanation: Waste creates the risk of adverse public health and environmental effects.		will review the effectiveness of the management plans periodically. The Contractor will ensure that solid waste, resource recovery and wastewater operations are managed in such a way as to minimise public health impacts.
	WAPDA will monitor and audit the contractor's operations	The contractor will submit draft management plans to WAPDA for review. WAPDA will review the Contract WMP and advise the contractor of the results. The contractor will finalise the Contract WMP taking account of WAPDA review requirements. The contractor will submit its operational reports to WAPDA at monthly intervals. WAPDA will review each report and undertake any such action as it considers appropriate to avoid or reduce waste.

Table 4-7: Objectives, Policies and Methods for achieving Goal 1

OBJECTIVE (project stage)	POLICY (activity)	METHOD
Objective 1.3 **Waste management and minimisation operations and other activities are safe.** Explanation: There are hazards and risks associated with handling solid waste and recovering resources.	**The Contractor adopts good health and safety practices with waste management and minimisation activities.** Explanation: Handling waste and diverted material poses risks to generators, service providers, and diverted material users. For example, there is a mercury risk with compact fluorescent light bulbs, and respiratory infection and other health risks with making and using compost.	The contract will develop health and safety plans applicable for the operation of waste and wastewater management and resource recovery facilities and operations. The plans will provide for the monitoring, recording and reporting all health and safety incidents or near incidents. The contractor will manage facilities and operations in accordance with the health and safety plan. The contractor will provide training in health and safety matters associated with different waste materials, wastewater, and recovered resources. The contractor will provide education and behaviour change programmes that raise awareness about the hazards associated waste, wastewater, and waste minimisation, and about safe practice at facilities and with operations.
	WAPDA will monitor and audit the contractor's health and safety practices.	The contractor will submit its draft health and safety plans to WAPDA for review. WAPDA will review the draft health and safety plans, and advise the contractor of the results. The contractor will finalise the health and safety plans taking account of WAPDA review requirements. The contractor will submit its health and safety reports to WAPDA

Table 4-7: Objectives, Policies and Methods for achieving Goal 1

OBJECTIVE (project stage)	POLICY (activity)	METHOD
		at monthly intervals. WAPDA will review each report and undertake any such action as it considers appropriate to avoid or mitigate health and safety incidents.

Goal 2: To promote more sustainable use of resources, including energy and water

These objectives, policies and methods augment those provided under Goal 1.

Table 4-8: Objectives, Policies and Methods for achieving Goal 2

OBJECTIVE	POLICY	METHOD
Objective 2.1 Facilities and operations provide for minimising waste and the harmful impacts of waste. Explanation: Efficient use of materials during construction and effective resource recovery methods will result in reduced quantities of waste.	**The contractor provides facilities and operations for avoiding waste, for reusing and recycling material that would otherwise become waste, and for recovering materials or energy from waste.** Explanation: Reduction relies upon changes in the way people utilise materials and in construction practice. Efficient resource recovery is dependent on personal commitment at all levels to source-separate reusable or recyclable resources and to avoid contamination, and the provision of facilities to receive and process the material.	Earthworks and tunnelling surplus material The contractor will optimise cuts and fills in order to minimise waste. Construction and demolition surplus material The contractor when undertaking the planning, design and operation of facilities and operations under Goal 1 will provide for the separation of reusable or recyclable material and the separate temporary storage, collection, stockpiling and utilisation of these materials. Municipal waste The contractor when undertaking the planning, design and operation of facilities and operations under Goal 1 will provide for the separation of reusable or recyclable material and the separate temporary storage, collection, stockpiling and utilisation of these materials. Recovered materials will be used on the KTDP to reduce the use of raw materials. When there is a surplus of recovered materials, the contractor will dispose of these materials on the open market.
	The contractor provides waste minimisation operations and waste management operations as components of integrated systems.	The contractor will ensure that the systems used for separation of reusable or recyclable material and the separate temporary storage, collection and stockpiling of these materials are clearly delineated

Table 4-8: Objectives, Policies and Methods for achieving Goal 2

OBJECTIVE	POLICY	METHOD
	Explanation: Waste minimisation operations need to complement the waste management operations with plans and resources developed, implemented and monitored to support the diversion of materials from becoming waste.	and are operated so as to avoid contamination with waste and incompatible materials.
	The contractor will monitor and measure the efficiency of resource use and the effectiveness of resource recovery operations. Explanation: Lack of waste data hampers waste management and minimisation planning. Gathering information will contribute to improved waste minimisation.	The contractor will monitor the quantity and quality of recovered material against specified performance indicators in the contract for the services and facilities. The contractor will monitor the need for control of identified problematic waste and will investigate methods of control when a need is established. The contractor will monitor performance of its waste and recovered material operations and will improve the data capture as a result of this monitoring. The contractor will monitor behaviour change programmes for its work force and consider the use of programmes where they have been demonstrated to be effective elsewhere and are applicable to the project.
	The contractor works to maximise the diversion of material that would otherwise become waste through promoting separation at source, and	The contractor will investigate improving facilities that receive separated diverted material, from construction and demolition activities and construction camps and the associated facilities such

Table 4-8: Objectives, Policies and Methods for achieving Goal 2

OBJECTIVE	POLICY	METHOD
	improved collection, storage and handling of diverted material. Explanation: Adequate source separation collection, storage and handling of diverted material are important to maintain and increase the quality and value of the diverted material.	as health care centres, canteens and workshops.
	The contractor works to maximise the quality of recovered materials. Explanation Maintaining material quality ensures the best markets for the material and helps to reduce the impact of economic changes on the marketability of material.	The contractor will provide for separated mixed dry reusable and recyclable material at construction camps and construction sites in a way that ensures the quality of material collected is maintained.
Objective 2.2 **The contractor improves the efficiency of resource use.** Explanation: An informed contractor is better placed to take responsibility in all aspects of waste minimisation with	**The contractor promotes employee awareness and responsibilities in reducing waste and increasing resource recovery.** Explanation: In order to improve the effectiveness of waste minimisation activities, rates of material recovery need to be monitored and the work force informed about the methods of waste minimisation. Use of recovered materials is a more efficient use of material resources and typically saves energy.	The contractor will create and maintain information about waste management and minimisation services available on the KTDP and elsewhere including the performance indicators. The contractor will provide appropriate information including signage to inform employees about waste minimisation facilities and operations.

Table 4-8: Objectives, Policies and Methods for achieving Goal 2

OBJECTIVE	POLICY	METHOD
consequential reduction in waste and sustainable use of resources.		
Objective 2.3 WAPDA provides leadership in waste minimisation	**WAPDA will monitor and audit the contractor's waste minimisation practices.**	WAPDA will review the contractor's waste minimisation operations at regular intervals and implement measures to improve waste minimisation.

5 SCHEDULES

5.1 Schedule A: Definitions of Waste and Landfill Types

Waste can be defined as "any substance or object that one discards, intends to discard, or is required to discard". The KTDP is a civil engineering construction project and the type of wastes potentially arising during the construction and operational phase of the project are briefly described below:

Waste Types

Cleanfill material

Cleanfill material comprises soil and rock from earthworks, foundation excavations and tunnelling. Typically, it is inert material.

Construction and Demolition Waste(C & D Waste)

Construction and demolition waste is generated from following sources:

- Waste from construction activities such as concrete, bricks, cement, sand, debris, leftover materials (timber from formwork, metal parts, fittings and pipe cuts, packing material etc.) as well as liquid waste resulting from construction activities like concreting, curing, soaking, washing etc.
- Demolition Waste results from site clearance and demolition of existing structures or temporary civil structures.

Municipal Solid Waste

Also referred to as municipal or domestic waste, it is generated by human activities and includes solid waste (e.g. leftover food, food containers, office waste etc.), liquid waste (e.g. used cooking oils etc.) and sanitary waste (waste from toilets, bathrooms, laundry and kitchen drains not treated in a septic or sewage treatment facility). In general, such liquid wastes do not meet the requirements of relevant NEQS and require treatment prior to their discharge into the environment. Domestic waste will be generated during both the construction and operation.

Hazardous Waste

Under the Environmental Protection Act 1997, hazardous waste is waste that contains a hazardous substance (i.e. a substance that because of its chemical activity or toxic, explosive, flammable, corrosive, radioactive nature or other characteristics can cause either directly or in combination with other substances an adverse environmental impact). It also includes waste that may be prescribed as hazardous. Hospital waste and nuclear wastes are classified as hazardous waste.. Hazardous substances are prescribed in Schedule I of the Hazardous Substances Rules, 2003 (Pakistan).

The following types of hazardous wastes may be generated by the KTDP:

- Ignitable wastes, which consist of liquid waste with a flash point of or less than 60°C; solid or semi-solid wastes capable of causing fire through friction, absorbing moisture or spontaneous chemical change, which burn vigorously and persistently when ignited; or waste oxidizers; or compressed gasses that can ignite.
- Reactive waste, which consists of substances that are likely to cause an explosion, can normally and readily undergo violent change without detonating, can react violently, are potentially explosive or generate dangerous quantities of toxic or explosive gases, vapors or fumes when mixed with water.
- Toxic waste, which any material which could cause acute or chronic adverse health effects in humans when exposed to low doses.

- Medical waste, which is generated during medical procedures and includes bandages, dressings, surgical waste, syringes and tissues.

Types of Landfill

The disposal facilities are classified into three types:

- Cleanfill
- Construction and demolition waste landfill
- Municipal solid waste landfill

Cleanfill

A cleanfill is a land disposal facility that accepts only cleanfill materials. The only effective control on discharges to the environment from cleanfills is the waste acceptance criteria.

Stringent siting requirements to protect groundwater and surface water receptors are not required. Site ownership, location and transport distance likely to be predominant siting criteria then suitability in respect of stability, surface hydrology and topography.

Surface water management may be required to manage sediment runoff. The disposal of cleanfill material can take place on the existing natural, or altered, land without engineered environmental protection or the development of significant site infrastructure. Extensive characterisation of local geology and hydrogeology are not necessary.

Waste acceptance criteria comprise:

- a list of acceptable solid materials;
- maximum ancillary/attached materials (e.g. vegetation) to be no more than 2% by volume per load;
- maximum chemical contaminant limits are regional background soil concentrations.

Monitoring of accepted material is required as well as sediment runoff.

Construction and Demolition (C&D) Waste Landfill

A construction and demolition landfill is a land disposal facility that accepts non-putrescible waste including C&D wastes, inert industrial wastes, controlled/managed fill and cleanfill. However, C&D waste contains biodegradeable and leachable components which may result in a leachate which, while not as strong as MSW landfill leachate, is characterized by mildly acidic pH, ammoniacal nitrogen and soluble metals, including heavy metals.

A construction and demolition landfill should be sited in areas of appropriate geology, hydrogeology and surface hydrology. A site environmental assessment is required to ensure adequate natural containment of leachate.

Waste acceptance criteria comprise:

- a list of acceptable solid materials;
- maximum ancillary biodegradeable materials (e.g. vegetation) to be no more than 5% by volume per load;
- maximum chemical contaminant TCLP limits.

Monitoring of accepted material is required as well as sediment runoff, groundwater quality and leachate quality and quantity.

Municipal Solid Waste Landfill

A municipal solid waste (MSW) landfill is any land disposal facility that accepts municipal solid waste. An MSW landfill generally also accepts C&D waste, some industrial wastes and contaminated soils. MSW landfills often use cleanfill and controlled/managed fill materials as daily cover.

A MSW landfill requires:

- a rigorous siting process;
- engineered redundancy through a liner and leachate collection system;
- landfill gas management;
- extensive monitoring of potential surface water and groundwater receptors.

Landfill site selection should be based on the evaluation criteria presented in the Guidelines for Solid Waste Management, 2005, USEPA 40 CFR Part 258 and the IFC EHS Guidelines for Solid Waste Management Facilities.

Waste acceptance criteria comprise:

- maximum chemical contaminant limits as presented in US EPA 40 CRF Part 258.

Monitoring of accepted material is required as well as sediment runoff, groundwater quality and leachate quality and quantity and landfill gas. Rigorous monitoring and reporting regime required.

MSW landfill management should be based on the Guidelines for Solid Waste Management, 2005, USEPA 40 CFR Part 258, the IFC EHS Guidelines for Solid Waste Management Facilities and the general principles outlined in the EMMP.

5.2 Schedule B: Staff Training for waste management and minimization

Since the quantities of waste generated during construction will far exceed that during operations, its management and handling is particularly crucial during the construction phase of the project. As such it is necessary to ensure that all personnel are correctly trained for their roles in the project waste management and minimization systems.

Waste Management Trainers

The key responsible organisations/responsible persons for providing trainings are:

- Project Proponent (WAPDA): EMC.
- Supervision Consultant: Construction Site Assessment Expert.
- Construction contractor: HSE Officer.

Trainees

The individuals/target groups requiring training during construction and operation of the KTDP are as follows:

Construction phase

- Labourers
- Construction Camp Staff
- Sanitary Workers
- Drivers - transportation

Operation phase

- Dam Operation Staff and workers
- Office building staff (Administrative, technical, accounts etc.)
- Sanitary Workers

Training Plan

The proposed training plan, presented in Table 5-1: Training Plan for Staff Managing Waste at KTDP below defines training areas, target groups, frequency and the cost of training. Adherence to this plan is a necessity. During operations WAPDA and Irrigation Department Bannu staff should be provided with similar training modules as those

Table 5-1: Training Plan for Staff Managing Waste at KTDP

Sr. No.	Target Group	Area of Training	Frequency	Responsibility		Cost/ Annum
				Construction	Operation	
1	Labourers and construction camps/ Office building Staff	• Identification of waste types and hazards associated with waste. • Waste management hierarchy (reduce, reuse and recycle waste to the extent practical, safe disposal of ultimate wastes) • Segregation and storage of waste and recovered materials • Familiarisation with the waste management and minimization systems • Use of Material Safety Data Sheets (MSDS) • Communications (query/complaints) • Maintaining records.	**General Training:** Quarterly **Construction Activity specific training:** Before commencement of any construction activity e.g; site clearing, blasting, excavation, etc.	Construction contractor: HSE Officer	WAPDA: EMC	Rs.500,000
2.	Sanitary Workers	• Identification of waste types and hazards associated with waste. • Familiarisation with the waste management and minimization systems including use of waste management equipment and machinery and	**General Training:** Quarterly	Construction contractor: HSE Officer	WAPDA: EMC	Rs.300,000

		personal protective equipment • Communications (query/complaints) regarding any deviations in planned waste management and minimization systems (procedures and equipment)				

5.3 Schedule C: Waste Management and Minimization System Monitoring and Audit Requirements

Planning and design activities

Planning and design activity monitoring and audit requirements are presented in Section 4.10 Project Waste Management Plan Objectives Policies and Methods and details are presented in the EMMP.

The contractor will establish a waste manifest system.

Definition
The Waste Manifest System will mean the procedure developed and documented by the Contractor and approved in writing by the WAPDA for managing waste and recovered resources.

The management of hazardous waste will be addressed in specific detail.

*P*rocedure:
The Waste Manifest System (WMS) should address:

- waste to cleanfill
- waste to construction and demolition landfill
- waste to municipal solid waste landfill
- hazardous waste
- recovered materials

For each material stream cited above, the WMS should cover:

- a material identification and, if applicable temporary storage procedure
- in the case of hazardous waste, an evaluation procedure
- a landfill reception, recording and disposal procedure, for waste going to a landfill
- a monitoring protocol
- a quality assurance system incorporating an audit procedure
- documentation and control procedure involving application forms, disposal forms, receipts, and site disposal recording
- staff responsibilities definition and training
- emergency procedures.

For hazardous waste, the application procedure should include:

- waste characterisation in terms of a recognised classification system such as that provided in the European Waste Catalogue (EWC)
- waste source identification
- a user declaration.

Waste and recovered material monitoring provisions are presented in Table 5-2: Waste and Recover Material Monitoring

Table 5-2: Waste and Recover Material Monitoring

Objective	Activity	Mitigation/ Enhancement	Monitoring / KPI	Standards
Minimisation and safe disposal of waste	Cleanfill material collection and disposal	Where possible, material will be used as a construction material and for concrete batching. Other material will be disposed of in cleanfills which have been identified at a number of locations within the Project area.	Maintain records of amount of material disposed of to each cleanfill Monitor cleanfills for erosion	IFC PS3 Resource Efficiency and Pollution Prevention IFC EHS General Guidelines on Waste Management
	Construction and demolition waste and recovered materials collection and disposal	Construction phase waste management plan	Materials inventory including: • material streams • quantities; • disposal routes • storage / disposal Audit including: • storage and disposal facilities; • collection; and • monitoring documents.	IFC PS3 Resource Efficiency and Pollution Prevention IFC EHS General Guidelines on Waste Management
	Construction camps and housing waste and recovered materials collection and disposal	Construction phase waste management plan	As for construction and demolition material	IFC PS3 Resource Efficiency and Pollution Prevention IFC EHS General Guidelines on Waste Management
	Waste and recovered material generated by operational activities	Operational phase waste management plan	As above	IFC PS3 Resource Efficiency and Pollution Prevention IFC HS General Guidelines on Waste Management
Sustainable use of raw materials	Construction and operational activities	Re-use materials on site wherever possible	Monitor materials use.	IFC PS3 Resource Efficiency and Pollution Prevention

Table 5-2: Waste and Recover Material Monitoring

Objective	Activity	Mitigation/ Enhancement	Monitoring / KPI	Standards
		Good housekeeping and operating practices, including inventory control to reduce amount of out-of date, off-specification, contaminated, damaged material or excess to plant needs Procurement measures to match material requirements with construction programme Substituting raw materials or inputs with less hazardous or toxic materials wherever economically and technically feasible.		
Minimise pollution	Materials handling and storage	Appropriately covered and bunded storage located away from sensitive receptors. Appropriate spill kits nearby (as necessary for hazardous liquids) Secure and protected from risk of theft or vandalism Easily accessible in a safe manner Located next to any required	Audit of Contractor's materials storage facilities Number of pollution incidents.	IFC PS3 Resource Efficiency and Pollution Prevention IFC EHS General Guidelines on Waste Management

Table 5-2: Waste and Recover Material Monitoring

Objective	Activity	Mitigation/ Enhancement	Monitoring / KPI	Standards
		Peronal Protection Equipment (PPE) (as necessary for irritants and hazardous materials)		

An example waste tracking log and waste disposal and transport record are provided respectively in Table 1-1and Table 5-4.

Table 5-3: Waste Tracking Log

Name of Station:					
Transportation Mode:					
Destination of Waste: Date:					
Sr.#	**Waste Type**	**Hazardous Yes**	**Non-Hazardous Yes**	**Quality and Quantity of waste**	**Disposal**
This is to certify that the above named materials are properly packed for transport to disposal site.				This is to certify that above materials are received at the specified disposal site	
Supervisor				Facility	
Date				Signature	
				Date	
Copy					
-	CONTRACTOR				
-	COMPANY				
-	Truck Driver				

Table 5-4: Transportation & Disposal Records

Sr. #.	Date	Type of Waste	Quantity of Waste	Vehicle	Disposal Way	Disposal Point/Place	Signature /Name
1							
2							
3							
4							
5							

Operational activities

Operational activity monitoring and audit requirements should be similar to those presented in Section 4.10 Project Waste Management Plan Objectives Policies and Methods.

Training

Training monitoring and audit requirements should be based on the training requirements presented in Schedule B.

Health and safety

Health and safety monitoring should address:

- Safety inspection, testing and calibration
- Surveillance of the working environment
- Surveillance of workers health
- Training
- Accidents and diseases.

Accidents and diseases monitoring should involve procedures and systems for reporting and recording:

- Occupational accidents and diseases
- Dangerous occurrences and incidents.

These systems should enable employees to report immediately any situation they believe presents a serious danger to life or health to their immediate supervisor.

The contractor should ensure the systems enable and encourage employees to report to management all:

- Occupational injuries and near misses
- Suspected cases of occupational disease
- Dangerous occurrences and incidents

All reported occupational accidents, occupational diseases, dangerous occurrences, and incidents together with near misses should be investigated with the assistance of a person knowledgeable and competent in occupational safety. The investigation should:

- Establish what happened
- Determine the cause of what happened
- Identify measures necessary to prevent a recurrence.

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6 REFERENCES

KTDC, (2004). *Feasibility Report. Kurram Tangi Dam Project*

United States Agency for International Development (USAID). (2012). *Initial Environmental Examination (IEE). Kurram Tangi Dam and Associated PrimaryIrrigation Distribution System.*