ENERGY POLICY PROGRAM

RAPID ENVIRONMENTAL ANALYSIS

DUBER KHWAR RUN-OF-RIVER HYDROELECTRIC POWER PROJECT

July 2014

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ENERGY POLICY PROGRAM

RAPID ENVIRONMENTAL ANALYSIS

DUBER KHWAR RUN-OF-RIVER HYDROELECTRIC POWER PROJECT

Contract No: AID-EPP-I-00-03-00004
Order No: AID-391-TO-12-00002

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Contents

List of Tables

List of Figures

Acronyms

AEAI	Advanced Engineering Associates International, Inc.
AKHP	Allai Khwar Hydroelectric Power Project
AOR	Agreement Officer's Representative
BEO-OAPA	Bureau Environmental Officer-Office of Afghanistan and Pakistan Affairs
CE	Ecological Impact during Construction stage
CFR	Code of Federal Regulations
COR	Contracting Officer's Representative
CP	Physical Impact during Construction stage
CS	Social Impact during Construction stage
DE	Ecological impact during Design stage
DKHP	Dubair Khwar Hydroelectric Power Project
DMEO	Deputy Mission Environmental Officer
DP	Physical Impact during design stage
DS	Social impact during Design stage
EIA	Environmental Impact Assessment
EMMP	Environmental Mitigation and Monitoring Plan
EMP	Environmental Management Plan
EPP	Energy Policy Program
HBP	Hagler Bailly Pakistan
IEE	Initial Environmental Examination
KP	Khyber Pakhtunkhwa
m3	cubic meters
m3/s	cubic meters per second
MEO	Mission Environmental Officer
OE	Ecological Impact during Operation stage
OP	Physical Impact during Operation stage
OS	Social Impact during Operation stage
PC-1	Planning Commission Form 1
REA	Rapid Environmental Analysis
REA-OAPA	Regional Environmental Advisor-Office of Afghanistan and Pakistan
SoW	Scope of Work
USAID	United States Agency for International Development
WAPDA	Pakistan Water and Power Development Authority

Environmental Documentation Form

Commissioning and Completion of Duber Khwar Hydroelectric Power Project

A. Applicant Information

Contractor/grantee (Organization): AEAI-EPP	**Parent grant of project:** Energy Policy Program (EPP)
Individual contact and title: Mr. Jimmy Roland Hicks, COP	**Address, phone and email (if available)** Advanced Engineering Associates International Inc. House # 4, Street 88, G-6/3, Islamabad – Pakistan Tel: +92 (0) 51 8357 072 jhicks@ep-ep.com.pk
Activity (brief description) Commissioning and completion of Duber Khwar Hydroelectric Power Project	**Amount:** U.S. $25 Million
Location of activity Duber Khwar Hydroelectric Power Project (DKHP), Khyber Pakhtunkhwa	**Start and end date of activity** FY 2013- Dec 2015

B. Activities, Screening Results, and Recommended Determination

Activity Breakdown	**Screening Result (Step 3 of instructions)**			**Recommended Determinations** (Step 6 of instructions Complete for all moderate and high risk activities)		
	Very Low Risk	**Moderate Risk**	**High Risk**	**No significant adverse impact**	**With specified mitigation, no significant adverse impact,**	**Significant Adverse Impact**
Management • Project/ Program Management • Environmental Monitoring	✓			Categorical Exclusion per 22 CFR 216. (c)(1)(i)		
Technical Assistance • Technical assistance, training programs except to the extent such programs include activities directly affecting the environment. • Financial, accounting, management and other capacity building.	✓			Categorical Exclusion per 22 CFR 216. (c)(2)(i)		
Documentation • Development of manuals and documents etc. • Studies required to support construction and other aspect of the program.	✓			Categorical Exclusion per 22 CFR 216. (c)(2)(iii)		

Activity Breakdown	Screening Result (Step 3 of instructions)			Recommended Determinations (Step 6 of instructions Complete for all moderate and high risk activities)		
	Very Low Risk	Moderate Risk	High Risk	No significant adverse impact	With specified mitigation, no significant adverse impact,	Significant Adverse Impact
• Analyses, investigations, reviews, assessments, planning, studies (monitoring, impact evaluation and other social. Technical studies etc.), surveys, mapping, workshops, seminars, conferences and meetings. • Preparation of environmental documentation, including environmentally required studies. • Information and experience sharing sessions,						
Media and Communications • Document and information transfer. • Public outreach, awareness campaigns, media campaigns, advocacy campaigns and Public information campaigns, including development of print or other media.	✓			Categorical Exclusion per 22 CFR 216. (c)(2)(v)		
Civil Works in Progress • Access Tunnel to Head Race Tunnel. • Sand Trap. • Flushing Tunnel. • Intake Control Building Stilling Basin & Tail Race. • Grouting Works of Right/Left Abutment & Head/Access Tunnel. • Hydraulic Steel Structure. • Metal Work and Instrumentation work. • Roads Works.		✓			Negative Determination with Conditions per 22 CFR 216.3 (a)(2)(iii)	
Civil Works • Payment for Construction Machinery used during construction.		✓			Negative Determination with Conditions per 22 CFR 216.3 (a)(2)(iii)	
132 KV Transmission Line • 46 km line from Patten to interconnect Allai Grid.		✓			Negative Determination with Conditions per 22 CFR 216.3 (a)(2)(iii)	
Construction • Construction of Officer Hostel for Operation Staff ($ 0.27 million).		✓			Negative Determination with Conditions per 22 CFR 216.3	

Activity Breakdown	Screening Result (Step 3 of instructions)			Recommended Determinations (Step 6 of instructions Complete for all moderate and high risk activities)		
	Very Low Risk	Moderate Risk	High Risk	No significant adverse impact	With specified mitigation, no significant adverse impact,	Significant Adverse Impact
• Water Supply ($0.45 million).					(a)(2)(iii)	

C. Summary of Recommended Determinations (check all that apply)

The activity contains	***(equivalent regulation 216 terminology)***
☒ Very low risk sub-activities.	*Categorical exclusion per 22 CFR 216.2 c(1)(i) and (c)(2)(i):* Management Technical Assistance Documentation Media and Communications
☐ After environmental review, sub-activities determined to have no significant adverse impacts.	*Negative determination(s)*
☒ After environmental review, sub-activities determined to have no significant adverse impacts, given appropriate mitigation and monitoring.	*Negative determination(s) with conditions per 22 CFR 216.3(2)(iii)* Civil Works in Progress Civil Works 132kV Transmission Line Construction
☐ After environmental review, sub-activities determined to have significant adverse impacts.	*Positive determinations(s)*

Confidential information redacted

Confidential information redacted

Executive Summary

The Energy Policy Program (EPP) is a multi-year, United States Agency for International Development (USAID)-funded initiative to increase power generation, improve transmission capacity and reliability. EPP works with selected energy enterprises to assist the Government of Pakistan's sector reform efforts. The Pakistan Water and Power Development Authority (WAPDA) requested that USAID assist in expediting the commissioning and completion of the run-of-river Duber Khwar Hydroelectric Power Project (DKHP or the 'Project') in Khyber Pakhtunkhwa (KP) Province. The USAID has assessed the works that remain and has decided to fund the DKHP, and is reviewing the costs and requirements for commissioning and completion of the Project

In order to meet regulatory requirements, USAID must ensure that the environmental assessment of the Project is compliant with the national laws of Pakistan, international best practice, and U.S. environmental regulations (22 CFR 216); and that implementation has been in accordance with agreed-upon environmental mitigation and monitoring measures. USAID's IEE (Tracking #: OAPA-14-Jan-Pak-0017) states that the ongoing construction activity will result in a Negative Determination with Conditions for completion of the DKHP and associated power transmission lines. The conditions include the use of environmentally sound materials and safe construction practices, monitoring and evaluation, and preparation of a specific Environmental Mitigation and Monitoring Plan for the activity.

The DKHP is located in Pattan Tehsil, District of Kohistan in Khyber Pakhtunkhwa (KP) province of Pakistan. The Project produces electricity by diverting water of Duber Nullah through tunnels into the Indus valley. The powerhouse is situated on the right bank of the Indus River. The Duber Nullah originates from the Eastern slopes of the Falakser Mountains situated between Swat and Kohistan at about 6,000 m. The weir structure is located on the west of the power house on Duber Nullah at a geodesic distance of 6.3 km from the power house. The weir is connected to the powerhouse via a headrace tunnel with a diameter of 2.6 m. A diversion tunnel of 452 m was constructed on the Duber Nullah to divert the original flow of the Nullah and create a dry environment to carry out construction of the weir structure.

The climate of the Project area is very cold in the winter and warm in summer. Snowfall takes place during winter while precipitation is low in summer. Pattan is the district headquarters of the Lower Kohistan district. It has twenty two (22) union councils. The local councils in Pattan have the technical support of various departments of the KP government, which includes communication, roads, agriculture, irrigation, fisheries, education, health, revenue, food, social welfare, wildlife and WAPDA.

At the weir site, major changes in terms of the environment were observed during the field visit. Local communities reported that 2010 floods had caused catastrophic damage in the area. Lesser communities are settled on the banks of Duber Khwar; therefore damage to houses was relatively limited. However, the access road for Duber weir, which passed along Duber Khwar, was completely damaged during the 2010 floods. The locals reported that the flow was very strong and carried huge rocks and boulders from the mountains. The earthquake in 2005 was a major disaster in the area, which caused damage in the village of Duber and surrounding areas. Local communities reported that the damage caused by floods in 2010 was significantly more than the damage caused by the 2005 earthquake in the area. At the powerhouse site, the team observed no major changes in the Indus River bed. The local communities reported that although the flood in 2010 was severe in nature, the Indus River bed was wide to accommodate the high flows.

A Rapid Environmental Analysis (REA) was carried out to evaluate impacts of Project design, construction and operation on the physical environment, terrestrial ecological resources, and the socio-economic environment. This exercise analyzed the impacts discussed in WAPDA's EIA, the assessment carried out by the Team, and comments from community and institutional stakeholders

concerning the identified impacts. This exercise also summarized the current EHS mitigation, monitoring, and supervision on site. During the field visit, field documents, such as accident registers, health and safety guidelines and environmental mitigation/monitoring documents were reviewed where they were available. Interviews were conducted with WAPDA staff working on site, such as guards, cleaners, engineers, and administrative staff. Separate meetings with WAPDA officials in Besham were also conducted.

The field assessment revealed that safety of the employees working at the powerhouse and weir site needs immediate attention. At the powerhouse, it was observed that the complex was secured by steel fencing. During consultations in the adjoining areas, it was noted that no potential grievances among the locals regarding the powerhouse existed that could lead to a possible serious security situation. However, the Duber weir site was completely unsecure with open access to all facilities. If a possible security situation arises, the weir will be unprotected and control of access to the weir would be difficult. Locals complained that WAPDA had no community liaison officer. There was one security guard on the weir who reported that incidents of road blockages on the access road of the weir were common and the locals often did not allow WAPDA officials and engineers to work on the weir. Although the population of the region is egalitarian in nature, some Khans and Maliks enjoy suzerainty and political power. Often, they are observed to misuse this power for their personal gain.

An Environmental Mitigation and Monitoring Plan (EMMP) was formulated for the design and construction periods. The EMMP is based on the REA for the design and construction phases of the Project. It summarizes the mitigation and monitoring plans, institutional arrangement and strengthening requirements, training requirements, occupational safety measures, and environmental and social audit requirements. Relatively minor mitigation recommendations, and associated monitoring and monitoring indicators are required for the Project. However, a major recommendation in the EMMP is institutional strengthening, and restructuring of the Environmental Management Unit, and associated monitoring.

1 Introduction

1.1 Background

The Energy Policy Program (EPP) is a multi-year, United States Agency for International Development (USAID)-funded initiative to increase power generation, decrease losses and increase cost recovery in Pakistan's power sector by working with selected energy infrastructure and facilitating the Government of Pakistan's (GOP) reform efforts by providing technical assistance and new technology. The program supports the joint goals of the United States Government (USG) and the Government of Pakistan (GOP) in reforming the power sector, and is designed to address Pakistan's chronic electricity shortage.

The Pakistan Water and Power Development Authority (WAPDA) has requested that USAID assist in expediting the commissioning of the nearly-complete run-of-river Duber Khwar Hydroelectric Power Project (DKHP or the 'Project') in Khyber Pakhtunkhwa Province (KP) (Figure 1). The Project was originally co-funded by the Islamic Development Bank (IDB) and WAPDA. WAPDA does not have sufficient resources to complete the Project, and the GOP has not disbursed the funds that were intended to be allocated to WAPDA under the annual Public Sector Development Programs (PSDP).

USAID has assessed the works that remain and has decided to fund the DKHP, and is reviewing the costs and requirements for commissioning and completion of the Project. In order to meet regulatory requirements, USAID must ensure that the environmental assessment of the Project is compliant with the national laws of Pakistan, international best practice, and U.S. environmental regulations (22 CFR 216); and that implementation has been in accordance with agreed-upon environmental mitigation and monitoring measures. USAID's Initial Environmental Examination (IEE) (Tracking #: OAPA-14-Jan-Pak-0017) states that the ongoing construction activity will result in a *Negative Determination with Conditions*[1] for completion of DKHP and associated power transmission lines. The conditions include the use of environmentally sound materials and safe construction practices, monitoring and evaluation, and preparation of a specific Environmental Mitigation and Monitoring Plan for the activity.

To that end, USAID has requested a Rapid Environmental Analysis (REA) of the Project. Advanced Engineering Associates International, Inc. (AEAI), USAID's implementing partner for EPP, engaged the services of Hagler Baily Pakistan (HBP) to conduct the REA.

[1] Section 2.6 of this report provides a discussion of the USAID procedure for environmental assessment of USAID funded projects.

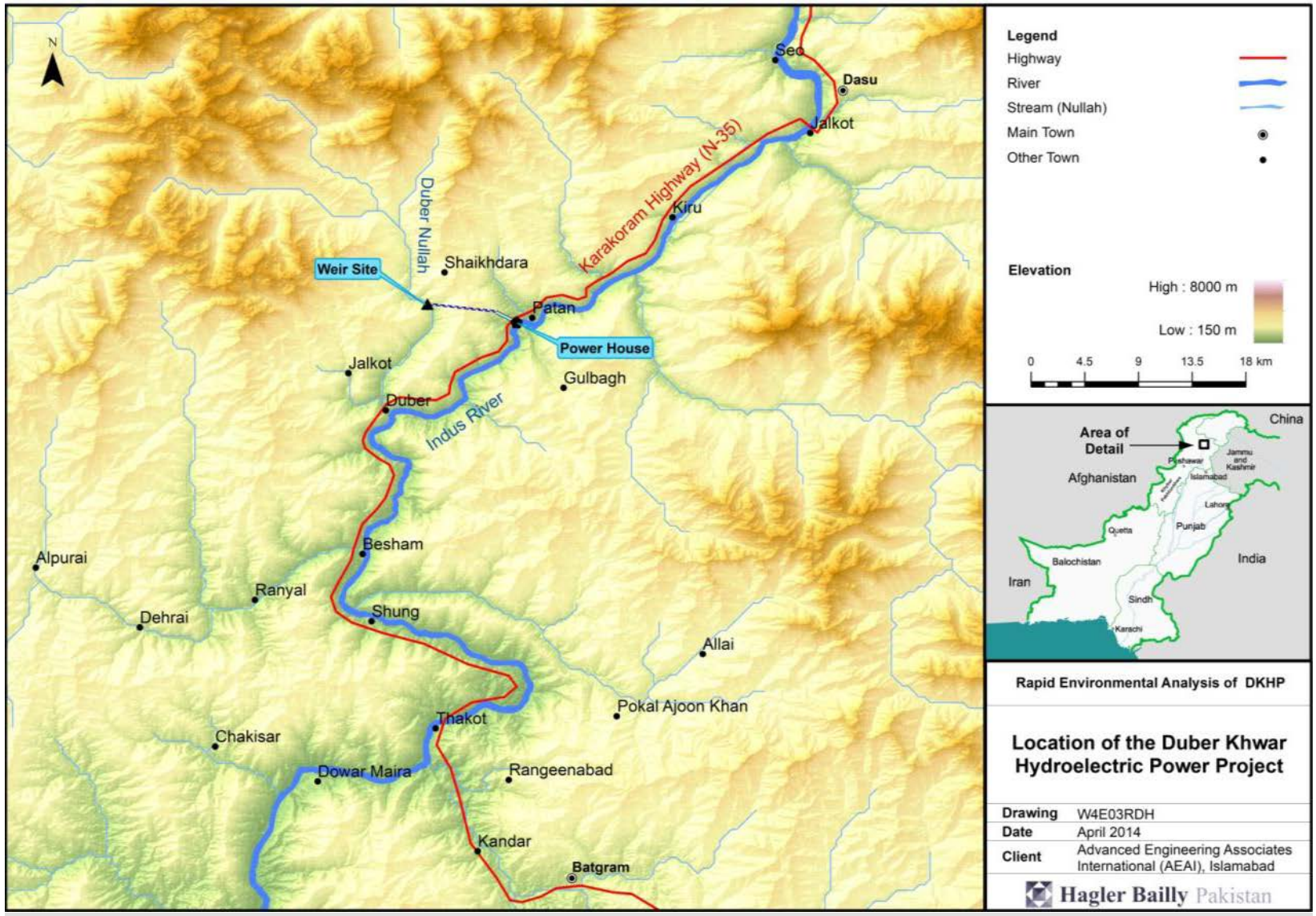

Figure 1: Location of the Duber Khwar Hydroelectric Power Project

1.2 Objectives and Scope of the REA

The Scope of Work (SOW) for the project is provided in Annex I. It clarifies that the SOW is "basically a very diligent and comprehensive 'desk study' to investigate project records and describe the basis and justification for the design, delay in construction, and the cost overrun with particular focus on the approved projects' Environmental Impact Assessments (EIA); implementation of, and compliance with, environmental mitigation and monitoring measures established in the EIAs; and environmental and social issues and the damages caused due to the 2010 floods".

Based on the technical requirements of the SOW, the following are the broad objectives for the REA:

Objective 1:	Determine whether the Project has been designed (siting and operation) and constructed in compliance with national environmental laws.
Objective 2:	Determine whether the Project design and operation plan conforms to international best practice and, in particular, with USAID's 22 CFR 216 (U.S. Government's environmental regulations) and identify gaps, if any.
Objective 3:	Determine whether all mitigation measures identified in the environmental reports for Project design and construction have been implemented, and whether the measures are adequate to address potential adverse environmental impacts under national laws and international good practice.
Objective 4:	Determine whether any environmental liabilities have been created during the construction phase of the Project.
Objective 5:	Clearly identify all measures that are required to meet the obligations of the Project under national laws, environmental approval of the Project by the KP Environmental Protection Agency (EPA), address any environmental liabilities, and bridge the gaps identified in Objective 2.
Objective 6:	Verify or provide the cost of implementing the measures identified in Objective 5.
Objective 7:	Evaluate other issues, including security, and provide high-level comments on issues such as construction cost overruns and any identified design flaws.

Section 5.0 of the SOW provides the specific technical requirements for the REA, while Table 1 provides the specific technical requirements, and how they are addressed in the REA.

Table 1: Addressing the Specific Technical Requirements of Scope of Work

Specific Technical Requirement from the SOW	Where Addressed
Complete review of the PC-1s as revised and/or amended, feasibility studies and other relevant project documents. Collect secondary data from relevant sources to compare with the information available in current project documents.	Section 1. Section 4 and secondary information referred to in Section 5.
Review of the project, its objectives, and a statement of economic and social benefits.	Project Description in Section 3 and benefits in Section 5.9 Beneficial Social and Environmental Impacts.
Review the engineering documents and ongoing work to determine the cost of remaining work based on current rates.	Section 3.7 Technical Review of DKHP.
Review of the requirements of IEE (Tracking #: OAPA-14-Jan-Pak-0017) and 22 CFR 216 as well as required identification of new significant environmental effects detected during the REA.	Review of the requirements of IEE in Section 1.4.2 and new environmental effects in Section 5.
Determine the inspection and reporting already done to determine compliance with existing requirements established in the approved EIAs and in signed contracts.	The inspection and reporting already done was assessed through document review, site visit and consultations. The results are summarized in Section 5 REA.
Review of the safety requirements, meetings with stakeholders, collection of environmental and social data, collection of designs and cost estimates documents from WAPDA, etc.	Meetings with community and institutional stakeholders, collection of environmental and social data was carried out during the Site Visit. The data collected is summarized in Section 5.
Review of project siting/design impacts identified in WAPDA IEE and identify any additional impact with project siting/design.	Project design impacts identified in Project EIA are summarized in Section 5.3 and additional impacts are identified in Section 5.4.
Carry out an engineering, environmental and social review/survey to verify costs, designs, environmental and social compliance issues, flaws, and construction adequacy and economic impact of the Project.	Engineering review (Section 3.7) and environmental and social review (Section 5.3-5.12).
Review details of the security situation and identification of local tribal leaders who could serve as contact points for ensuring security arrangements.	Details of security situation are described in Section 6 and identification of local tribal leaders in Section 6.7.
Describe the areas as they currently exist with the ongoing construction of the hydroelectric power projects, transmission lines, etc. This task will require onsite assessment in the field and should cover different areas impacting the environment such as physical, biological, climate, water resources, geology and socio-economic; including any resettlement and land acquisition, cultural heritage, indigenous peoples issues.	Covered in detail in Section 5 REA.

Specific Technical Requirement from the SOW	Where Addressed
Review all EIA/EAs, EMMPs and other environmental documents, including compliance and performance monitoring reports prepared and approved in 1999-2010; and conduct an independent rapid environmental due diligence analysis to determine: • The main environmental and social effects of the Project, both in the project area and in the surrounding area, including the timescale of the impacts, the defined mitigation and monitoring measures and compliance. • Required environmental mitigation and the inspection and reporting already done to determine compliance with existing requirements established in the approved EIAs and signed contracts. • Evaluate the understanding of environmental mitigation and monitoring requirements by the project implementation and construction staff. • Evaluation of existing environmental and social problems associated with the development of the hydroelectric power project that should be resolved because they are resulting in adverse environmental and social impacts. • The size and extent of the impacts, both adverse and beneficial, (the effectiveness of the mitigation measures should be based as much as possible on quantitative data rather than qualitative assessments). • Any potential impact on human health, social fabric of communities, etc. • The impact on rare species of plant or animal in the area. • Appropriateness of the construction and operation practices, on-going supervision as well as implementation of environmental mitigation and monitoring measures (and Contractor's capabilities) as proposed in the original approved IEE/EA/EIA. • The significance of existing and potential adverse environmental and social impacts due to the construction and operation of the hydroelectric power project and associated infrastructure, and update or develop of an Environmental Monitoring and Mitigation Plan (EMMP) for each part of the Project with a budget and responsibilities that should comply with GOP and USAID/USG environmental regulations and best international practice.	Review of the Project EIA is summarized in Section 5 according to the design, construction and operation stage impacts. Environmental mitigations required are given in Section 7. Section 5.10.
Based on the above, prepare a summary of the environmental issues for each part of the Project, including positive or negative impacts and proposed mitigations & monitoring (in tabular form). Highlight any changes in the environmental conditions & issues since the existing (original) reports and start-up of construction.	Provided in Section 7 EMMP.
Conduct an independent social assessment to determine: Those groups that have benefited and those that have been left disadvantaged by the project, with particular focus on women. Identify any pending resettlement/land-take/legal claims/compensation issues.	Social Assessment in Section 5.11 and re-settlement issues discussed in Section 5.3.
Identify responsibility for ongoing operations and maintenance and provide suggestions on the best approach to ensure conformance with requirements.	Section 7.3.2.
Review and report on on-going compliance with environmental monitoring requirements of the existing EAs.	Section 5 and in tables in Section 7 and Appendix B.
Identify mitigating measures that may be necessary to ensure project completion and ongoing operation and maintenance, and how they should be incorporated into the Project design.	Section 7.

Specific Technical Requirement from the SOW	Where Addressed
Draft a monitoring and evaluation scope of work to ensure that the Project is successfully completed, expected impact is attained, mitigating measures are implemented, and future potential adverse impacts are avoided.	Section 7.
Identify further assessments that may be necessary in order to determine Project impact and viability.	Section 8 (Conclusions).
Review the comments of USAID Environmental Officers and address all concerns.	

1.3 Project Overview

DKHP is located in KP's remote Batgram district on the Duber Khwar, a right bank tributary of the Indus River (Figure 2). The Project area is accessible by road, and is 270 kilometers (km) from Rawalpindi and 300 km from Peshawar, the provincial capital. The Project's maximum designed power output is 130 megwatts (MW). Upon commissioning, it will produce approximately 595 gigawatt hours (GWh), out of which 187 GWh will be available during a 4 hour period of the day when demand is high, known as the peak demand. The Project was originally approved by the Executive Committee of the National Economic Council (ECNEC)[2] on September 2, 2002. A revised cost was approved on 20 August 2009. Power from the Project will be transmitted to the national grid through a 220 kilovolt (kV) double circuit transmission line, which will also transport power from the Khan Khwar and Allai Khwar hydroelectric power projects (two other projects in the vicinity of the DKHP).

The Project started generating electricity in April 2014, and is currently within the Defect Liability Period,[3] with some remaining work to be completed.

1.4 Review of the Past Environmental Assessment

An EIA for the Project was prepared in December 1999[4] and submitted to KP EPA. This document is referred to as the "WAPDA EIA" in this document, or where the context does not suggests otherwise simply as the "EIA". The major findings of the review for the WAPDA EIA include:

- Baseline information and data is not sufficient to fully characterize the pre-existing environment.
- The EIA largely addresses impacts associated with construction and some for operation.
- The monitoring plan is general and does not address the detailed environmental monitoring required to detect potential environmental degradation.
- The responsibility of environmental monitoring is incorrectly assumed to be the responsibility of other government departments, such as fisheries, wildlife, etc.
- Details on how the mitigation and monitoring plan will be implemented are brief and do not sufficiently outline how these measures will be implemented.

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2 ECNEC is the highest decision-making body of the Government of Pakistan for approval of development projects. It is headed by the prime minister of the country. All projects exceeding PKR 500 million in cost must be approved by this body. (Government of Pakistan, Planning Commission, Planning and Development Division, Islamabad. *Handbook on Planning Commission Government of Pakistan*, May 2008. www.pc.gov.pk/organization/Handbook-Planning%20Commission.pdf. Accessed May 11, 2014.)

3 A set period of time after the completion of construction of a project during which the owner of a project has the right to return the site to the contractor in case of any defects in the project construction and the contractor is contractually bound to remedy the defects.

4 Feasibility Study of Duber Khwar Hydropower Project, Appendix 6, Environmental Impact Assessment, December 1999. Pakistan German Technical Co-operation and Sarhad Hydel Development Organisation.

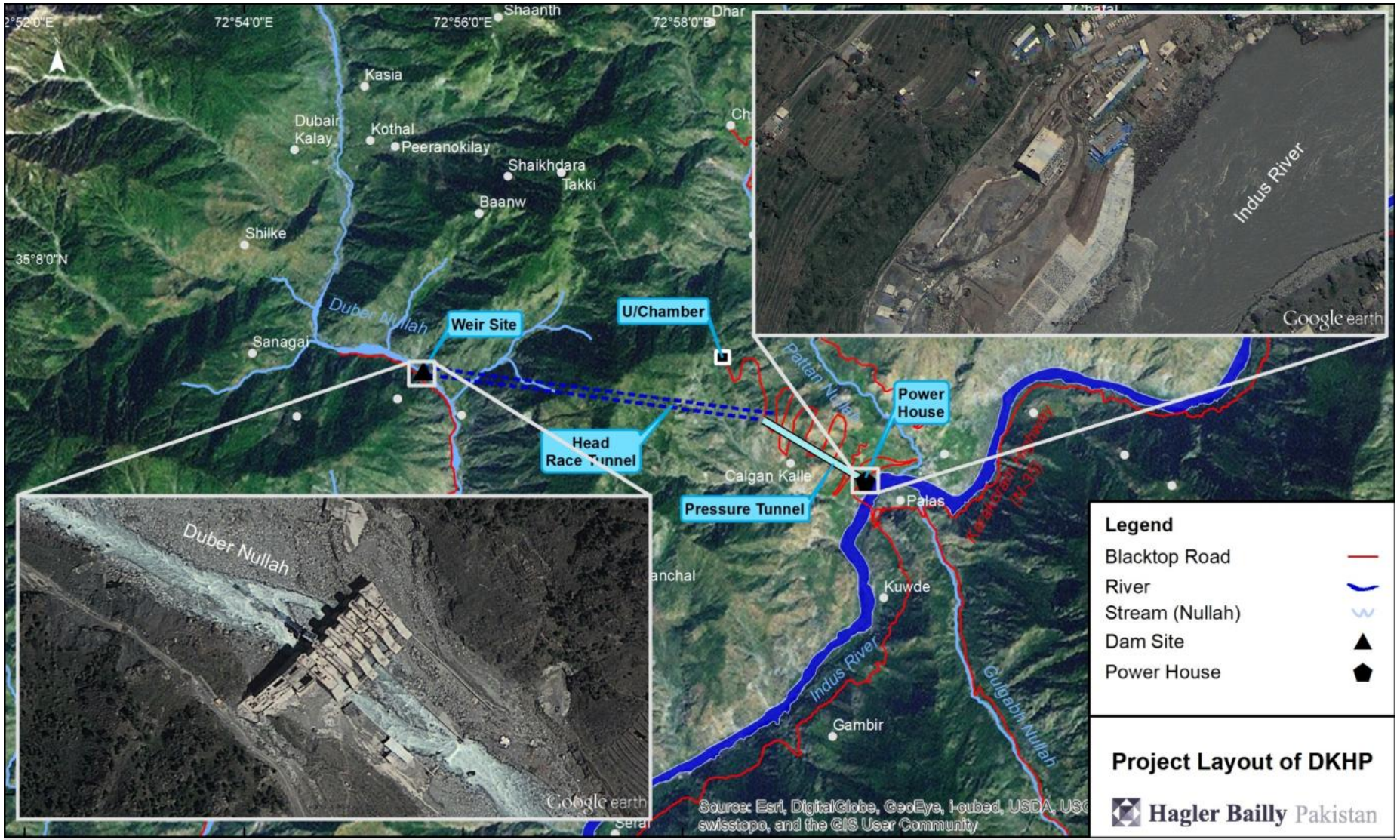

Figure 2: Project Layout of DKHP

1.4.1 Review of USAID's IEE of the Project

- USAID's IEE (Tracking #: OAPA-14-Jan-Pak-0017) states that the ongoing construction activity of the Project will result in a "Negative Determination with Conditions" for completion of the two run-of-river projects and associated transmission lines. These conditions will include the use of environmentally sound materials and safe construction practices, monitoring and evaluation, and preparation of a specific Environmental Mitigation and Monitoring Plan (EMMP) for the activity. A paid Environmental Assessment (REA) is required subsequent to approval of the IEE by BEO-OAPA. The REA has the following requirements:
- The REA should review the environmental reports and any conditions under the approved Environmental Assessments for both run-of-river projects, and prepare, as part of each project, positive or negative impacts and proposed mitigation and monitoring measures for the scope of activities under each project. The REA should highlight any changes in environmental conditions, and highlight issues that have arisen since the existing reports were written and construction commenced.
- The REA should describe the areas as they currently exist with the on-going construction of the run-of-river hydroelectric power plants and transmission lines. This task will require an on-site assessment, and should cover different areas impacting the environment, such as physical, biological, climate, water resources, geology, and socio-economic. Construction and operating practices, ongoing supervision, as well as implementation of environmental mitigation and monitoring measures (and the Contractor's capabilities) as proposed in the approved EMMPs should be reviewed and documented for compliance with approved new legislation (e.g. Seismic Code etc.). The REA also should determine the significance of existing and potential adverse environmental and social impacts due to construction and operation of the projects and associated infrastructure, and update or develop an EMMP for each project.
- A detailed EMMP with budget and responsibilities that complies with GOP and USAID/USG environmental regulations and international best practice.
- If the completed REA indicates the potential for significant environmental and social impacts, an EA process will be launched in consultation with the A/COR and MEO/DMWO, and with the concurrence of REA/OAPA and BEO/OAPA. The process will follow the requirements set forth in 22 CFR 216.6.
- All activities will be completed in compliance with Pakistan's environmental, OHS, construction regulations, standards, norms and guidelines, national obligations under ratified international environmental agreements, and conditions established in the approved EAs for each individual project. Absent this, activities should be completed in accordance with international best practices appropriate to the seismicity levels in Pakistan and in the projects' respective districts. This should be in compliance with USAID requirements.

1.5 Overview of other Documents

A list of the documents reviewed for the REA is presented in Table 2.

Table 2: List of Documents Reviewed

Document Type	Document
PC-I (2nd Revision)	Title: PC-I Form for Duber Khwar Hydropower Project (130 MW) (2nd Revision) Date: August 2013 Organization: General Manager Projects (Northern Areas), WAPDA, Hattian, District Attock File Name: DAKP Rev (PC-I).PDF, Pages (in PDF): 116

Document Type	Document
EIA (Feasibility Study Appendix)	Title: Feasibility Study for Duber Khwar Hydropower Project Appendix 6 Environmental Impact Assessment Date: December 1999 Organization: Pakistan German Technical Co-operation and Sarhad Hydel Development Organization File Name: EIA-Duber.PDF, Pages (in PDF): 85
Feasibility Study	Title: Feasibility Study for Duber Khwar Hydropower Project Main Report Vol 1 of 2 Date: December 1999 Organization: Government of Pakistan, Ministry of Water and Power in collaboration with German Agency for Technical Co-operation, Pages (in hard copy): 256
	Title: Feasibility Study Duber Khwar Hydropower Project Daily Storage Alternative Main Report Vol 2 of 2 Date: September 1999 Organization: Government of Pakistan, Ministry of Water and Power in collaboration with German Agency for Technical Co-operation
Safety and Emergency Plan	Title: Duber Khwar Hydropower Project Safety Plan and Description of Emergency Procedure Date: November 2003 Organization: Pakistan Water and Power Development Authority Pages (in hard copy): 8
Progress Reports	Title: Indus Tributaries High Head Hydropower Complex Project Monthly Progress Report No.128 Date: January 2014 Organization: Water and Power Development Authority (WAPDA) File Name: Monthly Progress Report-Jan 2014.PDF, Pages (in PDF): 144
	Title: Indus Tributaries High Head Hydropower Complex Project Monthly Progress Report No.127 Date: December 2013 Organization: Water and Power Development Authority (WAPDA) Pages (in hard copy): 128
	Title: Indus Tributaries High Head Hydropower Complex Project Monthly Progress Report No.126 Date: November 2013 Organization: Water and Power Development Authority (WAPDA) Pages (in hard copy): 131
	Title: Indus Tributaries High Head Hydropower Complex Project Monthly Progress Report No.125 Date: October 2013 Organization: Water and Power Development Authority (WAPDA) Pages (in hard copy): 132
	Title: Indus Tributaries High Head Hydropower Complex Project Monthly Progress Report No.124 Date: September 2013 Organization: Water and Power Development Authority (WAPDA) Pages (in hard copy): 132
	Title: Indus Tributaries High Head Hydropower Complex Project Monthly Progress Report No.123 Date: August 2013 Organization: Water and Power Development Authority (WAPDA) Pages (in hard copy): 127

Document Type	Document
	Title: Indus Tributaries High Head Hydropower Complex Project Monthly Progress Report No.122 Date: July 2013 Organization: Water and Power Development Authority (WAPDA) Pages (in hard copy): 128
	Title: Indus Tributaries High Head Hydropower Complex Project Monthly Progress Report No.121 Date: June 2013 Organization: Water and Power Development Authority (WAPDA) Pages (in hard copy): 139
Initial Environmental Examination	Title: Initial Environmental Examination for Run of River Hydroelectric Power Projects Date: 24th January 2014 Organization: USAID Pakistan File Name: OAPA 14 JAN PAK 0017 – Run of Rivers Hydroelectric Power Projects Completion and Commissioning.PDF Pages (in PDF): 28
Status of Land Acquisition	High Head Hydropower projects- WAPDA-Besham Duber Khwar Hydro Power Project Status of Land Acquisition (as on 30/06/2012)
KP EPA Letter	Letter from KP EPA communication no objection to on the application of Duber Khwar Hydropower Project to be considered as CDM projects (Dated 13/08/2010)
Punch List	Duber Khwar Hydropower Project Contract DC-02, LOT C&HS Punch List of Civil Works As on December 22-31, 2013

1.6 Organization of the Report

The report is organized as follows:

- **Section 1** (*Introduction*) provides the background to the current work, including the REA, the objectives and SOW, overview of DKHP, and a basic review of the previous environmental assessment.
- **Section 2** (*Legal, Regulatory and Institutional Framework*) provides a summary of the legal instruments, at the international and national levels, standards and guides that are utilized in carrying out the rapid impact assessment (REA) and utilized for the environmental mitigation and monitoring plan (EMMP).
- **Section 3** (*Project Description*) provides a detailed project description for the DHKP.
- **Section 4** (*Overview of Baseline Conditions)* provides an overview of the base conditions that existed before the Project and related activities commenced.
- **Section 5** (*Rapid Environmental and Social Assessment*) provides the analysis and results of the Rapid Environmental and Social Assessment and reports the findings of the field visits.
- **Section 6** (*Security Assessment*) provides an assessment of current security issues and concerns.
- **Section 7** (*Environmental Mitigation and Monitoring Plan*) provides detail on the mitigation and monitoring, against issues and impacts identified in the previous EIA, REA and utilizing other observations in the field visit, that need to be adopted and carried out to ensure project completion in an environmentally and socially responsible manner.
- **Section 8** (*Conclusion*) provides a summary of the conclusions of the rapid environmental and social assessment, security assessment, security assessment and mitigation and monitoring requirements.

2 Legal, Regulatory and Institutional Framework

This chapter provides a summary of the national and international legislation and guidelines that are relevant to the assessment of the Project's environmental components. The review of the legal and institutional framework and relevant laws help identify policy directives and required procedures to investigate social responsibility, environmental accountability and financial soundness of the Project. This chapter also discusses the compliance status of the Project as compared with the laws required to be followed during implementation. The EIA prepared by WAPDA in May 2000[5] serves as the reference document to determine the Project's compliance with applicable laws.

2.1 National Legislative and Regulatory Framework

2.1.1 Statutory Framework for Environment

The development of statutory and other instruments for environmental protection and management has steadily gained priority in Pakistan since the late 1970s. The *Pakistan Environmental Protection Ordinance 1983* was the first piece of legislation designed specifically for protection of the environment. The promulgation of this ordinance was followed in 1984 by the establishment of the Pakistan Environmental Protection Agency, the primary government institution dealing with environmental issues. Significant work on developing environmental policy was carried out in the late 1980s, which culminated in the drafting of the Pakistan National Conservation Strategy. Provincial environmental protection agencies were also established at about the same time. The National Environmental Quality Standards (NEQS) were established in 1993. The enactment of the *Pakistan Environmental Protection Act 1997* (PEPA 1997) conferred broad-based enforcement powers to the environmental protection agencies. Publication of the *Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations 2000* (IEE-EIA Regulations 2000) provided the necessary details on the preparation, submission, and review of an IEE and EIA. In addition to the PEPA 1997, Pakistan's statute books contain a number of other laws that have clauses concerning regulation and protection of the environment.

One of the key components of the 18th Amendment to the Constitution, passed by the parliament in 2010, was devolution of power from the federal to provincial governments. Through this amendment, the *concurrent legislative list* of the constitution was abolished, and all legislative powers on subjects included in the concurrent legislative list, which included environmental protection, were transferred to the provinces. Thus, after the passage of the 18th amendment, the federal government lost its power to legislate on environmental protection, and only provincial governments could make laws regarding protection of the environment. As PEPA 1997 was a federal law, the 18th Amendment made it necessary for the provinces to enact their own environmental protection laws. The KP government has drafted a law; however it has not yet been passed by the provincial assembly. Until passage of the new law, PEPA 1997 will remain in force in KP.

2.1.2 Provisions of PEPA 1997

The PEPA 1997 is the basic legislative tool empowering the government to frame regulations for protection of the environment. The act is applicable to a broad range of issues and extends to air, water, industrial liquid effluent, marine, and noise pollution; as well as handling of hazardous waste. The articles of PEPA 1997 that have a direct bearing on the REA are discussed below.

[5] The Feasibility Study for the Duber Khwar Hydropower Project, Appendix 6, Environmental Impact Assessment, December 1999. Pakistan German Technical Co-operation and Sarhad Hydel Development Organisation.

2.1.2.1 National Environmental Quality Standards

Article 11(1) of the PEPA 1997 states that "Subject to the provisions of this Act and the rules and regulations made thereunder no person shall discharge or emit or allow the discharge or emission of any effluent or waste or air pollutant or noise in an amount, concentration or level which is in excess of the National Environmental Quality Standards."

NEQS have been established for gaseous emission, liquid effluent, ambient air quality, noise, and drinking water. From the date of enforcement of the NEQS, all projects, whether in operation on the date or constructed later, are required to comply with these standards.

The Project needs to comply with all applicable standards, and Project proponents and contractors should ensure that no activity will result in the emission of pollutants and effluents exceeding limits as prescribed in the NEQS.

The applicability of the NEQS to the Project is described in Table 3.

Review of available documents with Project proponents indicates that regular monitoring was not undertaken for any of the parameters listed in Table 3, hence the compliance status during construction period cannot be established.

Table 3: NEQS Applicable to the Project

NEQS	Applicability During Construction	Applicability During Operation	Effective Date
Gaseous Emission	All power generators	Any back-up generator	Original 1 Jul 1994 Revised 8 Aug 2000
Noise emission	All noise sources	Not applicable	26 Nov 2010
Emission from motor vehicles	All project vehicles	All project vehicles	1 Jul 1994
Noise from motor vehicles	All project vehicles	All project vehicles	1 Jul 1994
Ambient air quality	Changes in air quality of the surrounding are due to construction activities	Not applicable	26 Nov 2010
Liquid effluent	Sanitary waste and other liquid waste discharged to the environment	Sanitary waste and other liquid waste discharged to the environment	Original 1 Jul 1994 Revised 8 Aug 2000
Drinking water	Water supplied by the owners and contractors to staff	Water supplied by the owners and contractors to staff	26 Nov 2010

2.1.2.2 Preparation and Submission of EIA

Article 12(1) states that "No proponent of a Project shall commence construction or operation unless he has filed with the Federal Agency[6] an [IEE] or, where the project is likely to cause adverse environmental effects an [EIA], and has obtained from the Federal Agency approval in respect thereof".

[6] The term 'Federal Agency' is defined in the Act to mean the government agency which has the power or to which the powers have been delegated to implement the provisions of this act. In case of this Project, the concerned agency is the KP EPA.

Hydroelectric power generation projects with capacities greater than 50 MW require an EIA per the categorization of the IEE-EIA Regulations 2000. The law requires that the EIA must be submitted and approved by the provincial EPA before any construction activities can commence.

An EIA for the Project was prepared in December 1999.[7] It was submitted to KP EPA. WAPDA communicated that environmental approval was issued by KP EPA; however it was unable to provide a copy of the approval.

It is pertinent to point out a legal issue regarding submission of the EIA. The PEPA 1997 was enacted in December 1997. As stated above, environmental assessment of the development projects was a mandatory requirement in the Act through Article 12(1). However, no procedural details for implementation of Article 12(1) were provided by the Act. Article 12(6) of the Act states that "[t]he provisions of the [Article 12(1)] … shall apply to such categories of projects and in such manner as may be prescribed." The term "prescribed" is explicitly defined in the Act to mean as prescribed by rules made under PEPA 1997. As the regulations that provided the categorization and procedures for submission and approval of EIA was notified in June 2000; strictly speaking, the requirement for submission of the EIA to EPA did not exist when the EIA was prepared. However, when construction on the project started in 2005, the regulations were already notified.

2.2 Other Laws with Bearing on Environmental Performance

There are a number of other laws in the statute books of Pakistan which have bearing on the environmental performance of the project. These are listed in the Table 4.

Table 4: Compliance Status of the Laws Relevant to the Project

Law	Description	Applicability to the Project
The Forest Act, 1927	This Act authorizes provincial forest departments to establish forest reserves and protected forests. The Act prohibits any person from: setting fires in the forest; quarrying stone; removal of any forest produce; or causing any damage to the forest by cutting trees or clearing areas for cultivation or any other purpose without express permission of the relevant provincial forest department.	The Project area does not include any forest reserve or protected forests established by the provincial forest department. Therefore, this law is not applicable to the Project.
Land Acquisition Act, 1894	This Act is the primary law for acquisition of land and built-up properties for public interest in Pakistan and also sets out procedures for land acquisition and payment of compensation to land-owners, including for any damage caused to their properties, crops and trees by a Project. However, it lacks the mechanism to address the complex issues of resettlement.	This law was applicable to the development of access roads and reservoir where land acquisition was required. During a field visit and community consultation conducted by the HBP team, it was noted that adequate compensation was paid to the land-owners. WAPDA officials at the project office in Besham, as document proof, provided signed Memorandum of Understandings (MOUs) with the locals for land acquisition.

[7] Feasibility Study of Duber Khwar Hydropower Project, Appendix 6, Environmental Impact Assessment, December 1999. Pakistan German Technical Co-operation and Sarhad Hydel Development Organisation.

Law	Description	Applicability to the Project
NWFP Wildlife Protection, Preservation, Conservation and Management Act, 1975 (NWFP Act No. V of 1975)	This law was enacted to protect the province's wildlife resources directly and other natural resources indirectly. It classifies wildlife by degree of protection, i.e., animals that may be hunted on a permit or special license, and species that are protected and cannot be hunted under any circumstances. The Act specifies restrictions on hunting and trade in animals, trophies, or meat. The Act also defines various categories of wildlife-protected areas, i.e., National Parks, Wildlife Sanctuaries, and Game Reserves.	The Project area does not include any protected wildlife species; therefore, this law is not applicable to the Project.
Fisheries West Pakistan. Ordinance XXX of 1961 Amended Vide NWFP Fisheries (Amendment) Ordinance 1982	This law prohibits destruction of fish by explosive, destruction of fish by poisoning water, and hunting of protected fish species. The law also forbids the use of net or fixed engine traps without a permit or license. The law grants power to the Director General (DG) Fisheries to issue permits to catch fish. The ordinance protects fish against 1) Destruction of fish by explosives, and 2) Destruction of fish by poisoning water.	This law was applicable to the Project as there was a possibility of catching fish as subsistence food by the Project staff and also makes it obligatory to obtain a license from the fisheries department before commencing any fishing activities. However, during community consultation and interviews with the Project staff, it was noted that no fishing activities were carried in Duber Nullah and its tributaries.

2.3 Environmental Guidelines

This section provides a brief introduction of both national and international environmental guidelines that are relevant to implementation of the DKHP.

2.3.1 Guidelines for the Preparation and Review of Environmental Reports 1997

These guidelines on the preparation of environmental reports address Project proponents, and specify the:

- Nature of the information to be included in environmental reports.
- Minimum qualifications of the EIA consultant.
- Need to incorporate suitable mitigation measures into every stage of Project implementation.
- Need to specify monitoring procedures.

Terms of reference for the reports are to be prepared by the Project proponents. The reports must contain baseline data on the Project area, a detailed assessment thereof, and mitigation measures.

2.3.2 Policy and Procedures for Filing, Review and Approval of Environmental Assessments 1997

These policies and procedures define the policy context and the administrative procedures that govern the environmental assessment process, from the Project pre-feasibility stage to the approval of the environmental report.

2.3.3 Guidelines for Public Consultation 1997

The guidelines deal with approaches to public consultation and techniques for designing an effective program of consultation that reaches out to all major stakeholders and ensures the incorporation of their concerns in the impact assessment.

2.3.4 Guidelines for Sensitive and Critical Areas 1997

The guidelines identify officially notified protected areas in Pakistan, including critical ecosystems and archaeological sites, and present checklists for environmental assessment procedures to be carried out within or near such sites. Environmentally sensitive areas include, among others, archaeological sites, biosphere reserves and natural parks, and wildlife sanctuaries and preserves. None of these are relevant to the Project area.

2.4 Environmental Regulatory Authorities

2.4.1 Environmental Protection Agency

The success of environmental assessments as a mean of ensuring that development projects are environmentally sound and sustainable depends in large measure on the capability of regulatory institutions for environmental management. The institutional framework for decision-making and policy formulation in environmental and conservation issues is briefly described below.

The KP EPA was established in 1989. It is a monitoring and regulating agency with the following main functions:

- Administer and implement the Act 1997, its rules and regulations.
- Review the IEE-EIA, including preparation of procedures and guidelines.
- Preparation, revision and enforcement of NEQS (industries, municipalities and vehicular emissions).
- Establish and maintain laboratories, certification of laboratories, for conducting tests and analysis.
- Assist local councils/authorities and government agencies in execution of projects.
- Establish a system for surveys, monitoring, examination and inspection to combat pollution.
- Conduct training for government functionaries and industrial management.
- Provide information and education to the public on environmental issues.
- Publish an annual state of the environment report. Survey qualitative and quantitative data on air, soil, water, industrial/municipal and traffic emissions.
- Take measures to promote environment related research and development activities.

2.4.2 Environmental Protection Council

The Pakistan Environmental Protection Council established in 1984 does not have regulatory power over KP. After enactment of the KP environmental protection law, a provincial level environmental protection council will be established. It will be the highest inter-ministerial statutory body in the province and will be responsible for:

- Formulating environmental policies.
- Overseeing enforcement of environmental law.
- Approval of the NEQS.
- Incorporation of environmental considerations into development plans and policies.

2.5 International Treaties

Important international environmental treaties that have been signed by Pakistan and may have relevance to the Project are listed in Table 5. They concern climate change and depletion of the ozone layer; biological diversity and trade in wild flora and fauna; desertification; waste and pollution; and cultural heritage.

There are no direct bearing of these treaties on the Project. Wherever required, the federal or provincial governments have enacted laws to comply with the provisions of the treaties listed in this section. Thus the obligations of the Project are to comply with pertinent laws only.

Table 5: International Environmental Treaties Endorsed by Pakistan

Topic	Convention	Date of Treaty	Entry into Force in Pakistan
Climate change and the ozone layer	United Nations Framework Convention on Climate Change - the primary objective is the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.	1992	1994
	Kyoto Protocol to the United Nations Framework Convention on Climate Change - enabled by the above Convention on Climate Change. It has more powerful and legally binding measures. It sets binding targets for 37 industrialized countries and the European community for reducing greenhouse gas emissions.	1997	2005
	Vienna Convention for the Protection of the Ozone Layer - acts as a framework for the international efforts to protect the ozone layer with a primary objective to protect human health and the environment against adverse effects resulting from human activities that modify or are likely to modify the ozone layer.	1985	1993
	The Montreal Protocol on Substances that Deplete Ozone Layer and associated amendments - enabled by the Vienna Convention, it is designed to protect the ozone layer by phasing out the production and consumption of a number of substances believed to be responsible for ozone depletion.	1987	1993
Waste and pollution	Basel Convention on the Control of Trans Boundary Movements of Hazardous Wastes and their Disposal - regulates the trans boundary movement of hazardous waste and other waste with a stated purpose to protect human health and the environment against the adverse effects from generation and management of hazardous waste and other waste. The Convention provides for three sets of measures with binding obligations. These are: Strict control of trans boundary movement of hazardous waste; Environmentally sound management of hazardous waste; and Enforcement and implementation of the provisions of the convention at international and national levels.	1989	1994
	International Convention on Oil Pollution Preparedness, Response and Co-operation	1990	1995
	Stockholm Convention on Persistent Organic Pollutants - seeks to protect human health and the environment from Persistent Organic Pollutants, which are chemicals that remain intact in the environment for long periods, become widely distributed geographically and accumulate in the fatty tissue of humans and wildlife.	2001	2008
	International Convention for the Prevention of Pollution from Ships (MARPOL) – is the main international convention that's covers prevention of pollution of the marine environment by ships from operational or accidental causes. The Convention includes regulations aimed at preventing and minimizing pollution from ships, both accidental pollution and that from routine operations, and currently includes six technical Annexes.	1983	

Topic	Convention	Date of Treaty	Entry into Force in Pakistan
Desertification	International Convention to Combat Desertification – with an objective to combat desertification and mitigate the effects of drought. It is supported by international cooperation and partnership arrangements, with the aim of achieving sustainable use of land and water resources and sustainable development in affected areas.	1994	1997
Biodiversity and the protection of plants and animals	Convention on Biological Diversity – covering ecosystems, species, and genetic resources and also the field of biotechnology. The objectives are: • conserve of biological diversity; • sustainable use of its components; and • fair and equitable sharing of benefits arising from genetic resources.	1992	1994
	Cartagena Protocol on Biosafety to the Convention on Biological Diversity - addresses potential risks posed by living modified organisms resulting from modern biotechnology.	2000	2009
	Bonn Convention on the Conservation of Migratory Species of Wild Animals - aims to conserve terrestrial, marine and avian migratory species throughout their range. It is concerned with the conservation of wildlife and habitats on a global scale.	1979	1987
	Memorandum of Understanding concerning Conservation Measures for the Siberian Crane - parties undertakes to provide strict protection to Siberian Cranes, and identify and conserve wetland habitats essential for their survival.	1998	1999
	Convention on International Trade in Endangered	1973	1976
	Species of Wild Fauna and Flora - to ensure that international trade in specimens of wild animals and plants does not threaten their survival.		
	International Plant Protection Convention (1997 Revised Text) - to prevent the international spread of pests and plant diseases. It requires maintenance of lists of plant pests, tracking of pest outbreaks, and coordination of technical assistance between member nations.	1951/52	1954
	Agreement for the Establishment of the Near East Plant Protection Organization - to establish the Near East Plant Protection Organization (NEPPO), which promotes international co-operation with a view to implementing International Plant Protection Convention.	1993	2009
	Plant Protection Agreement for the Asia and Pacific Region and amendments – establishes the Asia and Pacific Plant Protection Commission to review and promote the region's progress in the implementation of the Agreement. Trade in plants and plant products are regulated by certification, prohibition, inspection, disinfection, quarantine, destruction, etc., as necessary.	1955 (amend-ment 1967)	1958 (amend-ment 1969)
	Convention on Wetlands of International Importance especially as Waterfowl Habitat and associated protocols and amendments - to promote conservation and sustainable use of wetlands. The Ramsar List of Wetlands of International Importance now includes almost 1,800 sites (known as Ramsar Sites). There are currently 19 Ramsar sites in Pakistan.	1971 (amended 1987)	1976 (amended 1994)

Topic	Convention	Date of Treaty	Entry into Force in Pakistan
Cultural heritage	Convention concerning the Protection of the World Cultural and Natural Heritage - requires parties to adapt a general policy on the protection of the natural and cultural heritage, to set up services for such protection, to develop scientific and technical studies, to take appropriate legal, technical, scientific and administrative measures and to foster training and education for such protection.	1972	1976

2.6 USAID Environmental Procedures

This section provides policy directives and required procedures on how to apply Title 22 of the Code of Federal Regulations, Part 216 (22 CFR 216) to the USAID assistance process. This is to ensure that the assessment of the environmental consequences of all programs, activities, and substantive amendments are in full compliance with the requirements of this Federal Regulation implementing the underlying legislation and out-of-court settlement.

Environmental sustainability is integral to USAID's overall goal, and therefore must be mainstreamed into all activities to achieve optimal results and to avoid inadvertent harm to people and the environment. To meet this goal, USAID incorporates environmental considerations into results-based planning and related activities This section defines what USAID and its operating units must do to integrate environmental issues into its programs, both to meet USG legal environmental obligations and to optimize economic and social development results. USAID's IEE (Tracking #: OAPA-14-Jan-Pak-0017) states that ongoing construction activity will result in a "Negative Determination with Conditions" for completion of the two run-of-river projects and associated power transmission lines. The conditions include the use of environmentally sound materials and safe construction practices, monitoring and evaluation, and preparation of a specific Environmental Mitigation and Monitoring Plan for the Activity. An REA is required subsequent to the approval of the IEE by BEO-OAPA.

The Foreign Assistance Act, Section 117, requires USAID to develop procedures that take environmental impacts fully into account in their funded Projects. FAA Section 118 was added, requiring any program or project affecting tropical forests to take full account of environmental impacts into consideration. Section 119 of FAA includes parallel language applying to endangered species and biodiversity. These obligations are implemented through Title 22 (Foreign Relations) of CFR, Volume 1, Part 216, hereinafter referred to as 22 CFR 216.

22 CFR 216 are the USAID's procedures to undertake the Environmental Impact Assessment of agency funded programs. The procedures apply to every USAID officer who has a role in the agency's funded projects and to every partner who seeks agency funds for implementation of development programs.

The basic requirements of 22 CFR 216 are:

- Every program, project, activity, or amendment must undergo an environmental impact assessment prior to obligation of funds.
- Potential impacts must be considered, and mitigation measures or design changes must be incorporated.
- The processes and procedures should be documented and made available to the public.

Further details of the procedure can be found on the USG website http://www.usaid.gov/our_work/environment/compliance/regulations-procedures.

3 Project Description

3.1 Introduction

This chapter provides a description of the Project. Information is extracted from: (i) the EIA prepared by WAPDA in collaboration with GTZ in December 1999;[8] (ii) a brief on the project prepared by WAPDA in April 2014 providing the salient features of the project, and an assessment study to determine environmental flow from the weir and the revised PC–1 of the Project.[9]

3.2 Project History

Sarhad Hydel Development Organization (SHYDO) carried out comprehensive inventory studies for identification of the hydroelectric power potential in the mountainous areas of KP in collaboration with the German Agency for Technical Corporation (GTZ). Out of this inventory, the DKHP site was selected, which is situated in the North of Besham on the Karakoram Highway (KKH), about 11 km on the northwest of Duber village located on the KKH.

The DKHP was first identified in 1988 within the frame of the master plan for hydroelectric power development in the KP province of Pakistan. The project was investigated by several disciplines, whereby alternatives were considered and discussed for nearly all structures of the scheme as well as for discharge and layout. The project was found suitable in comparison to the other alternatives due to favorable topographical, geological and hydrological conditions and its short distance from the national grid. The three schemes that initially were studied included:

- Scheme 1: Duber Khwar–Pattan.
- Scheme 2: Diversion scheme Kayal Khwar–Moze.
- Scheme 3: Moze–Pattan, in combination with scheme 2 only.

For each basic alternative, three design discharges were selected within a certain range. According to those assumptions the preliminary estimations were carried out. The optimum[10] size was determined on economical parameters.

The engineering geological report dated March, 1998, was taken as a basis for further design work within the feasibility study. During different surveys and assessments, it was found that the available data provided sufficient information to commence with the development of the DKHP.

3.3 Project Justification

The energy requirement in the various consumer sectors of Pakistan is increasing at a rapid pace. Due to the shortfall between supply and demand, various industries have shut their operations and the country has seen a major decline in its annual economic growth rate in the past decade.

Power outages of six to eight hours can be attributed to growth in demand for power, poor management of electricity transmission and distribution systems in the public sector, electricity theft due to meager resources to afford it, a shortfall in the supply of natural gas to the combined cycle Independent Power Producers (IPPs), the circular debt from withholding of payments by the government for fuel as well as power produced by the generating units, fluctuating prices of crude oil in international markets, and increasing electricity rates in the country. The peak summer shortfall in 2013 reached 6,000 MW, corresponding to nearly one-fourth of the estimated demand in the

[8] Feasibility Study of Duber Khwar Hydropower Project, Appendix 6, Environmental Impact Assessment, December 1999. Pakistan German Technical Co-operation and Sarhad Hydel Development Organisation.

[9] PC-I Form for Duber Khwar Hydropower Project (130 MW) (2nd Revision), August 2013, Organization: General Manager Projects (Northern Areas), WAPDA, Hattian, District Attock.

[10] Optimum is defined as the size (design discharge) where the marginal benefits are equal to the marginal cost.

country. The country therefore must generate additional power to feed into the national grid. Any slippage in the addition of new generation capacity or fuel availability will further widen the gap between supply and demand.

3.4 Project Location

The DKHP is located on Duber Nullah, a right bank tributary of the Indus River in Pattan Tehsil, District Kohistan of KP province of Pakistan. The district is bounded on the northeast by Gilgit Baltistan, on South East by Mansehra district and on West by district Swat. The location of the project is shown in Figure 1 in Section 1.1.

The powerhouse situated on the right bank of the Indus River (35° 06′ 21″ N, 72° 59′ 41″ E) is accessible by road and is approximately 270 km from Rawalpindi and 300 km from Peshawar. The weir structure is located on the west of the powerhouse on Duber Nullah (35° 07′ 10″ N, 72° 55′ 38″ E) at a geodesic distance of 6.3 km from the powerhouse. The weir is connected to the powerhouse via a headrace tunnel with a diameter of 2.6 m. A diversion tunnel of 452 m was constructed on the Duber Nullah during the construction period to divert the original flow of the Nullah and create a dry environment to carry out construction of the weir structure. A general layout of the DKHP is provided in Figure 2 in Section 1.4.

The climate of the project area is very cold in winter and warm in summer. Snowfall takes place during winter while Precipitation is low in summer. Pattan is the district headquarters of the Lower Kohistan district. It has twenty two (22) union councils. The local councils in Pattan have the technical support of various departments of the KP government, which includes communication, roads, agriculture, irrigation, fisheries, education, health, revenue, food, social welfare, wildlife and WAPDA.

The implementation phase of this project will affect the villages of Duber Bala, Duber Khas, Ranolia, Duber Paayan, Pattan, Keyal and Banil.

The location of the weir and intake of the main scheme is upstream of the village Banil at an altitude of about 1,196 m.a.s.l. The headrace tunnel crosses the mountains between the Duber valley and Indus valley at an elevation of 1,200 m.a.s.l. From this point, a penstock of 1,237.65 m leads to the power house. The designed capacity of the reservoir is about 500,000 m^3.

The weir site is located about 11 km upstream from the mouth of Duber Nullah opening in the Indus River. An off-road track from the bazar of Duber village on the KKH leads to the proposed weir site. This 11 km track needed development, improvement and maintenance for the construction activities at the proposed weir site.

The catchment area at the weir site is about 380 km2. The 1,000-year flood was estimated to be 2,500 m3/s, whereas a ten-year flood assumed for the construction period was estimated to be about 600 m3/s.

The weir is a reinforced concrete gravity structure equipped with five radial gates and one bottom outlet at the intake site which is situated at the left bank of Duber Nullah. The weir sill and bottom outlet are protected by steel plates. The headrace tunnel between Duber valley and its exit near Pattan is about 4,873 m long. At the end of the tunnel a surge tank is built from where a 1,237.65 m long penstock carries the flow to the installed vertical Pelton turbines with capacity of 65 MW each.

The external power house is located near the road from Pattan to Palas, at about a distance of 100 m from the right bank of the Indus River.

3.5 Project Components

The DKHP has an installed capacity of 130 MW, corresponding to a designed maximum discharge of 29 m^3/s at a mean gross head of 534 m achieved from a horizontal conduit of 4,873 meters. DKHP is capable of producing 595 GWh per year.

Major components of Duber weir site are shown in Figure 3. The description of the major structures and components of the project is given below and the salient features of the project are given Table 6.

Figure 3: Duber Weir Site

Table 6: Salient Features of the Project

Features	Details
Duber Nullah	
Catchment area at weir site	380 km^2
Mean monthly discharge	19.27 m^3/s
Total annual flow	608 hm^3
Reservoir	
Total storage capacity	0.563×10^6 m^3
Net volume	0.440×10^6 m^3
Live volume	0.370×10^6 m^3
Dead volume	0.096×10^6 m^3
Surface area	50,000 m^2
Length of reservoir	570 m
Weir Structure	
Height above river bed	26.70 m
Length of weir	111 m

Features	Details
Width at river bed	66 m
Stilling basin	Length: 73.5 m Width: 64.5 m
Flood Control	
Design flood (return period: approximately 1,000 years)	2,500 m^3/s
Two overflow sections with flap gates	6×2.5 m each
Five bottom outlets with radial gates	6×6.7 m each
River Diversion	
Diversion flood during construction	600 m^3/s
Diversion tunnel	Length: 425 m Diameter: 10.1 m
Sand Trap	
Four chamber	Length: 160 m Net Cross Area: 20 m^2
Gate chamber length	55 m
Access tunnel to gate chamber length	124.5 m
Sand flushing tunnel length	177 m
Power House	
Type of power house	External power house
Number of units	2 units (65 MW each)
Type of turbines	Vertical Pelton (6-nozzles each)
Rotation of units	428 rpm
Generator voltage	11 kV
Discharge per unit	14.5 m^3/s
Power and Energy	
Installed Capacity	130 MW
Firm capacity	105 MW
Mean annual peak energy	187 GWh
Mean annual off peak energy	408 GWh/annum
Total mean annual energy	595 GWh/annum
Plant factor	52%
Capacity	80 MVA
Number of generators	2
Daily peak hours	4
Losses	
Q_{design} =	29 m^3/s
Net Head	24.4 m
Maximum net head	516.1 m
Minimum net head	507.1 m
Abs minimum net head	504.1 m

3.5.1 Reservoir

The live storage of the reservoir required to achieve the four hours daily peak is met at the following reservoir levels:

- Maximum Operation Level: 1,218 meters above sea level (m.a.s.l)
- Minimum Operation Level: 1,206 m.a.s.l

3.5.2 Weir Structure

Based on various studies of alternate options while considering topography, geology, reservoir flushing requirements and flood control, the decision was made to build the weir having a height of 26.70 m above the river bed, with the length of 111 m, width of 66 m and a top elevation of 1,224 m.a.s.l. The maximum design flood of 2,500 m^3/s was selected for a thousand year return period. The feasibility design of the flood control includes two overflow sections with flat gates (6×2.5 m each) and five bottom outlets with radial gates (6×6.7 m each). During construction, the diversion of water during a flood stage of up to 600 m^3/s will be allowed through two diversions, one on each side of the river.

The location of the weir is approximately 11 km upstream of the village Duber that is located at KKH. A jeep-able road is used during suitable weather conditions to reach the weir site.

The weir axis is upstream of the Banil village, which is located near Tangai Nullah. Being a left tributary of Duber Nullah., the axis was identified within an area where the valley is wide enough to locate the flood control structures. The geological conditions are reasonable for the construction of a weir structure.

The weir structure design is described below.

- The maximum operation level in the reservoir is at 1,218 m.a.s.l; while the normal minimum operation level is at 1,218 m.a.s.l and the absolute minimum operation level is at 1,206 m.a.s.l.
- The total crest length of the weir is 111 m. the foundation level is at elevation 1,224 m.a.s.l. and is approximately 7 to 10 m below the river floor.

The height of the weir from the foundation level:

- To overflow crest at elevation. 1,219 m.a.s.l. is 26.70 m
- The weir bridge at elevation. 1,224 m.a.s.l. is 35 m

3.5.3 Conduit System

The conduit system of the DKHP from the reservoir to the power house consists of the following:

- Power Intake.
- Sand Trap.
- Headrace Tunnel (length 4,873 m with an internal diameter of 2.6 m).
- Surge Tank (with the surge shaft diameter of 5 m).
- Pressure Shafts and Tunnels.
- The design maximum gross head height of the conduit system is 540 m.

3.5.4 Power House

The main features of the power house are;

- Location in Pattan as seen on the layout (open power house instead of cavern).
- Two turbines at a distance of 12 m from each other, each with the capacity of 65 MW.
- The power house located on the right bank of the Indus River at a distance of 100 m.
- A 220 kV switchyard is also installed on the right bank of the Indus River to dispatch the generated power to the national grid.

3.5.5 Hydro-Mechanical Equipment

The comparative studies conducted for the feasibility design prefer an external type power house located at Pattan on the right bank of the Indus River near the KKH, North East of Besham and South West of Dassu. The power house comprises of the following structures:

- Two vertical Pelton turbines each with the capacity of 65 MW.
- Surface machine hall and operation building.
- Tailrace (with open canal 60 m and covered canal 192 m).
- Residential buildings.

The design discharge of 29 m^3/s for the main equipment will serve two vertical Pelton turbines of 65 MW capacity each. Each unit will have a rated flow of 14.5 m^3/s and a rated turbine speed of 428 rotations per minute (rpm).

3.5.6 Electrical Equipment

The Electrical equipment consists of;

- Two vertical shaft generators each with the capacity of 80 MVA are connected via 11 kV cables to the respective 11/132 kV block transformer located in a 132 kV outdoor switchyard.
- Auxiliary supply for all power needs of the power house is supplied through one 6.3 MVA 132/11 kV grid station transformer.
- Control and protection devices.

3.6 Project Construction Cost

The project cost of various associated components of the DKHP is provided in Table 7. A summary of the project cost presenting local and foreign cost is provided in Table 8.

Table 7: Project Costs

Components	Cost in First Revised PC–I[11] in (Million rupees)	Cost in Second Revised PC–I in (Million Rupees)	Increase in Cost (Million Rupees)
Preliminary Works			
Environmental impact mitigation cost	178.365	375.037	196.672
Improvement of existing and construction of new access roads	399.798	635.655	235.857
Site installation, camps/housing during construction	57.352	67.325	10.00
Total	654.580	1.110.385	455.805

[11] The Planning Commission is a financial and public policy development institution of the Government of Pakistan. PC–I is the Planning Commission's pro forma document for development of public projects in production, infrastructure and social sectors. The form includes technical and financial information, project justification and its provision in the Public Sector Development Programmes (PSDP). The pro forma document is filled and submitted to the Planning Commission by the project proponent for its approval and allocation of funds.

Components	Cost in First Revised PC–I[11] in (Million rupees)	Cost in Second Revised PC–I in (Million Rupees)	Increase in Cost (Million Rupees)
Civil works			
Reservoir and	8.190.572	8.585.494	394.922
River Diversion and weir foundation 1st and 2nd stage			
Weir structure			
Conduit system, surge tanks, headrace tunnels/shafts			
Power house and tailrace			
Switchyard			
Hydraulic steel works	468.835	1.454.175	985.340
Hydro mechanical equipment	622.254	967.617	345.363
Electrical equipment	1.429.585	2.366.997	937.412
Consultancy Services (Engineering and Supervision)[12]			
Evaluation of bids and award of contracts	410.907	453.877	42.970
Monitoring, co-ordination and approval of construction design and preparation of go ahead orders on behalf of the client for Implementation			
Inspection of works, construction Supervision and progress monitoring, contract administration and control			
Supervision of Installation, commissioning and acceptance Tests			
Training of personnel, maintenance, completion, reports, as-built drawings and manuals			

3.6.1 Administration, Audit and Accounts and Authority's Overheads

In the first revised PC–I, an amount of Rs. 362.793 million was allocated, which due to extension of project implantation period, was revised as Rs. 634.316 million. The expenditure on this item up to June 30 2012 was Rs. 540.321 million and for the anticipated period it is estimated at 2% of the project works cost.

3.6.1.1 Authority's Overheads

In the first revised PC–I, an amount of Rs. 167.012 million was allocated, which due to cost overrun, was revised as Rs. 212.330 million. The expenditure on this item up to June 30, 2012 was Rs. 540.321 million and for the anticipated period it is estimated at 1.5% of the project works cost.

3.6.2 Custom Duties

These include import charges, clearing and forwarding charges, L.C. charges and custom duties for each imported equipment and material. Custom duties at 5% and sales tax at 15% of the imported equipment and material have been added to the estimates.

[12] The cost for supervision and engineering has been taken as 4% on civil works and 2.5% on electro-mechanical equipment cost.

3.6.3 Interest during Construction

An amount of Rs. 1331.595 million has been paid as interest during construction (IDC) up to June 30, 2012. For the remaining period, the IDC has been estimated at 12.64% on both local and foreign costs.

Table 8: Summary of Project Capital Cost

Component	Estimated Cost in (Million Rupees)		
	Local	Foreign	Total
Preliminary Works	1,110.385	0.000	1,110.385
Civil Works	3,132.549	5,452.945	8,585.494
Hydraulic Steel Structures	196.328	1,257.847	1,454.175
Hydro-mechanical Equipment	0.000	967.617	967.617
Electrical Equipment	552.257	1,814.740	2,366.997
Transmission System	2,283.634	24.690	2,308.324
Engineering and Supervision	232.241	221.636	453.877
Custom Duties	349.801	0.000	349.801
Administration, Audit and Accounts	634.316	0.000	634.316
Authority's Overhead	212.330	0.000	212.330
Interest During Construction	2,380.405	0	2,380.405
Total Project Cost	**11,084.246**	**9,739.475**	**20,823.721**

3.7 Implementation Arrangements

The implementation arrangements for the Project included the following:[13]

- The project was initially identified by SHYDO in collaboration with GTZ between 1987 and 1991.
- The project was handed over to WAPDA for its execution.
- WAPDA conducted site identification studies through Engineering Consultancy International Limited (ECIL) to determine the most suitable location for the construction of weir at Duber Nullah and an associated power house.
- After site selection, WAPDA contracted High-Head Hydropower Consultants, NDC, Lahmeyer, Barqaab, BAK, PES, EGC, RC, IDC and DMC as consultants[8].
- The contractors were CWH-HE and VA Tech[8].

3.8 Technical Review of DKHP

The area of the DKHP has seen two major natural disasters during the past 10 years—the 2005 earthquake and the 2010 floods. These events resulted in cost overruns for the projects. A brief description of the events following these natural disasters is discussed below.[14]

3.8.1 2005 Earthquake

The 2005 Kashmir Earthquake was a 7.6-Magnitude earthquake that struck at 8:50 AM, local time, on October 8, 2005. The epicenter of the earthquake was located about 21 km, northeast of

[13] WAPDA, Projects for USAID Assistance (Ongoing – New) For 2013 – 2018, October 2013.

[14] The information is based on information provided during a meeting held between WAPDA (headed by General Manger Projects (Northern Areas) tenured while the DKHP was constructed), AEAI and the HBP teams.

Muzaffarabad, in Azad Jammu and Kashmir (34.493°N, 73.629°E). The epicenter was about 90 km southeast of the DKHP project site.

In light of, and subsequent to, the 2005 earthquake, an assessment[15] of the adequacy of earthquake design parameters for DKHP was carried out. While the assessment was independent, the results were similar to the previous seismic analysis. Nevertheless, a decision was taken to increase the earth quake resistance of the DKHP structures to accommodate the maximum credible acceleration (MCA) instead of the operational base earthquake (OBE). Increasing the earthquake resistance increased the expenditure as additional material, such as steel and concrete, were required.

The PC-1 (2nd revision) includes the costs associated with the design change during construction.

3.8.2 2010 Floods

No design changes were carried out in light of the 2010 floods. The design flow for the spillway for DKHP was higher than the 2010 flood observed at the spillway. Some visceral damage to the surface of the spillway was observed after the 2010 floods. While the spillway is not prone to major failure due to floods lower than the design flood, extremely large boulders carried by the flood waters caused some visceral damage to the spillway. The spillway required minor repairs at a relatively small cost.

The major cost associated with the 2010 floods was due to the following:

- The floods caused a halt in construction activities and delayed the Project by almost 2 years. Since the contractors were mobilized, contractually they still claim for delays.
- A period of large scale land-sliding upstream of the DKHP, debris flow, and sediment buildup followed the 2010 floods. During this period, additional expenditure was incurred for earth moving requirements. This further impeded and slowed down construction work during the period following the floods.
- Contractor and construction material costs increase over time due to inflation. Where the construction extends beyond what was originally planned, additional unbudgeted costs are incurred due to inflation.

The PC-1 (2nd revision) does not include the costs associated with the floods of 2010.

[15] High-Head Power Consultants, Allai Khwar, Duber Khwar and Khan Khwar High Head Hydropower Projects – Provision of Additional Copy of Engineer's Interim Seismic Hazard Assessment Report and Engineer's Recommendation for Upgrading of Earthquake Design Loading for Project Structures, October 21 2005.

4 Overview of Baseline Conditions

This discussion gives a brief account of the environmental and social baseline of the project area. The information given in this section is drawn from the previous EIA report prepared by WAPDA in collaboration with GTZ in December 1999.

4.1 Physical Environment

This section provides the physical baseline of the Project site and vicinity. Information has been derived from the EIA of the Duber Khwar Hydroelectric Power Project[16] and further information has been added where appropriate from secondary sources.

4.1.1 Topography

The project area is located near the center of KP province in a region broadly called Indus Kohistan. Characteristic feature of the area are mountains ranging from about 1,000 to 6,200 m.a.s.l., with height increasing from south to north. The vegetation is found up to the height of 3,400 m.a.s.l.

River Indus divides the region into two halves and flows mainly in the southeasterly direction.

A topographical map of the area is given in Figure 4.

4.1.2 Climate

Duber is located inside the Indus canyon surrounded by high mountains peak. This topographic setting gives rise to a strong valley breeze, which keep the temperature of the valley moderate. Summers are mostly dry due to leeward location of the area whereas winters receive rain and snow from December to March.

4.1.2.1 Temperature

Average daily temperatures of Duber area during December to February ranges between –4°C and 7°C, whereas during June to August it ranges between 21°C and 35°C. Occasionally the temperature rise to 40°C during June.

4.1.2.2 Precipitation

The precipitation of this area is mostly in the form of snowfall on surrounding peaks. However, deeper parts of the Indus canyon get only rainfall. Almost all the precipitation comes during winter. Mean annual rainfall is about 400 mm.

[16] Feasibility Study of Duber Khwar Hydropower Project Appendix 6, Environmental Impact Assessment, December 1999, Pakistan German Technical co-operation, Sarhad Hydel Development organization.

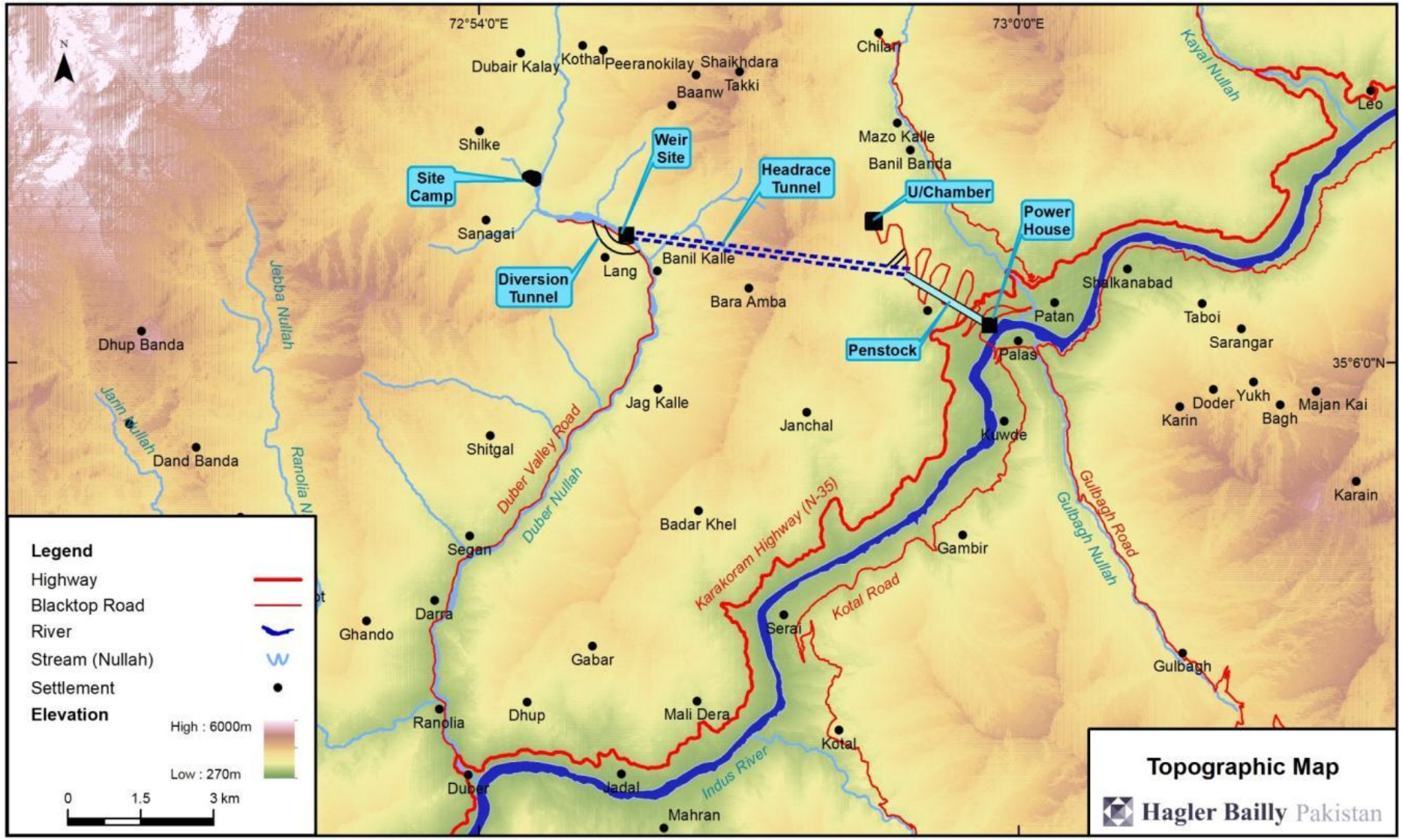

Figure 4: Topographic Map

4.1.3 Geology and Seismicity

The area is geologically marked by intruded, folded and faulted metamorphic and igneous rocks. Within the project area, the tectonic setting is dominated by the presence of the Main Mantle Thrust (MMT)[17]. The MMT crosses the project area about one kilometer north of the dam site. The Thakot shear zone[18] was positively identified at the site. Therefore, a serious concern is the potential occurrence of seismic events, which could result in very high peak ground accelerations (PGA). As shown in Figure 5, prior to the 2005 Earthquake, the Duber region was categorized as Zone 2 under the Building Code of Pakistan.[19] Subsequent to the earthquake, the zoning was revised. Figure 6 shows that Duber region falls in seismic Zone 3 after the 2005 earthquake.

[17] The single Indus suture was bifurcated into two sutures in the western Ladakh which extends into Pakistan. The two sutures are differentiated as the Northern Megashear and the Main Mantle Thrust (MMT). The MMT is one of the important major tectonic scars on the northwestern terminus of the Himalaya.
(Tahirkheli, R.A. Khan . "The Main Mantle Thrust: Its Score in Metallogeny of Northern Pakistan." *Geological Bulletin* Vol. 13, no. 19 (1979): pp 193 - 198. http://nceg.upesh.edu.pk/GeologicalBulletin/Vol-13-1979/Vol-13-1979-Paper21.pdf Acessed on **7** May 2014).

[18] The Thakot-Allai road passes through several weak geological features/zones known as the Thakot Shear Zone. (Khan, Mohammad Abid. *Journal of Himalayan Earth Sciences* Vol. 47, no. 01 (2014): pp. 131-140. http://nceg.upesh.edu.pk/GeologicalBulletin/Vol-47(1)-2014/Vol-47(1)-2014-Paper11.pdf. Accessed on 7 May 2014).

[19] Government of Pakistan, Ministry of Housing and Works, Environment and Urban Affairs Division. Building Code of Pakistan; 1986.

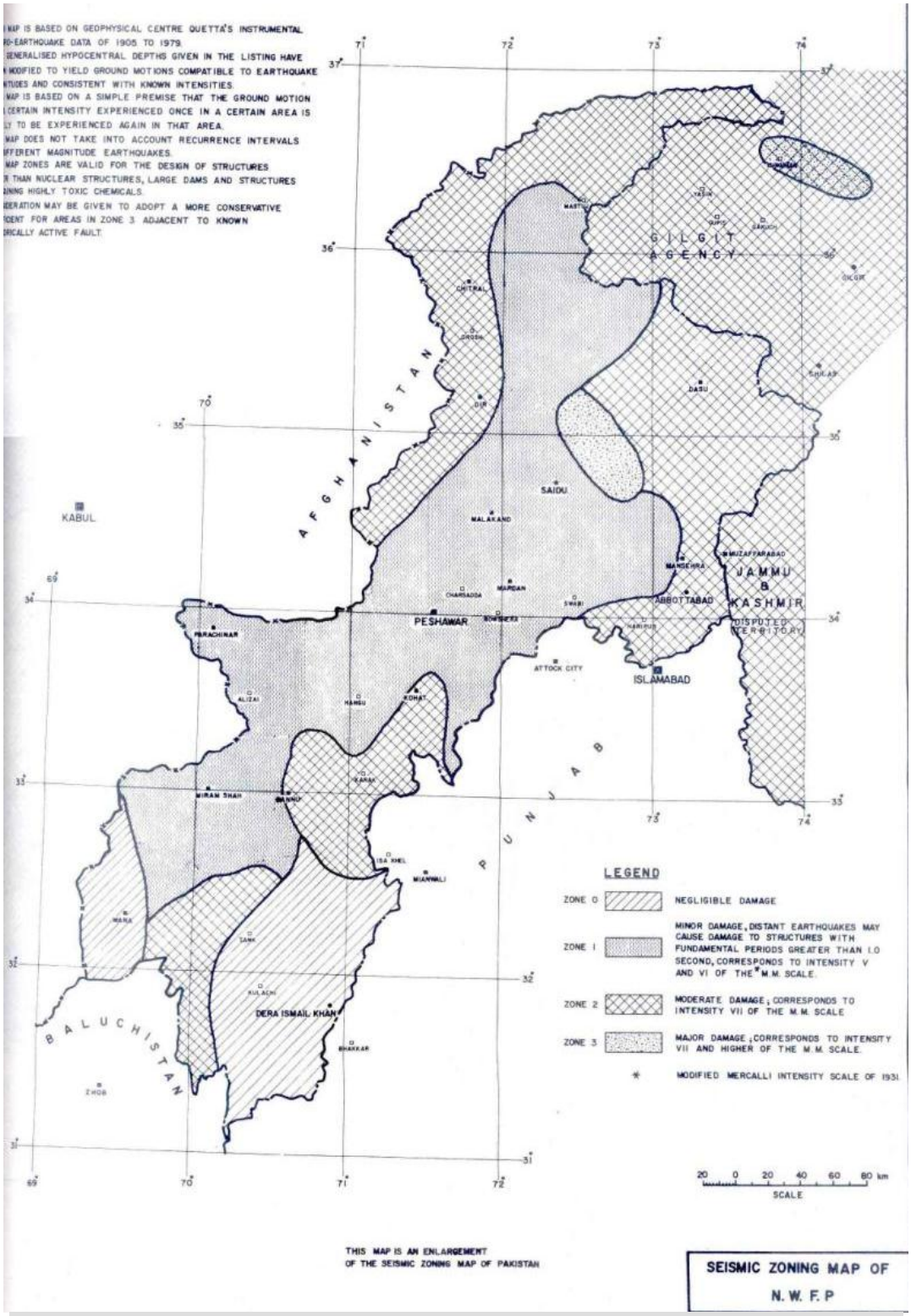

Figure 5: Seismic Zoning Map of Northern Pakistan Prior to 2005

Source: Government of Pakistan, Ministry of Housing and Works, Environment and Urban Affairs Division. Building Code of Pakistan. 1986

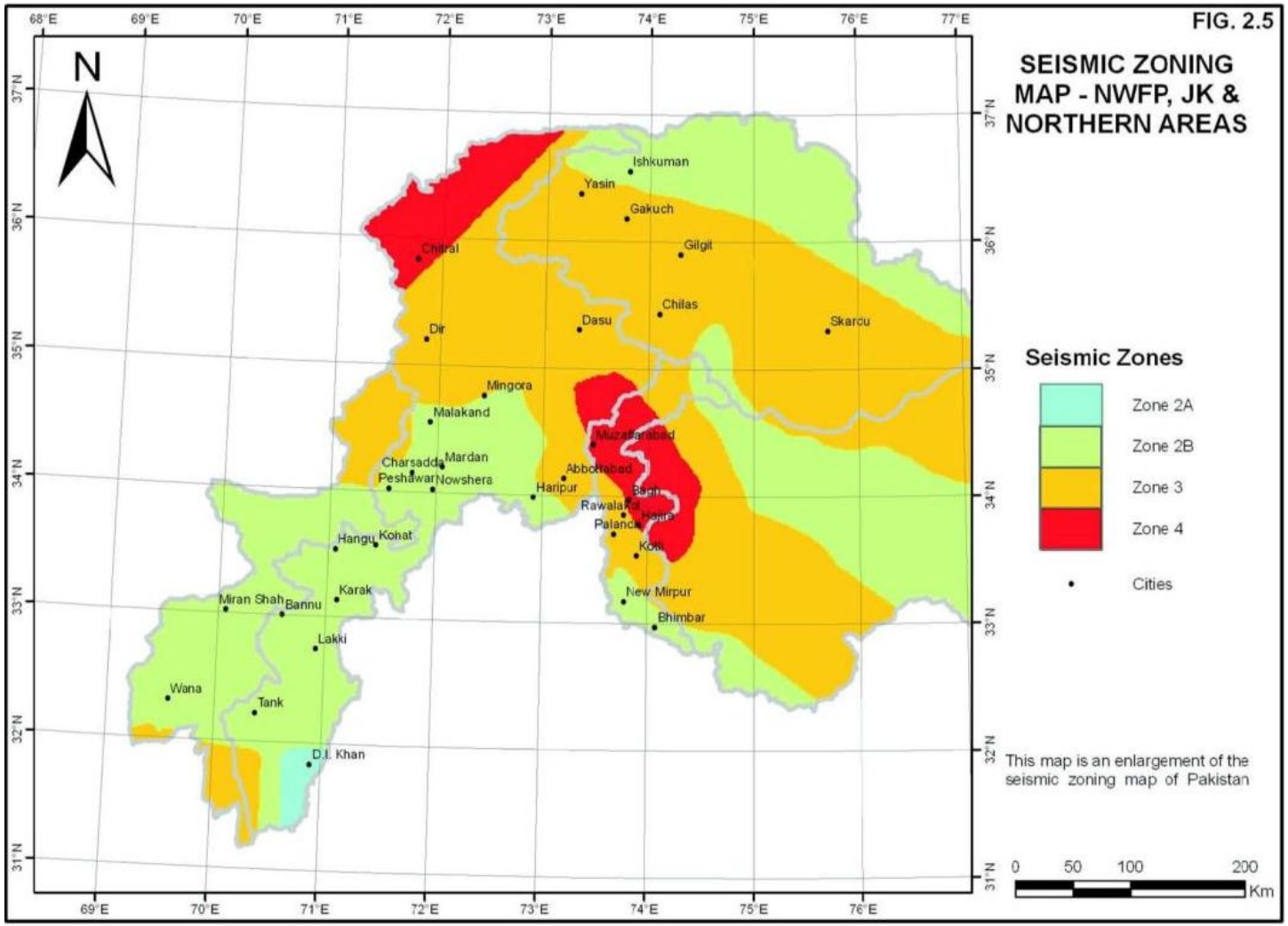

Figure 6: Seismic Zoning Map of Northern Pakistan

Source: Government of Pakistan, *Building Code of Pakistan Seismic Provisions – 2007*, http://www.pec.org.pk/buildingcode.aspx accessed May 2014

4.1.4 Hydrology and Existing Water Needs

Stream flow data of Duber Nullah is available since 1992. The run of in the stream and sub-streams is mainly influenced by snow melt. The snow melt takes place between March and June. The monsoon rains in the upper catchment helps to increase the flow in August and September. The precipitation generally decreases from south to north. The catchment area of Duber weir site is 375 km^2. The observed normal, peak and minimum flows in Duber Khwar are shown in Table 9.

Table 9: Summary of flows in Duber Nullah

Year	Mean Annual Discharge (in m^3/s)	Daily Maximum Discharge (in m^3/s)	Daily Minimum Discharge (in m^3/s)
1993	21.65	79.06	5.69
1994	24.86	70.60	5.37
1995	27.64	80.19	5.28

4.1.5 Sedimentation

An investigation on sedimentation has been carried out in different similar areas but not specifically for the Project site. Such studies carry more significance for Duber Nullah weir site as it includes construction of the weir to give a reservoir capacity of 500,000 m^3. This storage will be necessary to collect water during low flow months and use it to run the plant for peak hour generation. In case of a heavy sediment rate, the storage capacity is most likely to be depleted, reducing the utilization of the total installed capacity of the plant during the lean month. The catchment of Duber Nullah at the proposed diversion site is 375 km^2. Based on an empirical formula worked out for these catchments, the sediment transport would be 1,650 tons/km^2.

4.2 Biological Environment

This section provides an overview of the aquatic and terrestrial ecological resources of the Project site and vicinity. Information has been derived from the WAPDA EIA, literature review of scientific journals, relevant websites and articles, as well as a field visit to the Project site.

4.2.1 Terrestrial Ecological Resources

4.2.1.1 Vegetation

There are four phyto-geographical regions in Pakistan. The Project area, which is located in Lower Kohistan, falls into the Sino Japanese region. This region is considered very rich in vegetative diversity and represents 10.6% of the total flora of Pakistan. It comprises evergreen coniferous forest, subtropical thorny forest, and deciduous trees forest. The conifers of this region include Blue Pine *Pinus wallichana*, Cedar *Cederus deodara*, Spruce *Picea smithiana* and Yew *Taxus baccata*. In addition some deciduous trees like Oak *Quercus baloot*, Horse Chestnut *Aesculus hippocastanum*, Maple *Acer japonicum*, Poplar *Populous mexicana* and *Prunus* sp. are also found in this region (Rafiq and Nasir 1995)[20].

The Kohistan area is mainly characterized by steep valleys and precipitous mountains. The vegetation of this area mainly consists of West Himalayan temperate forest, subalpine Himalayan forest, as well as alpine scrub and meadows. The West Himalayan temperate vegetation type covers the lower slopes (up to 3,000 m area). The vegetation of this zone is a mix of evergreen coniferous and deciduous broadleaf trees. The main coniferous species found in this zone consist of Cedar *Cederus deodara*, Blue Pine *Pinus wallichana*, Siver Fir *Abies pindrow*, Spuce *Picea smithiana*, Oak *Quercus baloot* and *Quercus semecarpifolia*. A variety of deciduous broadleaf trees are also found which include Maples *Acer japonicum*, Amlok *Diopyros lotus*, Walnut *Juglans regia* and rare Elm *Ulmus wallichiana*.

[20] Rafiq, Rubina A., and Nasir, Yasin J. 1995. Wild Flowers of Pakistan, Oxford University Press.

Main shrubs species include *Artemisia maritime, Indigofera sp. Ephedra sp. Daphne oleoides, Sophora sp. Cotoneaster sp. Jasminum sp. Sorbaria tomentosa* and *Caragana sp. (*Raja *et al)*[21]. Above 3,000 m, a subalpine Himalayan birch forest is found grading into alpine scrub and meadows above 3,300 m. The main vegetation species found in this zone are *Betula utilis*, *Pyrus foliosa* and *Rhododendron sp*.

There is no continuous canopy of forests at the site of the weir or power house. [22] The forests are located at a higher altitude. Plants species observed in the vicinity of the Project site during the April 2014 field visit include *Morus alba*, *Melia azadhrach, Malwa sp.,* Oak *Quercus, Canabis sativa, Barbaris, Rosa sp, Azandharicata indica, Populs Casia sp., Albizia lebbek, Amaranthus viridis, Ficus sp. Olea ferroginea, Pinus roxburgii.*

4.2.1.2 Birds

The avi-fauna of the Project site and vicinity is diverse and consists of both resident birds as well as summer and winter migrants. Abundant birds reported from the area include Snow Partridge *Lerwa lerwa*, Snow Cock *Tetraogallus himalayensis*, Monal Pheasant *Lophophorus impejanus*, Tragopan *Tragopan melanocephalus*, Koklass Pheasant *Pucrasia macrolopha*, Jungle Crow *Corvus macrorhynchos* and Golden Eagle *Aquila chrysaetos*[23]. Of these, the Tragopan *Tragopan melanocephalus* is listed as vulnerable in the IUCN Red List 2013[24] while some members of the Family Accipitridae are included in CITES Appendix II[25].

Ornithological surveys carried out between May 1987 and December 1996 in the Palas Valley, District Kohistan (located approximately 22 km from the Project site) reported 157 bird species from the area[26]. The surveys primarily concentrated on locating pheasants, principally the globally threatened Western Tragopan *Tragopan melanocephalus*, for which Palas is believed to support the largest single population in the world. Eight restricted range species have been reported from the Palas Valley including Western Tragopan *Tragopan melanocephalus*, Kashmir Nuthatch *Sitta cashmirensis*, White-Cheeked Tit *Aegithalos leucogenys*, White-Throated Tit *Aegithalos niveogularis*, Brooks's Leaf Warbler *Phylloscopus subviridis*, Tytler's Leaf Warbler *Phylloscopus tytleri*, Spectacled Finch *Callacanthis burtoni*, Orange Bullfinch.

4.2.1.3 Mammals

Mammals reported from the Project site and vicinity include Snow Leopard *Panthera uncia*, Common Leopard *Panthera pardus*, Markhor *Capra falconeri*, Monkey *Macaca mulatta*, Grey Goral *Nemorhaedus goral*, Himalayan Ibex *Capra ibex*, Musk Deer *Moschus chrysogaster* and Black Bear *Ursus thibetanus* [27].

Small mammals reported from the Project site and vicinity include the Small Kashmir Flying Squirrel *Hylopetes fimbriatus*, Giant-red Flying-squirrel *Petaurista peturista*, Royle's Pika *Ochotona roylei*, Indian-crested Porcupine *Hystrix indica*, Long-Tailed Marmot *Marmota caudata*, Black Rat *Rattus rattus*, Turkestan Rat *Rattus pyctoris*, House Mouse *Mus musculus*, Wood Mouse *Apodemus sylvaticus,* Birch Mouse *Sicista*, Shrew *Crocidura attenuata*, and at least two species of bat *Pipistrellus*[28].

Among these, the mammals of conservation importance include the following: the Snow Leopard *Panthera uncia,* Markhor *Capra falconeri* and Himalayan Musk Deer *Moschus chrysogaster* are listed as endangered; the Common Leopard *Panthera pardus* is listed as near threatened; and the Asiatic Black Bear *Ursus thibetanus* is listed as vulnerable.

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21 Raja N. A., Davidson P., Bean R., Drijvers R., Showler D. A., and Baker C. 1999. The birds of Palas, North-West Frontier Province, Pakistan. Forktail (15): 77-85.

22 Feasibility Study of Duber Khwar Hydropower Project, Appendix 6, Environmental Impact Assessment, December 1999. Ministry of Water and Power in collaboration with GTZ, German Agency for Technical Co-operation.

23 The Feasibility Study of Duber Khwar Hydropower Project, Appendix 6, Environmental Impact Assessment, December 1999. Pakistan German Technical Co-operation and Sarhad Hydel Development Organisation.

24 IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 22 April 2014.

25 UNEP-WCMC. 24 April, 2014. UNEP-WCMC Species Database: CITES-Listed Species.

26 N.A Raja et al (1999, the birds of Palas Northern-West Frontier Province, Fork tail 15 (1999): 77-85.

27 The Feasibility Study of Duber Khwar Hydropower Project, Appendix 6, Environmental Impact Assessment, December 1999. Pakistan German Technical Co-operation and Sarhad Hydel Development Organisation.

28 Sarfraz Hayat, July 2009, Palas Valley Conservation project in Kohistan, Pakistan.

4.2.1.4 Reptiles

Little information is available about the herpeto-fauna of the Project site and vicinity. However, according to information provided by herpeto-faunal experts[29], no threatened amphibian or reptile species is present in Project site or vicinity.

4.2.2 Aquatic Ecological Resources

A total of six fish species have been recorded from the River Indus and Duber Khwar in the vicinity of the Project site and vicinity. An outline of these fish species as well as the flow and migratory requirements for feeding, wintering and breeding of these fish species are given below.

4.2.2.1 Diversity of Fish Fauna

A total of six fish species have been reported from the Duber Khwar and adjacent reaches of the River Indus.[30] [31] Some of these fish species have been recorded both from the River Indus as well as Duber Khwar. These include the Alwan Snow Trout *Schizothorax plagiostomus,* Tibetan Catfish *Glyptosternum reticulatum,* and Chitral Loach *Triplophysa choprai*. In addition to these species, two fish species have been reported from the River Indus but have not been recorded from Duber Khwar. These include Kunar Snow Trout *Racoma labiate,* and Bhed Catfish *Glyptothorax stocki.* The Brown Trout *Salmo trutta fario* is an exotic species introduced in to the Duber Khwar (Table 10).

Among these fish species, only one species the *Schizothorax plagistomus richardsonii* is listed as vulnerable in the IUCN Red List[32]. None of these species are endemic.

Table 10: Fish Diversity of River Indus and Duber Khwar in Project site and vicinity

No.	Common Name	Scientific name	Endemism	IUCN Status	Distribution
1	Alwan Snow Trout	*Schizothorax plagistomus richardsonii*		Vulnerable	River Indus and Duber Khwar
2	Tibetan Catfish	*Glyptosternum reticulatum*			River Indus and Duber Khwar
3	Chitral Loach	*Triplophysa choprai*			River Indus and Duber Khwar
4	Kunar Snow trout	*Racoma labiate*			River Indus
5	Bhed Catfish	*Glyptothorax stocki*			River Indus
6	Brown Trout	*Salmo trutta fario*			Introduced species in Duber Khwar

The River Indus in Kohistan flows into a deep gorge. Due to this, the river in these reaches is deep and torrential and water velocities are high. Most of the fish cannot withstand this intense water pressure of the river[33] and therefore, fish diversity of the River Indus in Kohistan is comparatively lower than upstream and downstream river reaches[34].

[29] Personal Communication with Rafaqat Masroor, herpeto-faunal expert, Pakistan Museum of Natural History, Islamabad on 7 May, 2014.

[30] Rafique, M 2000. Fish Diversity and Distribution in Indus River and its Drainage system. Pakistan J. Zool., 32(4): 321-332.

[31] Rafique, M 2001. Fish fauna of the Himalaya in Pakistan with comments on the origin and dispersal of its High Asian Elements. Pakistan J. Zool., 33(4): 279-288.

[32] IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 22 April 2014.

[33] Rafique, M 2000. Fish Diversity and Distribution in Indus River and its Drainage system. Pakistan J. Zool., 32(4): 321-332.

[34] Omer, T. and Mirza, M.R., 1975. A checklist of the Fishes of Hazara District, Pakistan, with the description of a new subspecies. *Biologia*, **21**: 199-209.

The Snow Trout *Schizothorax plagiostomus* is the most common fish in the Indus River near the Project site and vicinity. Even though this is a commercially important fish, fishing in the Duber Khwar area is not common due to low abundance of this fish as well as fast water currents that make fishing difficult.

4.2.2.2 Flow and Migratory Requirements for Feeding, Wintering, or Breeding of Fish

Schizothorax plagiostomus is primarily a river fish. However, it cannot breed in the River Indus due to the torrential nature of the river in Kohistan. Before the onset of the breeding season (July/August), it migrates to upstream tributaries (nullahs) for feeding and breeding. The newly hatched fries and fingerlings of the species remain in the tributaries to avoid the fast water currents of the River Indus, and return to the main river for wintering only after they have attained a certain size. The Duber Khwar thus provides a breeding ground and habitat for the *Schizothorax plagiostomus.* Although this fish is common in the River Indus in the northern areas of Pakistan, it is listed as vulnerable in the IUCN Red List (the alternative scientific name of this fish is *Schizothorax richardsonii*,) due to drastic declines in many areas of its range caused by the introduction of exotics, damming and overfishing[35].

The cat fish *Glyptosterrnum reticulatum* is a common and widespread fish in the northern areas of Pakistan. It generally inhabits the shallow stream waters and also breeds and feeds in water bodies with cobbly, stony and gravely beds. Duber Khwar provides breeding habitat for this fish.[36]

The species *Triplophysa choprai* is common in River Indus in Kohistan. It is also found in Swat, Dir and parts of Hazara.[37] [38] Duber Khwar provides breeding habitat for this fish.

Racoma labiata is a rare fish of the River Indus. It can withstand fast currents and turbidity. Similarly, the *Glyptothorax stocki* has the ability to survive in turbid waters among big boulders. It has been recorded in the River Indus but not Duber Khwar. Both of these fish are river fish and not dependent on Duber Khwar for breeding.

In 1990, a trout hatchery for the Brown Trout *Salmo trutta fario* was established near Duber town[39]. However, it uses spring water and not the waters of Duber Khwar and so will not be affected by Project induced changes in Duber Khwar or River Indus. Some specimens of *Salmo trutta fario* have been introduced in to the Duber Khwar but information regarding their current population status is not available.

4.2.3 Protected Area or Critical habitat

There is no national park or protected area in the Project site or vicinity. Moreover, the area does not meet any of the criteria of Critical Habitat as outlined in Performance Standard 6. [40]

4.3 Socioeconomic Environment

4.3.1 Population

Population figures of the area according to the 1981 census of Union Council Duber, Pattan and Keyal are as follows (Table 11).

Table 11: Male and Female Population of the Area

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35 IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 22 April 2014.

36 Rafique, M 2000. Fish Diversity and Distribution in Indus River and its Drainage system. Pakistan J. Zool., 32(4): 321-332.

37 Omer, T. and Mirza, M.R., 1975. A checklist of the Fishes of Hazara District, Pakistan, with the description of a new subspecies. *Biologia*, **21**: 199-209.

38 Rafique, M and Hamid, I. 2002 Fish fauna of Swat and Bunair Valleys, N.W.F.P., Pakistan. Rec. Zool. Surv. Pakistan, 14: 43-48.

39 The Feasibility Study of Duber Khwar Hydropower Project, Appendix 6, Environmental Impact Assessment, December 1999. Pakistan German Technical Co-operation and Sarhad Hydel Development Organisation.

40 Policy on Social and Environmental Sustainability, January 2012. Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources, International Finance Corporation. The World Bank Group.

	Male	Female	Total
Union Council Duber	28,610	19,719	48,329
Union Council Patan	9,538	7,447	16,985
Union Council Keyal	12,099	8,419	20,518
Grand Total			**79,336**

Families of brothers and cousins live under joint family system. This living provides protection against their enemies and helps in the collective development and utilization of available resources. The average per household is 9 persons. The population growth rate has been reported to be about 3%. Literacy rate is low. Considering that 59% of the population is less than 20 years old, there are only 400 to 500 students in schools from primary to matric level. A key reason for this is the seasonal immigration of families to the high lands in summer and returning to their villages in autumn.

4.3.2 Religion, Customs and Ownership

Religion of the entire population is Islam. They speak both Kohistani and Pashto. Some educated people also understand Urdu.

Houses and land property are individually owned; holdings are small and, due to the growing population of the area are becoming increasingly small. Forest, pasture and water are the joint property of the people. Gujars who lead a nomadic life live with their herds at high altitudes. They take their herds to lower altitude during winter where they sell some of their stock and return to their abode during summer.

For a long period of time, the people of the area have believed in a democratic system of local governance. Jirgas are formed to settle issues. Almost all decisions are made by general consensus and influential people are not allowed to dominate decisions. In order to resolve conflicts, community consensus has proved most effective.

4.3.3 Public Facilities

Karakoram Highway is the major source of communication for trade and transport. Duber bazar is an important trade center of the area, where sheep wool, hide, mushrooms, poultry and honey are sold as local products. Flour, ghee and other edibles, cloth and medicine are among important items that are transported from down country for sale in this area. The village has a Government high school for education and Government dispensary for health services.

4.3.4 Agriculture and Other Livelihood

Both irrigated and rain water farming is practiced. The important crops consist of wheat, maize and some vegetables. As the rainfall is low, rainwater farming is given less attention. Most of the cultivable lands in the rain fed (Barani) areas are unused. The Agriculture Department is encouraging the people to grow apple and Japanese fruit. Pastures are utilized to raise herds, which is one of the major sources of revenue for the people.

After they cultivate their lands, people who have small land holdings move down the country where they work as laborers. Their women and children look after these farms during their absence. The estimated cultivable land available is 9,212 hectares out of which only 1,943 hectares are irrigated. The predominant crop is corn, grown on more than 90% of the land. Other crops are wheat and vegetables.

Other than agriculture, livestock and timber are the major income generating means. A large number of healthy male folk work mostly outside as laborers.

4.3.5 Public Health and Diseases

Kohistan is one of the backward and economically depressed areas of KP. Duber, like all the other villages of the area, has no proper health center or hospital. As a result, complicated cases have to be taken to Saidu Sharif or Abbottabad for attention. No proper drinking water treatment system is employed in the area which usually results in various ailments to the local people. Main diseases are reports to be malaria, dysentery, typhoid, skin infection, cholera, tuberculosis, and leprosy.

4.4 Change in Site Conditions and Effect of 2010 Floods

The Team visited the DKHP site during April 24 to 27 2014. During the visit, thorough inspection and observations were carried out to establish environmental and social baseline conditions and make note of any significant changes relative to conditions discussed in WAPDA EIA. Prior to the field visit, the GIS team prepared a land use map (Figure 7) of the area using Google Earth images to clearly identify agricultural land, forest land and land being occupied by community settlements.

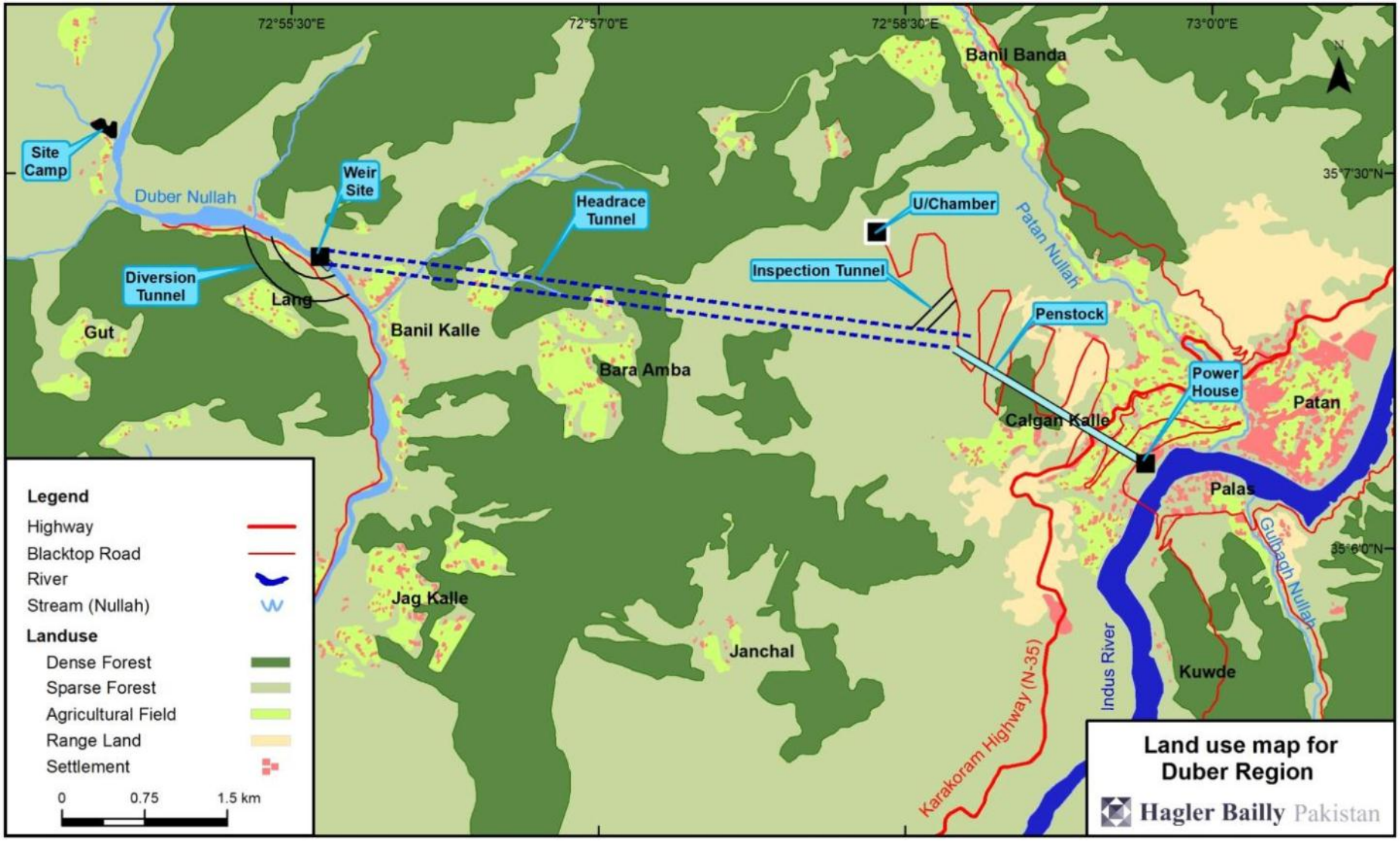


Figure 7: Land use Map for Duber region

4.4.1 Weir Site

At the weir site, major changes in terms of environment were observed during the field visit. Major changes were observed in the pattern of the Duber Khwar bed (Figure 8 and Figure 9). Local communities reported that the 2010 floods had caused catastrophic damage in the area. Relative to Allai Khwar, lesser communities (Figure 7) are settled on the banks of Duber Khwar; therefore damage to houses was relatively limited. However, the access road for Duber weir, which passed along Duber Khwar, was completely damaged during the 2010 floods. The locals reported that the flow was very strong and carried huge rocks and boulders from the mountains. WAPDA officials at Duber weir reported that minor damages to construction work of the weir had taken place during the 2010 floods and remediation works were carried out. Besides changes caused by the floods, no major changes in the physical or social environment were observed.

The earthquake in 2005 was a major disaster in the area, which caused damage in the village of Duber and surrounding areas. According to the locals, the effects of the earthquake were less severe in Duber relative to the Allai region. Local communities reported that the damage caused by floods in 2010 was significantly more than the damage caused by the 2005 earthquake in the area. WAPDA officials did not report any major damage to the weir construction site due to the earthquake in 2005. A seismic map is given in Figure 10.

4.4.2 Power House

At the powerhouse site, the HBP team observed no major changes in the Indus River bed. The local communities reported that although the flood in 2010 was severe in nature, the Indus River bed was wide enough to accommodate the high flows. WAPDA officials reported that no damage to the powerhouse construction or structure was caused by the floods. No observation to establish that the environmental and social conditions had changed since year 2000 was made. The landscape around Duber powerhouse is shown in Figure 11.

Figure 8: Duber Khwar Bed

Figure 9: Duber Reservoir

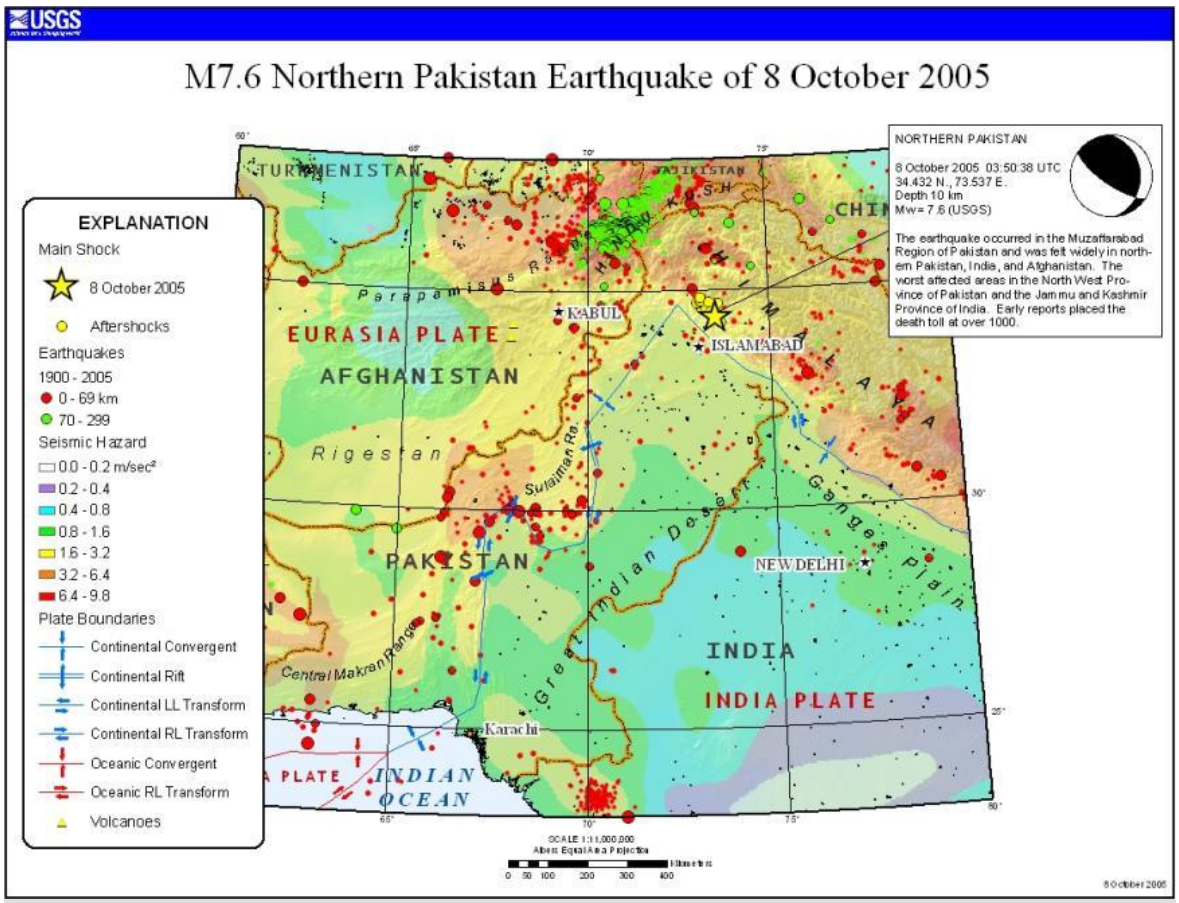


Figure 10: Northern Pakistan Earthquake of October 8, 2005

Figure 11: Landscape around Duber Powerhouse

5 Rapid Environmental and Social Assessment of Duber Khwar Hydroelectric Power Project

5.1 Introduction

This section summarizes the impacts of Project design and construction on the physical environment, terrestrial ecological resources and the socio-economic environment. It includes impacts identified in the WAPDA EIA and impacts identified by the REA Team. Further comments from stakeholders concerning the identified impacts are also included. The section also summarizes the current EHS mitigation, monitoring and supervision at the site.

5.2 Methodology

The WAPDA EIA for the Project was reviewed, including the potential impacts and recommended monitoring and mitigation plans. From the data collected during reviews, an inventory of issues was developed before the field visit. This inventory is given in Annex II. The field visit was carried out from April 24 to April 27, 2014. The field visit was used to assess compliance with environmental guidelines, mitigation measures identified in the EIA, and to assess additional environmental issues identified by the Team. Additional documents provided during the field visits were also incorporated into the inventory.

During the field visit, the Project facilities and environmental aspects were thoroughly inspected by the Team. Field documents such as accident registers, health and safety guidelines and environmental mitigation/monitoring documents were also reviewed where these were available. Interviews were conducted with WAPDA staff working on site; including guards, cleaners, engineers and administrative staff. Separate meetings with WAPDA officials in Besham were also conducted. Further verification of information regarding environmental and social impacts was carried out through community stakeholder consultations conducted by the HBP team at the following locations:

- Shop owners in nearby areas.
- Residents in nearby areas
- A local member of the Provincial Assembly (MPA) and local influential people.
- Communities downstream of Duber weir.
- Communities upstream of Duber weir.

Pictures taken at the Project site during inspection of the weir and powerhouse are provided in Figure 13**.** Pictures of consultations with local tribal leaders and communities are also attached in Figure 13**.** Locations where consultations were carried out are shown Figure 12. Per local cultural norms, pictures were not allowed during most of the consultation meetings.

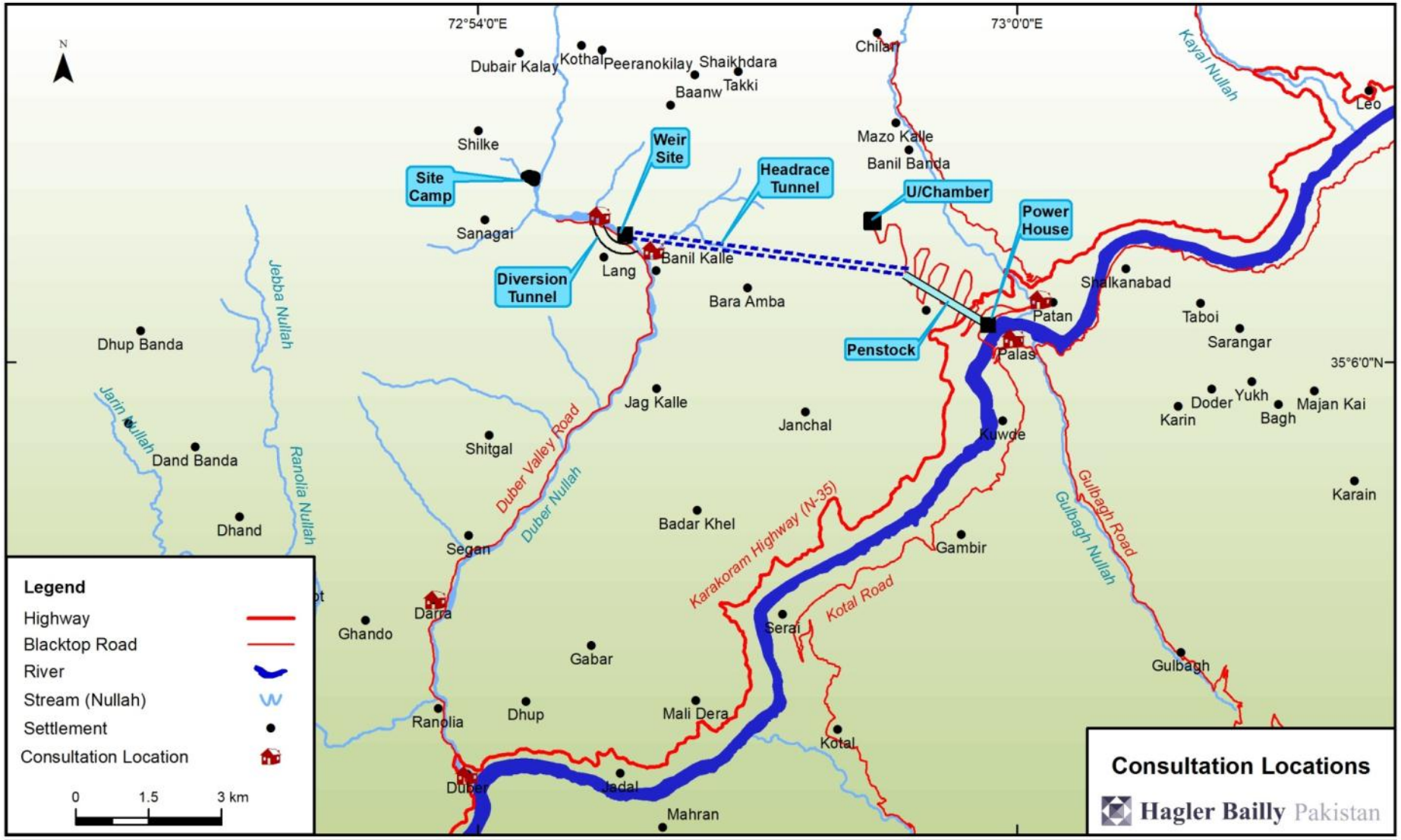


Figure 12: Consultation Locations

5.3 Impacts Related to Project Design Identified in WAPDA EIA

The impacts associated with Project location and design were categorized in the EIA prepared by WAPDA in December 1999. Impacts on rest water requirements due to design and location of the weir are presented in Section 7 (Environmental Impact) of the EIA prepared by WAPDA.

5.3.1.1 DP1: Impact on rest water availability

The EIA identified that the construction of the weir may have significant potential impacts on water availability for the community located downstream of the weir (i.e. rest water availability). Water downstream of the weir is required for irrigation, operation of water mills and micro-hydels, domestic use, wildlife and domestic animals, sanitation and dilution of effluents, and fisheries. The diversion of flow from the reservoir to the headrace tunnel for power generation could deprive the downstream reaches of the Duber Nullah and impact the community at Duber village. This could significantly impact the local community. The condition is expected to be more critical during the winter months characterized by lower water flow.

This may not have a significant impact as the Project has a provision to release adequate amount of environmental flow (0.944 m^3/s)[41]. During the visit, the HBP team observed that an adequate amount of environmental flow[42] as committed in the EIA was being released downstream of the weir into the Duber Nullah (Figure 13g). During consultation with the local community, it was noted that there is no significant impact of diversion of water at the weir on downstream water availability. Specific observations to confirm this finding related to environmental flow are included in the following sections covering construction and operation of the Project. Release of environmental flows should be continued and impacts should be monitored particularly during the low flow season.

5.3.1.2 DP2: Impacts on land-use due to the location of penstock

The initial design of the Project included a penstock alignment passing through a graveyard. However, the local community had reservations, and the design was changed to accommodate these. The penstock is now located underground. This design change mitigated the negative impact and helped avoid a potential social conflict.

5.3.1.3 DS1: Impacts due to resettlement/displacement of people

The location of the Project may require resettlement or displacement of affected persons. The displacement may have a socioeconomic impact. Mitigation measures provided in the EIA include a carefully planned resettlement program so that a minimal number of people are affected. In addition, a budget was allocated to adequately compensate affected people.

No issues related to resettlement were reported by the local community or stakeholders during the field visit (Figure 13i).

5.3.1.4 DS2: Impacts on livestock due to the location of weir

The diversion of water through the headrace for generation of hydroelectric power was expected to reduce the availability of drinking water for animals. This is unlikely to have a significant impact as the Project has a provision to release an adequate amount of environmental flow (0.944 m^3/s).

During consultations, no issues were reported with respect to water availability (also see DP1). The HBP team observed an adequate amount of environmental flow downstream of the weir.

[41] It is the minimum flow release for the lean period as determined by the WAPDA Environment Cell (WEC) during the study conducted in May, 2010 for the assessment of environmental flow from the weir site.

[42] The term 'rest flow' has been replaced with environmental flow in this report which is a term currently being used in the industry. Environmental flow is defined to cover both ecological use and flow required for supporting ecosystem services.

5.3.2 Additional Impacts Associated with Project Siting/Design

This section provides an account of the impacts that are not addressed in the EIA. No additional impacts associated with project design were identified during the document review and field visit by the Team.

5.4 Impacts Associated with Project Construction

5.4.1 Construction Impacts Identified in EIA

5.4.1.1 CP1: Impacts on landform due to excavation of material and quarry area

Improper handling of the excavated material and inappropriate disposal practices may have significant impacts on the landform. The EIA and feasibility study for the Project identified locations (ravines) for dumping of construction related excavated materials. The dumping in the ravines could block natural watercourses and impede flows. Excavated material was not to be dumped over existing vegetation or on private property.

During the field visit and consultations with Project staff and the local community, it was noted that excavated material was dumped at the sites identified in the EIA. Some of this excavated material was used for terracing and was developed into fields for growing crops. No blockage of natural watercourses was observed.

5.4.1.2 CP2: Impacts due to dust emissions

Dust emissions associated with activities such as blasting and transport of material and equipment on unsealed roads during the construction period may have adverse impacts on construction workers and communities in the Project area. The mitigation measure proposed in the EIA involved continuous sprinkling of water to suppress dust emissions.

The community reported that sprinkling of water was not carried out during construction. However, no issues related to dust emissions were reported during community consultation.

5.4.1.3 CP3: Impacts due to construction of access road

The construction of an access road of 1 km could have direct or indirect adverse impacts on soil erosion, drainage, wildlife and human activities. To reduce impacts on drainage, the EIA recommended that the road design incorporate drainage considerations.

The major floods in 2010 damaged a portion of the road, which had not been repaired at the time of the field visit. The Team also observed erosion along the roads constructed as part of the Project. Repair of this road is recommended in the EMMP included in Section 7 of this report.

5.4.1.4 CS1: Impacts on community wastewater

Water is required downstream of the weir (see Figure 13a) for irrigation, watermills, micro-hydels, domestic use, domestic animals and a fishery. The diversion of water to allow construction of the weir, and diversion through the headrace tunnel for generation of hydroelectric power could significantly reduce the availability of water downstream. The EIA noted that wastewater from houses, including sewage from seepage pits and toilets, and farmland located downstream of the weir may seep or directly flow into the Duber Nullah. During the low flow season from October to May, there will be lower dilution of potential pollutants entering the Nullah. After the diversion of water at the weir, this condition could prevail throughout the year as well. Lowered flows could also results in stagnant pools of polluted water in the streambed.

During the field visit and consultations, no significant impact related to decreased dilution of wastewater was reported or observed, including any formation of pools.

5.4.1.5 CHS1: Impacts due to noise and vibration from machinery and construction work

The increased level of noise and vibration during construction work including tunnels, due to blasting and use of heavy machinery, may have significant impacts on workers and adjacent communities.

Vibrations can cause damage to community property located close to the construction areas. Mitigation measures for increased levels of noise and vibration were not provided in the EIA.

During inspection of the weir site and interviews with the contractors' staff, it was noted that appropriate Personal Protective Equipment (PPE), including helmets, gloves and safety glasses, was being utilized.

An interview was conducted with the contractor Adritz Hydro GmbH's Environment Health and Safety (EHS) inspector Syed Arif Hussain. It was reported during the interview that appropriate PPE was mandatory in construction areas, a first aid box was provided at various points, and safety drills were carried out on a regular basis. Statistics including an EHS Annual Report for 2013 were reviewed (Figure 13d). There had been one reportable serious injury registered in 2013.

5.4.2 Additional Impacts Associated with Construction Activities

This section provides a brief account of the impacts that were not identified in the EIA and could have significant impacts on the existing environment and socioeconomic setting of the area.

5.4.2.1 CP4: Impacts due to construction camp site

Sewage generated from the campsite could have significant impacts on the physical environment, and local communities could also be affected. The camp could have been placed at a greater distance as a measure to avoid this impact. Improper waste management practices could have significant adverse impacts on the environment, including soil and groundwater contamination and degradation, and aesthetics.

The EIA did not cover this aspect. There were no issues related to this issue reported during the consultations and field visit.

5.4.2.2 CS2: Impacts on existing traffic due to movement of project related vehicles

During the construction phase, which is largely over, material and equipment, including heavy machinery was transported via the Karakorum Highway (KKH). This may have had an impact on traffic, particularly due to the size of the road. A management plan addressing transport related issues was not found in the Project documentation provided by WAPDA. However, since construction activities have largely seized, this impact is not expected to be on-going.

5.4.2.3 CS3: Impacts on water availability

Downstream of the weir, water is required for irrigation, water mills, micro-hydels, domestic use, wildlife and domestic animals, sanitation and a fishery. Construction of the weir requires dry conditions and water is diverted to maintain dry conditions. This alters natural flow patterns, decreases the amount of water in downstream sections of the Duber Nullah and may, consequently, impact the community at Duber village.

A diversion tunnel was constructed to release water downstream into Duber Nullah. The diversion tunnel is still operational and utilized to release environmental flow. No issues were reported as the diversion tunnel is releasing adequate amount of water to meet downstream requirements.

5.4.2.4 CS4: Impacts due to construction camp site

Sewage generated from the campsite could have significant impacts on proximal communities. The camp could have been placed at a greater distance as a measure to avoid this health related impacts and potential conflicts between the workers and adjacent community.

The EIA did not cover this aspect. There were no issues related to this issue reported during the consultations and field visit.

5.5 Impacts Identified in EIA Associated with Operation

5.5.1.1 OP1 and OS1: Impacts on sewage disposal scheme of the local community

The decrease in the flow of water downstream of the weir may impact waste water, including the sewage disposal system, and may have a significant impact on ground water quality. The EIA proposes mitigation by provision of a sewerage system at a number of houses.

At the field visit, it was noted that septic tanks and soak always are provided to the local community. The impact is not considered significant as it is mitigated; however, monitoring is recommended (see Section 7).

5.6 Additional Impacts Associated with Operations

5.6.1.1 OS2: Economic Impacts

The DKHP has a generating capacity of 595 GWh per annum. The Project is operating at full capacity and generated power is being fed to the national grid. A positive impact of the Project is that it is lowering the supply-demand gap in the country and supporting economic growth.

5.6.1.2 OP2 and OS3: Impacts on the rest water availability

During the operation, release of the environmental flow for the survival of flora and fauna downstream of the weir and for rest water requirements (see Section 5.3) is mandatory. The environmental flow assessment study conducted by WAPDA estimates that a minimum 0.944 m^3/s is required. This will be particularly important during the low flow periods from November 15 to February 15 of every year.

Negligence in the release of environmental flow may impact the operations of water mills installed downstream of the weir and irrigation and domestic water requirements of the local community. It is recommended that environmental flows are released continually during operations.

5.6.1.3 OS4: Impact on Employment

The EIA mentions that the Project could have significant positive impacts on the socioeconomic conditions in the area as it offers employment opportunities for local communities. It was also mentioned in the EIA that some individuals trained during construction phase will be utilized during operation of the project.

A hiring mechanism, promoting utilization of local people as much as possible, is not employed by WAPDA; and was not present in documents or noted in interviews with WAPDA officials. During the consultations, grievances were recorded relating to employment for local people in project operation. People were concerned that employment has not been provided and will not be given to the local community. The Project is in operation and no employment opportunities have been announced by WAPDA as yet.

It is recommended that WAPDA develop a strategy to employ individuals from within the local community, where the necessary skills are available, and that the search for local employees is conducted through local advertisements.

5.6.1.4 OS5: Dam break emergency plan

A Safety and Emergency Procedures Plan[43] has been prepared for DKHP's construction phase. It contains the safety management system and responsibilities for each department in relation to construction activities. However, the plan does not cover dam safety monitoring and procedures for operations.

DKHP's weir height is 26.7 m, which falls under the category of "large dams" according to the International Committee on Large Dams' (ICOLD) classificationand the Operational Policy (OP 4.37) Safety of Dams Guidelines issued by the World Bank. A dam safety plan should be developed as part

[43] WAPDA, Duber Khwar Hydropower Project Safety Plan and Description of Emergency Procedure, November 2003

of operational management procedures to ensure protection of the downstream community in case of dam failure.

5.7 Impact on Ecological Resources

The EIA discusses the impacts of the Project siting and design on ecological resources. However, the impacts of Project design on the aquatic and terrestrial ecological resources of the Project site and vicinity are not adequately addressed in the EIA.

5.7.1.1 DE1: Impact of Project Design on Terrestrial Ecological Resources

Site clearance and construction of Project infrastructure such as power house, weir, inlet and outlet of the power tunnel result in immediate and direct modification of land in the footprint of the Project infrastructure and a 200 m zone around the boundary of Project facilities A reservoir of 570 m and surface area of 50,000 m^2 was created by Project operations. The creation of the reservoir submerged terrestrial habitat upstream of the weir. This habitat loss in the areas occupied by the Project infrastructure and reservoir (zone of habitat loss) lead to detrimental negative impacts on the abundance and diversity of flora and fauna.

The EIA[44] states that 24 trees will be removed for clearance of land for construction of Project infrastructure including Olive *Olea ferruginea*, Oak *Quercus baloot*, Amlok *Diospyros lotus* and Apple *Malus domestica*. The forests are located at a higher elevation and not likely to be directly impacted by clearance of the land for Project construction. A review of literature and a site visit in April 2014 reveals that this information is correct. No threatened or rare flora or faunal species has been reported from the area of habitat loss. Moreover, no critical habitat, threatened or unique ecosystem was identified in this area. The habitats are homogenous and widespread and hold no significance for the survival of endemic or restricted range species. Therefore, the magnitude of impact caused by habitat loss on terrestrial ecological resources is considered minor. Even though the Project infrastructure and new roads that have been constructed were not located in a forest habitat, these roads may facilitate greater access for Project staff, contractors and locals into pristine forest areas who may cut trees from these forests for use in construction and fuel wood.

5.7.1.2 DE2: Impact of Project Design on Aquatic Ecological Resources

Peaking in hydropower generation is defined as an operating mode in which water from the weir is released for only part of the day corresponding to peak demand for power on the system. A peaking operation, however, can be detrimental to the ecology downstream of the weir. With non-peaking operations, low flows normally occur in the section of the river/nullah starting just below the weir, and extending to the point where water is added back into the river/nullah at the outlet of the tailrace tunnel of the powerhouse. However, with a peaking operation low flows are extended downstream of the power house as well as during the period the power house is shut down to accumulate water in the reservoir upstream. The river/nullah ecology, which is adapted to normal daily and seasonal variations in flows, is severely impacted by the daily long dry spells.

As expected in a daily storage hydropower project with peaking operations, the fish fauna have suffered a decline in abundance and diversity in the Duber Khwar. The Duber Khwar provided breeding grounds for some of the fish species of the River Indus. However, almost all the fish species found in Duber Khwar are also found in the River Indus and there are several other nullahs/tributaries of the River Indus than can be used for fish breeding. Moreover, there are no threatened or endangered fish species in Duber Khwar and there is almost no subsistence, recreational or commercial fishing in the area. Therefore, even though individual receptors are likely to suffer harm, the overall impact on the fish species is not considered to be significant.

To compensate for detrimental ecological impacts downstream of the weir, it was recommended that an environmental and compensatory flow rate (rest water requirements) of 0.944 m^3/s be

[44] Feasibility Study of Duber Khwar Hydropower Project, Appendix 6, Environmental Impact Assessment, December 1999. Pakistan German Technical Cooperation (GTZ), Sarhad Hydel Development Organization.

released by the Project downstream of the weir[45]. This flow is actually insufficient for protecting the aquatic ecology of Duber Khwar. However, considering that the Project impact on the aquatic ecological resources is of low significance and any additional release of flow will be at the expense of power generation, which is a critical economic importance for the country, a revision of this environmental flow is not recommended. No additional mitigation measures for protecting aquatic ecology are proposed.

5.7.1.3 CE1: Impact of Construction Activities on Terrestrial Ecological Resources

Construction of Project infrastructure such as the powerhouse, weir and power tunnel result in disturbance to floral and faunal species due to blasting, noise, vibrations, illumination, air pollution and dust. Habitat loss, habitat fragmentation, sensory disturbances usually result in a decrease in species abundance and possibly change in species diversity within a zone of impact identified as within 500 m of Project infrastructure.

As correctly identified in the EIA of the Project[46], the impact of Project construction on the terrestrial ecological resources is not likely to be significant. This is because only 24 trees consisting of olive, oak, amlok and apple have been removed during construction. There is no threatened or endemic floral or faunal species present. The nearby forests are at a higher elevation and not likely to be directly affected by Project construction; provided that Project staff and contractors do not utilize wood from these forests for construction or fuel wood.

There are reports of large mammals of conservation importance in the forests and hills located a few kilometers from the Project, These include the Snow Leopard *Panthera uncia,* Markhor *Capra falconeri* and Himalayan Musk Deer *Moschus chrysogaster* as well as the Common Leopard *Panthera pardus* and the Asiatic Black Bear *Ursus thibetanus*. Even though these animals are found at high elevations and not likely to be directly impacted by Project construction activities, improved access to the forests as a result of the Project may indirectly increase the incidence of poaching. The hunting and trapping of bird species such as Snow Partridge *Lerwa lerwa*, Snow Cock *Tetraogallus himalayensis*, Monal Pheasant *Lophophorus impejanus*, Tragopan *Tragopan melanocephalus*, Koklass Pheasant *Pucrasia macrolopha* may also increase due to this improved access.

5.7.1.4 CE2: Impact of Construction Activities on Aquatic Ecological Resources

The EIA does not elaborate on the impact of construction on the aquatic ecological resources. Impacts of construction are similar to those of operation since a barrier is created for upstream migration of fish and fish fauna both upstream and downstream of the cofferdam and diversion tunnel. As a result, these species may face population isolation.

See OE2 for further details.

5.7.1.5 OE1: Impact of Project Operations on Terrestrial Ecological Resources

The EIA briefly identifies the impacts of Project operation on the terrestrial flora and fauna. However, this information is inadequate and the predicted impacts are outlined below. The operation of the hydropower plant will result in some potential disturbances to species, which may exacerbate the effects of habitat loss and decreased species abundance. These disturbances include noise and light during Project operation. However, considering the fact that no threatened ecosystem or species has been reported from a zone of impact (identified as being within 500 m of the Project infrastructure), this impact is not likely to be significant.

Influx of Project staff and contractors during the operations phase of the Project may increase encroachment into pristine areas and increase the incidence of wood cutting and poaching.

Inadequate management and disposal of solid waste from the camping locations can lead to deterioration of soil and habitat quality with consequent negative impacts on the flora and fauna. In

[45] Assessment of Environmental Flows from Weir Site downstream of Allai, Khan and Duber Khwar Projects, May 2010, Director General (Environment) WAPDA Environment Cell (WEC), Sunny View Estates, Lahore.

[46] The Feasibility Study of Duber Khwar Hydropower Project, Appendix 6, Environmental Impact Assessment, December 1999. Pakistan German Technical Co-operation and Sarhad Hydel Development Organisation.

addition, the biodiversity may be disturbed due to loss of soil productivity caused by uncontrolled discharge of waste water.

5.7.1.6 OE2: Impact of Project Operations on Aquatic Ecological Resources

The impacts of Project operations on the fish fauna of Duber Khwar and adjacent reaches of River Indus have not been adequately identified in the EIA[47]. There is mention that the reservoir may have a positive impact on pool-loving fish. However, keeping in view that the Project reservoir will be flushed at required intervals and has a live storage of 1.13 million m^3, this beneficial effect is not likely to be significant. The predicted impacts of Project operation on aquatic ecological are outlined below.

As mentioned in Section 7, Overview of Baseline Conditions, a total of six fish species have been reported from the Duber Khwar and adjacent reaches of the River Indus[48] [49]. Some of these fish species have been recorded in both the River Indus as well as Duber Khwar. These include the Alwan Snow Trout *Schizothorax plagiostomus,* Tibetan Catfish *Glyptosterrnum reticulatum,* and Chitral Loach *Triplophysa choprai*. In addition to these species, two fish species have been reported in the River Indus but not in Duber Khwar. These include Kunar Snow Trout *Racoma labiate,* and Bhed Catfish *Glyptothorax stocki.* The Brown Trout *Salmo trutta fario* is an exotic species introduced in to the Duber Khwar.

The Alwan Snow Trout *Schizothorax plagiostomus* is primarily a river fish that used the Duber Khwar for breeding before Project construction. The Project weir presents a barrier to the upstream migration of Alwan Snow Trout *Schizothorax plagiostomus* and a decline in its population abundance in the Duber Khwar is likely once Project operation begin. However, this is a common and widespread fish in the upper reaches of the River Indus. Similarly, the other fish species found in the Duber Khwar such as *Glyptosternum reticulatum* and *Triplophysa choprai* are common species of the River Indus. The impact of Project operation on the population abundance of these species in the River Indus is not likely to be significant; although the species upstream and downstream of the weir will face population isolation in Duber Khwar. There are no threatened or endangered fish species in Duber Khwar and there is almost no subsistence, recreational or commercial fishing in the area. Therefore, even though individual receptors are likely to suffer harm, the overall impact on the fish species is not considered significant.

The species Kunar Snow Trout *Racoma labiate,* and Bhed Catfish *Glyptothorax stocki* have been reported from the main River Indus but have not been recorded in Duber Khwar. They are not likely to be affected by Project operations,

In 1990, a trout hatchery for the Brown Trout *Salmo trutta fario* was established near Duber town[50]. However, it uses spring water and not the waters of Duber Khwar and so will not be affected by Project induced changes in Duber Khwar or River Indus. Some specimens of *Salmo trutta fario* have been introduced in to the Duber Khwar but information regarding their current population status is not available.

5.8 Social Assessment

The methodology used for collecting social information included group discussions, consultations held at the Project site and surrounding area, and interviews with the community and institutional stakeholders. The overall acceptability of the Project was low among the community stakeholders around the powerhouse and the weir. This perception was mainly due to long hours of load

[47] The Feasibility Study of Duber Khwar Hydropower Project, Appendix 6, Environmental Impact Assessment, December 1999. Pakistan German Technical Co-operation and Sarhad Hydel Development Organisation.

[48] Rafique, M 2000. Fish Diversity and Distribution in Indus River and its Drainage system. Pakistan J. Zool, 32(4): 321-332.

[49] Rafique, M 2001. Fish fauna of the Himalaya in Pakistan with comments on the origin and dispersal of its High Asian Elements, Pakistan J. Zool, 33(4): 279-288.

[50] The Feasibility Study of Duber Khwar Hydropower Project, Appendix 6, Environmental Impact Assessment, December 1999. Pakistan German Technical Co-operation and Sarhad Hydel Development Organisation.

shedding carried out in the region and low level of communication with the communities by WAPDA. The mechanism of information sharing with the local communities and keeping them informed was almost non-existent and locals complained of not being heard by WAPDA.

The labor class in the region of Duber benefited from the Project since employment opportunities were available particularly during the construction period. People working in the transport sector benefitted from the Project related construction activities. Tribal leaders and local people who owned land that was inundated by the reservoir benefitted from proper compensation for their land. Locals also benefited from better infrastructure and access facilities such as upgraded and new access roads in the area.

However, one claim was pending by a local tribal leader, Ahmed Khan Malik. During the 2010 floods, the access road from Duber market to the weir site was severely damaged. A new access road was constructed and Mr. Malik claimed that the new road passed through his property. WAPDA has agreed to assess how much compensation should be paid so that this issue is resolved soon.

No vulnerable groups, including indigenous people that would be affected by the Project were identified.

5.9 Current EHS Mitigation, Monitoring and Supervision on Site

This section summarizes the current status of Environmental Health and Safety (EHS), mitigation, monitoring and supervision at the site.

EHS measures for increased levels of noise, vibration and dust were not provided in the EIA. Similarly, no EHS standards, guidelines and EHS monitoring plan were available. However, during inspection of the weir site and interviews with the contractor's staff, it was noted that Personal Protective Equipment (PPE) including helmets, gloves and safety glasses were being utilized and were provided. The HBP team noted WAPDA staff using PPE and appropriate safety precautions were pasted on nearly every wall of the powerhouse.

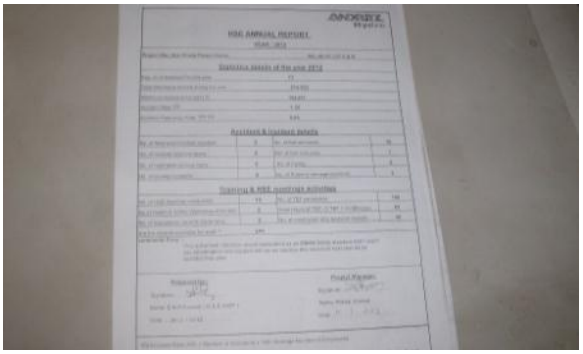
An interview was conducted with Adritz Hydro GmbH, contractors hired for provision and installation of DKHP electrical equipment, EHS inspector Syed Arif Hussain. Statistic details of EHS annual report for 2013 were reviewed. There was only one reported injury registered during in 2013 and appropriate measures, as reported by staff, were taken to avoid any kind of major accident at the Project site during construction.

Figure 13: Photographs of Site Visit

a. Downstream of Duber weir

b. Spillway of Duber weir

c. Access road to Duber weir



d. Documentation reviewed at the powerhouse

e. Access road

f. Communities living adjacent to Access Road

g. Flow downstream of the weir

h. Meeting with WAPDA officials

i. Meeting with local communities

j. Inspection at powerhouse

6 Security and Social Assessment of Duber Khwar Hydroelectric Power Project

6.1 Information Source

An independent security assessment of the region around DKHP was carried out by the Team. The primary source of information for this assessment was obtained by a quick survey of the surrounding area, interviews with the communities in the adjoining areas of the project facilities, and feedback from concerned persons regarding the security situation of the area. Meetings with local political representatives and tribal chiefs were also carried out to consider their views. Furthermore, meetings with officials at WAPDA in their Besham office and with employees at the Duber Khwar powerhouse and weir sites were also carried out to record past security related incidents.

The information collected from the field served as a tool for the analysis of the security situation in the area. The community consultations were mainly conducted at the following locations:

- Shop owners in nearby areas.
- Residents in nearby areas.
- A local member of the Provincial Assembly (MPA) and local influential people.
- Communities downstream of Duber weir.
- Communities upstream of Duber weir.
- The locations of communities consulted are shown in Figure 12 in Section 5.

6.2 Potential Security Issues in the Area

The field assessment revealed that the security situation in the Duber was more serious than at Allai. Safety of the employees working at the powerhouse and weir site was important and needed attention. At the powerhouse, it was observed that the complex was secured by steel fencing. The powerhouse complex had only one checkpoint and a security breach was possible. During consultations in the adjoining areas, it was noted that no potential grievances among the locals regarding the powerhouse existed that could lead to a possible serious security situation. However, the community complained about long load shedding hours and demanded provision for free or subsidized uninterrupted supply of electricity. The Chief Engineer working at the powerhouse reported that no incidents, protests or demonstrations have been observed at the powerhouse.

At Duber weir, it was noted that locals grieved about the lack of provision of free or subsidized electricity, jobs for the locals at the powerhouse and the weir, and some pending land compensatory claims. Duber weir site was completely unsecure with open access to all the facilities to anyone. If a possible security situation arises, the weir will be unprotected and access cannot be blocked. Locals complained that WAPDA had no community liaison officer and promises made before the construction of the project were not met. The local tribal chief of Duber, Ahmed Khan Malik reported that his claims of compensation regarding the access road passing through his land were still pending. He further added that WAPDA had initially committed to send a survey team to take measurements of the land to calculate the compensation to be given to the tribal chief but the team was never sent. There was one security guard on the weir who reported that incidents of road blockages on the access road of the weir were common and the locals often did not allow WAPDA officials and engineers to work on the weir. The main demand for the regular protests, demonstrations and road blockages by the locals was for provision of an uninterrupted supply of electricity and payments against land compensation claims. The houses that were affected due to the reservoir were given full compensation and they were satisfied with the amounts received.

It was observed that the local communities were very hospitable to the foreign Chinese workers who were engaged in construction activities. The main complains were targeted towards WAPDA

employees because the community believed that the provision of electricity was WAPDA's responsibility and the Chinese contractors had no authority in supply of electricity.

It is unlikely that the situation will escalate to a serious conflict. However, to a lesser level, threats such as damage to infrastructure, harassment of Project staff, and potential damage to project vehicles and installations exists.

6.3 Security Related Incidents

The following-security related incidents have taken place near the Project site:

- Incidents of several road blocks at multiple locations throughout the project period were reported by locals and WAPDA officials.
- Blast of two transmission towers (220 kV) around Mansehra were reported in February 2014. They were carried out by the people of Oogi due to termination of electricity initially provided.
- During the second week of April 2014, people from Besham and the surrounding area threatened to blow up the power house for not providing adequate electricity to the local population.
- Demonstrations and agitations in Kohistan for the last several days as a result of WAPDA not complying with promises made to locals before and after commencement of the Project.
- An alliance has been formed between the people of Allai, Besham and Koshistan to jointly struggle for the fulfillment of the written commitments and promises made by WAPDA over the project period.
- Detention of Project vehicles on many occasions by locals from Duber and Pattan over compensation, jobs and the provision of electricity.
- On April 26th 2014, the vehicles of the Consultant's team working on REA of RoR Hydropower Projects were taken at gunpoint by a local tribal chief in Duber for seven hours to force WAPDA to accept his demands regarding compensation.
- Details of the incident are as follows:

  The Consultants' team was traveling in their own vehicle. WAPDA Executive Engineer was accompanying the team in his own vehicle along with another WAPDA employee. The team was proceeding to Duber Khwar Hydropower Project weir site for physical inspection and community consultations. Local tribal chief Ahmed Khan Malik intercepted the vehicles at approximately 10:30 a.m. near his home on the road connecting Duber market and Duber weir. He forcibly took control of the vehicles (one of the consultants and the other of WAPDA).

  The tribal chief claimed that the road was built on his land for which adequate compensation has not been paid. He wanted WAPDA to settle his claim and wanted WAPDA to meet the legitimate demands of locals regarding compensation, jobs and provision of electricity. He threatened that if these demands are not met he would ensure that "the weir will not exist anymore". Following this, Mr. Malik left for Besham for unspecified work. The team was offered vehicles by Mr. Malik's grandson to be used until his grandfather returned. The offer was availed in order to go to the weir site. The team and WAPDA staff returned to the tribal chief's residence by 3:00 p.m. A negotiation proceeded but the vehicles were only released when the Assistant Commissioner of the area and Deputy Superintendent of police (DSP) arrived on site and ensured the tribal chief that they will summon a meeting of the tribal chief and Chief Engineer WAPDA. This meeting was scheduled at the Deputy Commissioner's office to review all the documents related to compensation and claims made by the tribal chief. The discussions lasted for about two hours and the team was allowed to leave for Duber at 5.00 p.m.

- It may be pointed out that not all of the above incidents relate to Duber Khwar. There are three hydropower projects in and around Besham. It is often difficult to separate the issues associated with one project from another.

6.4 Community Perceptions

Local communities reported that they regret allowing such projects in their area, which they say has significantly affected their lifestyle both socially and environmentally. Locals demanded a free or subsidized uninterrupted supply of electricity and jobs at the Project facilities. Locals demanded a reasonable share in royalties against the Project located in their area. Local communities also demanded mitigation measures (biological engineering/protection walls/retaining/breast) against damage caused by poor cut and fill mechanisms during the construction of roads by the contractors.

6.5 Evaluation of Options for Security Arrangements

Community engagement and consultations by trained qualified community relations personnel should be initiated by WAPDA on priority basis. Efforts should be made to maximize dialogue and negotiations with locals and tribal leaders at all levels. Use of force is not recommended, as it will create contention between the locals and WAPDA. The WAPDA Community Relations Officer should maintain a community complaint management register at all weir sites and powerhouses. The mechanism must be transparent and communicated to the locals. The complaint management registers may be placed at convenient or frequently visited locations to ensure easy access. At Duber weir, construction of fences around the weir to control access to the project facilities is advised.

6.6 Role of Community in Security Arrangements

It is recommended that the involvement of locals in safeguarding the project sites should be undertaken on a priority basis. Such activities will increase the sense of ownership, and provide a means of employment and subsistence for the local population. The local community complained about not being given employment opportunities at DKHP facilities, therefore recruiting them for securing the project facilities will reduce this sentiment.

6.7 Roles Played by the Community Leaders

- Although the population of the region is egalitarian in nature, some Khans and Maliks enjoy suzerainty and political power. They are often observed misusing this power for their personal gain.
- The two Maliks, Ahmed Khan Malik and Malik Aurangzeb, have traditionally had strong influence in the valley. While it is easier for Project management to deal with a few individuals, they can be easily be blackmailed by the powerful chieftains who are often seen to be exercising a local fiefdom.

7 Environmental Mitigation and Monitoring Plan

This section includes the Environmental Mitigation and Monitoring Plan (EMMP) based on the REA for the design and construction phases. As the scope of the USAID's involvement does not extend to the operation phase, the EMMP for the operation phase is not provided. However, recommendations for operations EMMP are provided in Section 7.6.

The EMMP provides the mitigation and monitoring plans, institutional arrangement and strengthening requirements, training requirements, occupational safety measures, and environmental and social audit to ensure that the following necessary measures are taken by WAPDA to:

- Avoid potentially adverse effects and maximize potential benefits for the Project.
- Operate in conformance with applicable laws and regulations of Khyber Pakhtunkhwa (KP), as well as with the policies of international financial organizations such as the ADB, IFC and USAID.

The Environmental Mitigation and Monitoring Plan (EMMP) presented in this section is a component of the overall environmental management that is important with respect to the Rapid Environmental Analysis (REA) as it presents WAPDA's commitments to address impacts identified by the impact assessment process. The EMMP is a USAID requirement as per the USAID IEE (OPA Tracking #: OPA-14-JAN-PAK-0017).

The EMMP is based on the baseline conditions and the REA that are described in previous chapters, plus the results of discussions with the stakeholders. EMMP is prepared for all the identified environmental impacts during construction of the Project.

The methodology followed for preparing the EMMP consists of the following:

- Deriving mitigation/protection measures for identified impacts using impact evaluation methodology.
- Rationalizing and combining series of mitigation, compensation and enhancement measures from each identified impacts and risks to prepare overall measures.
- Developing a mechanism for monitoring the proposed mitigation measures to ensure project completion and ongoing operations and maintenance and incorporation of these into project design.;
- Estimating budget requirements for implementation, mitigation and monitoring measures.
- Identifying responsibilities of various agencies involved in the Project for implementation and monitoring of mitigation measures.

The EMMP is the "synthesis of all proposed mitigation and monitoring actions, set to a timeline with specific responsibility assigned and follow-up actions defined."[51] It is generally recognized as the most important output of the environmental assessments as through this tool it is ensured that the mitigation measures identified in the assessments are implemented. The EMMP may be considered as a separate, stand-alone section within the suite of documents that are prepared as part of the EIA and REA process for this Project.

This EMMP due to its nature and applicability will be further used for contractual purposes and will be included as a part of the bid document for EPC contractor who have to conform to it along with the regulatory requirement. Strict implementation of the EMMP and project management's strict enforcement of the adequate construction practices and standards will greatly reduce the negative impacts of the Project.

[51] The World Bank, http://go.worldbank.org/UC9PIUINF0, Accessed April 2013.

7.1 Environmental Mitigation Plan for Design and Construction Phases

The mitigation plan prepared in accordance with the above framework is given below. Key components of the plan are discussed in the following sections.

The mitigation plan (see Table 12) and monitoring plan (see Table 13) include the following important format specifications from the IEE (OPA Tracking #: OPA-14-JAN-PAK-0017:

- **Project Activity/Phase –** indicating the project phase/activity associated with the impact.
- **Impact Reference** – this specifies the impact(s), which according to the impact assessment methodology followed for the project has/have potential influence either negative or positive, and need(s) to be mitigated by the proposed management measure influences as discussed in earlier sections.
- **Mitigation/Management Measure** – a description of the action, which will be clear, concise and specific enough to enable execution of the action. Where relevant, targets, indicators, trigger points and/or threshold levels will be incorporated into the management measure. If a set of management actions is required to meet the objective, the EMMP will be simplified by making a commitment to develop an appropriate supporting document in which the details will be provided.
- **Monitoring Indicators** – a description of the indicator used to monitor the mitigation measure and determine if it is successful.
- **Monitoring and Reporting Frequencies** – the frequency at which monitoring should be carried out and the frequency of reporting (linking Table 12 and Table 13).
- **Institutional Responsibilities/Party Responsible** – an indication of the roles and responsibilities for the concise implementation of the proposed management measures.
- **Indicative Budget –** budget considerations linked to Section 7.8.

7.2 Environmental Monitoring Plan for Construction

The environmental monitoring plan for the construction period is provided in **Table 13**. The environmental monitoring program is based on information presented within the baseline and the REA, including observations in the field visit and the EIA.

The recommended type of monitoring, frequency, location, recording and reporting is also provided. The monitoring is to be carried out by appropriately appointed field staff or an environmental consultant. Ensuring that monitoring is carried out and a review of monitoring information is the responsibility of the proposed EHS manager (see Section 7.5).

Table 12: Environmental Mitigation and Management Measures for Design and Construction

Project Activity/Phase	Impact reference	Environmental Aspect	Mitigation/ Management Measures	Monitoring Indicator(s)	Institutional Responsibility and Party Responsible	Indicative Budget
Design	DP1	Physical	Release of recommended environmental flow of 0.944 m^3/s to be maintained and continued, including after diversion tunnel is closed.	Indicator 4 (see Table 13)	WAPDA	n/a
Design	DP2	Physical	n/a; impact not significant and mitigated through design.	n/a	n/a	n/a
Design	DS1	Social	n/a; potential impact on community has already been mitigated through appropriate compensation.	Indicator 8, 9, 11 (see Table 13)	n/a	n/a
Design and Location	DS2	Social	n/a; impact not significant as adequate amount of water is available.	Indicator 4 (see Table 13)	n/a	n/a
Design	DE1	Ecology	n/a; weir is near completion and wood has already been cut. Recommend planting trees in protected forest areas, in conjunction with forest department.	Indicator 1 (see Table 13)	n/a	PKR 100,000
Design	DE2	Ecology	Release of recommended environmental flow of 0.944 m^3/s to be maintained continued, including after diversion tunnel is closed.	Indicator 4 (see Table 13)	WAPDA	n/a
Construction	CE1	Ecology	Contractual obligations to mandate that project staff and contractors must avoid cutting wood from forest areas in the vicinity, and restrict wood cutting to designated areas.	Indicator 1 (see Table 13)	WAPDA to maintain contact and ensure forests are not cut illegally. It is WAPDAs responsibility to maintain contact with Forest Department.	n/a
Construction	CE2	Ecology	Release of recommended environmental flow of 0.944 m^3/s to be maintained and continued, including after diversion tunnel is closed.	Indicator 4 (see Table 13)	WAPDA to ensure release.	n/a
Construction	CHS1	Health & Safety	n/a; no further mitigation or management required.	Indicator 11 (see Table 13)	WAPDA	n/a

Project Activity/Phase	Impact reference	Environmental Aspect	Mitigation/ Management Measures	Monitoring Indicator(s)	Institutional Responsibility and Party Responsible	Indicative Budget
Construction	CP1	Physical	n/a; quarry has been rehabilitated.	n/a	n/a	n/a
Construction	CP2	Physical	Current mitigation and management of dust from roads using sprinklers to be continued during construction operations.	Indicator 2, 3, 4 and 6 (see Table 13)	WAPDA	PKR 5,000/day
Construction	CP3	Physical	n/a; continual repair of road, particularly when construction activities are low, is responsibility of Works Department. WAPDA should facilitate the repair of the access road when it is being used for construction related activities.	Indicator 2 and 3 (see Table 13)	WAPDA	n/a
Construction	CP4	Physical	n/a; no further mitigation required.	Indicator 4 (see Table 13)	n/a	n/a
Construction	CS1	Social	Release of recommended environmental flow of 0.944 m^3/s to be maintained and continued, including after diversion tunnel is closed.	Indicator 4 (see Table 13)	WAPDA	n/a
Construction	CS2	Social	n/a; weir is near completion and traffic due to construction activities is very low.	Indicator 7 (see Table 13)	n/a	n/a
Construction	CS3	Social	Release of recommended environmental flow of 0.944 m^3/s to be maintained and continued, including after diversion tunnel is closed.	Indicator 4 (see Table 13)	WAPDA	n/a
Construction	CS4	Social	No mitigation measure required as the impact was mitigated through design. The construction site is being disassembled.	Indicator 11 (see Table 13)	WAPDA to ensure contractors maintain fence until completion of construction.	n/a

Table 13: Environmental Monitoring Program

Aspect	Monitoring Indicator Number	Type of monitoring/indicator	Units	Monitoring Frequency	Location/s	Records and Reporting	Reporting Frequency	Cost Type
Land disturbance	1	Footprint area disturbed and/or rehabilitated	m^2	Monthly during construction and then as needed when land disturbed or rehabilitated	Alongside the weir and power house area	Log	Monthly report during construction Annual report during operation	On-going cost
	2	Visual inspections for signs of erosion or wind deposition	None	Quarterly or on receipt of grievance	Construction sites, rehabilitated areas and water release points	Log	Annual report with non-conformances handled	On-going cost
	3	Visual inspection of road condition	None	Quarterly or on receipt of grievance	Bypass roads around fenced Project facilities	Log	Annual report with non-conformances handled	On-going cost
Water	4	Quantity and quality of water supply in accordance with the WHO and national regulation	mg/l or other units as appropriate	Quarterly	Upstream and downstream of weir	Database	Quarterly report	Lab cost
	5	Volume of water used for dust control	m^3/d	When water trucks filled	Truck filling points	Database	Monthly report of volume	On-going cost
Air	6	Dust deposition and horizontal dust flux	$mg/d/m^2$	Quarterly	Near roads and weir	Database	Quarterly report of results and long term trends	On-going cost
Vehicle and Equipment	7	Records of vehicle and equipment maintenance	None	As per manufacturer's instructions	Mine truck shop and equipment workshop	Log	Annual report	On-going cost

Aspect	Monitoring Indicator Number	Type of monitoring/indicator	Units	Monitoring Frequency	Location/s	Records and Reporting	Reporting Frequency	Cost Type
Employment	8	Domicile, age, qualifications and salary of all employees in management, technical, skilled and unskilled category		Quarterly	All hiring undertaken directly by WAPDA or its contractors	Log	Monthly reporting during construction	On-going cost
Socioeconomic conditions	9	Socioeconomic parameters		As required	Project Site and areas around it	Log		On-going cost
Vocational Training and Skill Development	10	Number of persons trained		Once a year	Project Site and areas around it	Log	Annual reporting during construction	On-going cost
Stakeholder Engagement Plan	11	Conflicts, social ills reported by community, NGO initiatives in community, people's concerns regarding socioeconomic conditions in area		Monthly	Project Site	Log	Monthly reporting during construction	On-going cost
Occupational Health and Safety	12	Report on any OHS incidents and on-going monitoring of compliance with OHS guidelines.		On-going with immediate report of incidents	All locations	Log	Quarterly reports	On-going cost

7.3 Institutional Arrangement and Strengthening

Effective implementation of the EMMP depends on adequate human and financial resources, clearly defined responsibilities for environmental management, appropriate training and good communication. An outline of how these features will be managed for the Project is presented in this section.

As part of this, the Team proposes hiring an Environmental Health and Safety Officer (EHSO) and Social Manager to work under the WAPDA Chief Engineer (WCE) and WAPDA Executive Engineer (XEN). Additionally, a Community Liaison Officer (CLO), also should be hired.

7.3.1 Management Commitment

To be effective, this EMMP must be viewed as a tool reflecting the contractor's and sub-contractor's overall commitment to environmental protection. This must start at the most senior levels in the organization. Contractor management must provide strong and visible leadership to promote a culture in which all employees share a commitment to environmental awareness and protection.

The following should be made by WAPDA:

- Put environmental matters high on the agenda of meetings.
- Highlight the importance of environmental issues in relation to the Health, Safety and Environment considerations in business decisions and communication with stakeholders.
- Evaluate environmental aspects, before final decisions are reached.
- Become fully aware of the main environmental hazards associated with the contractor and sub-contractor activities and the systems, procedures and field practices in place to manage these hazards.
- Respond immediately and being involved in investigating incidents or other abnormal events related to environmental, health and safety issues.
- Seek internal and external views on environmental issues; and recognizing their achievement.

The proposed organizational diagram for environmental monitoring and mitigation of the proponent (WAPDA) is provided in Figure 14.

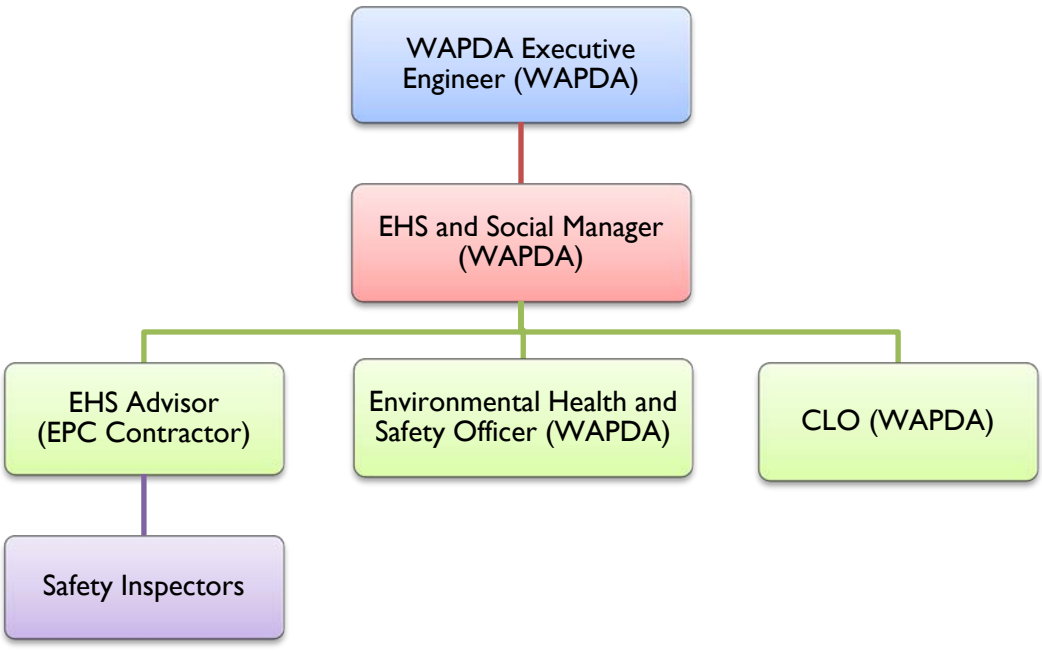


Figure 14: Proposed Setup for Environmental Unit

7.3.2 Roles and Responsibilities

7.3.2.1 WAPDA

With overall responsibility for the Project, WAPDA will:

- Appoint responsible contractors who will comply with the EIA and this REA.
- Approve environmental safe materials for use on site in accordance with the EIA and this REA.
- Ensure all relevant parties receive a copy of the approved EIA and REA and that it is incorporated into all contractual documentation.
- Obtain the relevant environmental permits, consents and authorizations prior to commencing site works.
- Comply with all requirements of KP EPA and obtain NOCs related to the Project.
- Comply with USAID requirements and provide monthly reports on compliance based on monitoring (see Table 14) of the Energy Policy Program (EPP). The EPP will subsequently share this information with USAID contractor AEAI (at least once every three months).

7.3.2.2 Contractors

The Contractor's general responsibilities will be to:

- Ensure the implementation of the EIA/EMMP throughout construction works by all contractor personnel and subcontractors.
- Ensure that adequate resources are available to implement the requirements of this EMMP.
- Undertake quarterly environmental audits and report to WAPDA on regular basis.
- Coordinate with WAPDA for all correspondence to KP EPA.
- Prepare a comprehensive legislation list and ensure compliance to these legislations.

7.3.2.3 Sub-Contractors

Any Sub Contractor hired directly or indirectly by the Contractor to carry out Project related tasks whose activities have at least one interface with identified key environmental aspects, are responsible to comply with the EIA and EMMP at all times. They must also designate sufficient competent resources to ensure all Sub-Contractor personnel receive the required training.

Sub-Contractors directly in charge of activities shall be registered and approved. Registration documentation should be provided to the Client prior to commencement of any activities. Sub-Contractors are expected to demonstrate a proactive behavior towards environmental concerns. It is their responsibility to provide information requested by the Client with regard to their scope of activities and to demonstrate compliance with the applicable environmental requirements.

7.3.2.4 Personnel

WAPDA Chief Engineer (WCE)

The WAPDA Chief Engineer (WCE) manages and superintends all head office and site activities for the implementation of the Project. In relation to the REA and implementation of EMMP, the WCE's responsibilities, as related to the environment, will include:

- Overall responsibility for ensuring implementation of the EMMP in compliance of all legal matters regarding the Project.
- The development and establishment of adequate Environmental, Safety and Quality Management teams, who will ensure the development, communication and implementation of the EIA and this EMMP across the entire project, including all activities being undertaken by subcontractors and suppliers working on the site, and all personnel visiting the site.
- Ensure that an environmental representative is available on the Subcontractor part to address environmental requirements in accordance with the EIA.
- Develop and establish an organization structure adequate to oversee the whole of the works, including overseeing the appointment of an appropriate qualified EHS Manager.

- Ensure that adequate resources are available to implement the requirements of the EIA and EMMP.
- Ensure the EIA, REA and EMMP are reviewed regularly (see Section 7.6 and 7.7) to correspond with on-going construction activities.
- Coordinate with government agencies and bodies regularly to discuss the Project's construction environmental issues and requirements.
- Attend regular meetings with the Construction Managers (contractors) and EHS Advisor in order to discuss the site's environmental issues and requirements.

WAPDA Executive Engineer (XEN)

Responsibilities include:

- Taking primary responsibility for all activities on site, including those undertaken by direct or indirectly employed personnel or agencies.
- Ensuring the issue of suitable procedures for the definition of working methods and site regulations that take into consideration the requirements within the EIA, REA and EMMP.
- Ensuring that construction and erection works are performed in respect of the EIA, REA and EMMP requirements.
- Attending regular meetings in order to discuss the site's environmental issues and requirements.

EHS and Social Manager

The EHS and Social Manger will supervise the Project activities relating to health, safety and environment. The Manager will be responsible for:

- Overall responsibility for the development and implementation of the Project HSE policy/philosophy.
- Coordinating weekly HSE meetings, during which any environmental issues will be discussed and minuted.
- Reviewing and ensuring the implementation of Contingency and Emergency Response Procedure.
- Providing specialized HSE input into engineering, construction and contracts, ensuring requirements are properly integrated into project planning, design criteria, construction plans and specifications and contracts
- Supporting/leading incident investigations as per project procedure and report to all concerned. Follow up and review the corrective and preventive action taken, and close-out the incidences.
- Conducting HSE inspections of project construction activities and monitoring compliance with requirements including contractual commitments, permits and projects HSE plan and other applicable HSE requirements and ensure that the Project HSE inspection plan is implemented.
- Ensuring that all internal as well as external incidents and complaints are appropriately resolved with all applicable forms and records duly filled and maintained.
- Coordinating and organizing regular meetings with the Project Director, Construction Manager and Environmental Manager in order to discuss the site's HSE issues and requirements.
- Coordinating the environmental activities with the higher management time to time.
- Coordinating with the KP EPA, other regulatory authorities and stakeholders on environmental issues related to construction of the Project.
- Monitoring construction activities and performance to ensure compliance with the EIA and this EMMP and evaluate effectiveness of control measures adopted.
- Ensuring that no works are carried out outside the construction corridor as defined in the EIA/EMMP, especially within the protected areas (e.g. forests).
- Ensuring the issue and updating of the project's environmental plans.
- Coordinating Project document review activities from an environmental standpoint, assuring that the execution of these activities is compatible with development of the Project and reporting any discrepancies between the environmental requirements and other Project objectives to the Head Hydro Power and CEO.

- Supplying essential information for the preparation of the environmental control plan for construction.
- Updating KP EPA regularly on construction information.
- Coordinate the development of environmental monitoring data relevant to construction activities.
- Performing environmental checks and monthly internal audits of onsite activities, in coordination with the HSE Manager.
- Supporting the higher management in relations with the governmental agencies and with the KP EPA on environmental matters.
- Implementing the environmental requirements of the project management system including inspection and reporting.
- Monitoring construction activities and performance to ensure compliance with the CEMP and effectiveness of control measures adopted.
- Developing and implementing of the environmental training program.
- Conducting staff environmental training, inductions and Tool Box Talks (TBT).
- Advising the Project Manager, or in his absence the relevant Construction Manager, to stop work which could, or is, causing unacceptable environmental impacts.
- Communicating with internal and external parties as required.
- Coordinating daily and weekly site inspections and approving the associated environmental inspection report.
- Reviewing daily and weekly checklists to ensure that appropriate recording of site activities and observations.
- Preparing of the monthly environmental reports, quarterly performance reports and incident reports.
- Reporting of any environmental incidents to higher management.
- Ensuring that major environmental incidents are reported to KP EPA within a maximum of 3 days.
- Participating in environmental management reviews.
- Reviewing environmental monitoring data.
- Raising non-conformance and issue CAPs reports in coordination with the HSE Manager/coordinator(s).
- Ascertaining that effective measures and relevant actions are undertaken to avoid or minimize adverse environmental impacts.
- Attending regular meetings with the CEO, Head Hydro Power, PM, Construction Manager and EHS Manager in order to discuss the site's environmental issues and requirements.
- Ensuring that all internal as well as external environmental incidents, emergencies and complaints are appropriately resolved with all applicable forms and records duly filled and maintained.
- Reviewing environmental plans and procedures to assess compliance and recommend revisions regularly, where required.
- Reviewing quarterly audit reports and submitting them to KPK EPA with the quarterly performance reports.

Community Liaison Officer (CLO) (proposed), to engage with the community and NGOs; and provide a monthly report on conflicts, social ills reported by community, NGO initiatives in community, people's concerns regarding socioeconomic conditions in area.

Environment, Health and Safety Officer (EHSO) (proposed), to carry out monitoring and reporting tasks under the supervision and as required by the EHS Manager.

7.4 Training Requirements

The training and induction requirements identified are:

- Occupational Health and Safety (OHS) induction (for all employees and contractors).

- Training on environmental monitoring for appropriate staff.

The induction for contractor staff may be carried out by the contractor. However, WAPDA needs to monitor and ensure that the contractors are inducted and trained properly and ensure this is stipulated.

7.5 Occupational Safety Measures

Occupational Health and Safety Measures (OH&S) need to be identified for all personal and contractors as part of an OH&S Plan. A detailed OH&S Plan should be formulated for construction and operations.

7.5.1 Personal Protection Equipment

Based on the jobs and exposure to different hazards for employees and contracting staff, Personal Protection Equipment (PPE) is listed below:

- **Shoes:** appropriate footwear that is effective for preventing injury for employees that are exposed to conditions that may cause or cause foot injuries.
- **Safety Glasses and Goggles:** appropriate eye protection be provided and worn by employees with job performance requirements that expose them to potential eye hazards.
- **Gloves:** protection for hands and arms from chemicals, temperature extremes and abrasion including proper selection of the glove based on its ability to protect the hand of the employee and contractors based on their jobs.
- **Ear Plugs and Muffs:** hearing protectors, including ear plugs and ear muffs, to be work by construction workers and employees who are exposed to noise to reduce this to an acceptable level.
- **Hard Hats:** head protection should be work by construction workers and employees who may be exposed to anything that may fall or hit the head and cause injury.

The PPE list should be added to where required for additional safety measures required for specific and specialized roles.

7.5.2 Occupational Safety Audit Measures

Formal audits will be undertaken at planned intervals in accordance with the requirements of WAPDA and regulatory authorities. Procedures for audits will be established, implemented and maintained. These will cover the audit criteria, scope, frequency and methods, and will address the responsibilities and requirements for planning and conducting audits, reporting results and retaining associated records.

Any negative findings arising from an audit will be treated as an incident and dealt with in accordance with the non-conformance and incident procedure. Results from audits and evaluations of compliance with legal requirements will be reported to site and senior management and subject to management reviews. Usually environmental regulatory authorities require a quarterly audit report for large scale projects.

7.6 Environmental and Social Audit

Formal environmental and social audits should be carried out on a yearly basis.

An external consultant will carry out the following:

- Review the EMMP.
- Review monitoring data and reports (see Section 7.2).
- Review socio-economic data and reports (see Section 7.2).
- Carry out a consultation with staff and community.
- Carry out independent monitoring (e.g. water quality, water quantity, environmental flow, etc.).

The result of the audit will include recommendations to update the EMMP, including recommendations on impact mitigation and monitoring. Additionally, the audit will independently verify the environmental and socio-economic data and reports to a reasonable degree, and highlight any non-compliance with the EMMP that is evident.

Any negative findings arising from an audit will be treated as an incident and dealt with in accordance with the non-conformance and incident procedure. Results from audits and evaluations of compliance with legal requirements will be reported to site and senior management and subject to management reviews. Usually environmental regulatory authorities require a quarterly audit report for large scale projects.

7.7 Reporting Requirements

The reporting and feedback mechanism will comply with the EMMP for all aspects of the environment. The reporting requirements for monitoring are provided in Table 13.

During construction, the EPC Contractor, through the environmental specialist on the team, will prepare periodic (at least once every three months) status reports on EMP implementation (including measures for mitigations of impacts on biological resources). Such reports will carry information on the main types of activities carried out within the reporting period, status of any clearances/permits/licenses that are required for carrying out such activities, mitigation measures applied, and any environmental issues emerging. These will also include monitoring reports as specified in Table 14.

The EPC Contractor will prepare a 'Construction Management Plan' (CMP) demonstrating the manner in which they will comply with the requirements of mitigation measures proposed in the EMP. After completion of the EPC Contractor's contract, WAPDA will be in charge of the operation and maintenance of the Project and will be responsible for compliance with the monitoring plan during operations.

The independent external monitor will do periodic reviews to ensure that monitoring requirements are being met.

7.7.1.1 Regular Reporting to USAID Energy Policy Program and AEAI

All documentation mentioned as part of the reporting requirements, including monitoring related reports from Table 14, will be compiled and shared in the form of a "Compliance Report" with Energy Policy Program (EPP) on a monthly basis. The EPP will share this information with other relevant stakeholders, such as USAID subcontractor AEAI, on a regular basis (at least once every three months). Consolidated comments and feedback on the compliance reports from EPP, AEAI and their sub-contractors will be incorporated into suggestions for modifying or refining the EMMP if required.

7.8 Budget for Environmental Mitigation and Monitoring Plan

Costing considerations are provided for mitigation and monitoring in Table 14. These relate to the mitigation and monitoring identified in Table 12 and Table 13.

Table 14: Estimated Budget

Item	Indicative Cost	Budget Per Quarter
Environmental Health and Safety Manager	PKR 70,000/month	PKR 210,000
Environmental Officer	PKR 30,000/month	PKR 90,000
Community Liaison Officer	PKR 30,000/month	PKR 90,000
Monitoring - Lab Costs (water quality testing)	PKR 10,000/sample (i.e. per quarter)	PKR 10,000
Mitigation - Dust Suppression	PKR 5,000/day	PKR 475,000
Tree plantation	PKR 100,000	-
Total Budget – Capital cost		**PKR 100,000**
Total Budget – On-going cost (per quarter)		**PKR 875,000**

7.9 Environmental Management Recommendations for the Operation Phase

Some impacts associated with operation were identified in Section 5. While compliance with the EMMP during Project operation is not a requirement of USAID as it is not funding these activities, it is recommended that WAPDA follow the EMMP above during operation. With respect to operations, the recommended measures for mitigation and management are provided in Table 15. The environmental monitoring program is based on information presented within the baseline, the REA, including observations from the field visit, and the EIA.

The recommended type of monitoring, frequency, location, recording and reporting is also provided. The monitoring should be carried out by appropriately appointed field staff or an environmental consultant.

Table 15: Environmental Mitigation and Management Measures for Operation

Impact Reference	Environmental Aspect	Project Phase	Mitigation/ Management Measures	Cost	Institutional Responsibility
OE1	Ecology	Operation	Contractual obligations to mandate that project staff and contractors must avoid cutting wood and illegal hunting from forest areas in the vicinity, and restrict wood cutting to designated areas.	n/a	Contractor responsibility. WAPDA to ensure compliance.
OE2	Ecology	Operation	Contractual obligations to mandate that project staff and contractors must avoid cutting wood from forest areas in the vicinity, and restrict wood cutting to designated areas.	n/a	Contractor responsibility. WAPDA to ensure compliance.
OP1 & OS1	Physical and Social	Operation	Release of recommended environmental flow of 0.944 m^3/s to be maintained and continued, including after diversion tunnel is closed.	n/a	WAPDA
OP2 & OS3	Physical and Social	Operation	Release of recommended environmental flow of 0.944 m^3/s to be maintained and continued, including after diversion tunnel is closed.	n/a	WAPDA
OS2	Social	Operation	n/a; providing free or uninterrupted electricity to the local community is not a WAPDA commitment or responsibility. Nevertheless, a community liaison officer appointed by WAPDA can aid in better co-ordination and collaboration with the community and resolution of their grievances.	Operational cost associated with hiring (see Section 7.8)	WAPDA
OS4	Social	Operation	An advertisement providing information on required education and skills against available vacancies should be given in local newspapers and interviews should be conducted to hire able individuals from the local community. It was also mentioned in the EIA that some of the individuals trained during construction phase will be utilized during operation of the project. WAPDA should consider following this recommendation.	n/a	WAPDA to advertise and hire from local community where necessary skills are available.
OS5	Social/Physical	Operation	The Dam Safety Organization of WAPDA (http://www.wapda.gov.pk/htmls/anexiidso.htm) to prepare a dam safety plan to make sure procedures are in place in case of dam failure.	n/a	WAPDA

8 Conclusions

The Project has been designed and constructed in compliance with national and environmental laws (Section 2). Additionally, no major environmental liabilities were identified as part of the REA. Construction over-runs associated with the Project are associated with the 2005 earthquake and 2010 floods. The earthquake and floods caused delays in construction and where associated with cost over-runs, and associated delays in Project completion of approximately 2 years. The 2005 earthquake mandated a change in design parameters to increase the resistance of the design to earthquakes (Section 3.8).

While no major non-conformance issues were identified in relation to national laws, there are certain aspects that need to be addressed to ensure conformance with international best practice. These aspects or gaps include following:

- The WAPDA EIA does not provide detailed mitigation and monitoring plans.
- During the Project construction evidence of full compliance with the mitigation measures is not available, mainly due to lack of monitoring and documentation.
- Communication and the community outreach strategy by WAPDA has been poor (Section 5).

One of the objectives of the REA was to identify additional impacts that are not covered in the WAPDA EIA. These impacts have been identified and corresponding mitigation measures have been proposed. To address the issue of monitoring noncompliance, WAPDA's conformance with the EMMP developed as part of this study is required (Section 7). To promote better communication with the communities, and to carry out the duties and fulfill WAPDA's responsibilities, it is recommended that the environmental management unit proposed in the WAPDA EIA be strengthened and the structure changed through hiring for the following proposed positions (see Section 7):

- EHS and Social Manager.
- Community Liaison Officer.
- Environmental, Health and Safety Officer.

Where the Environmental Management Unit can carry out its responsibilities and the EMMP is strictly followed, it is expected that the Project will be completed in a socially and environmentally-responsible manner.

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ANNEXES

Annex I:
Scope of Work

Scope of Work

Technical Assistance on Rapid Environmental Analysis (REA) of Duber Khwar and Allai Khwar Run-of-river Hydroelectric Power Projects

1.0 Background

The U.S. Government's Quick Impact Energy program started in October 2009 to address Pakistan's severe electricity shortages that have created an energy crisis threatening the country's political and economic stability. WAPDA has requested USAID for grant funds to expedite the commissioning of two near-completion on-going run-of-the-river hydroelectric power projects Duber Khwar and Allai Khwar. These projects were originally co-funded by IDB with WAPDA. WAPDA ran short on funds and projects were delayed because Government has not disbursed the funds that were planned and allocated to WAPDA under the Annual Public Sector Development Programs (PSDP).

As part of Phase-II of the Energy Program, the USG through USAID is considering Duber Khwar and Allai Khwar for USG funding. Both projects are under different phases of construction completion and USAID is assessing the remaining work required for commissioning them into operation. For the purpose of projects' due diligence evaluation, USAID has to ensure that the environmental assessments for both the projects are compliant with the local, international best practice and US environmental regulations, i.e. USAID's 22 CFR 216, and implementation has been in accordance with agreed environmental mitigation and monitoring measures.

2.0 Project Brief

2.1 Duber Khwar

It is located in KP's remote district 'Kohistan' on the Duber Khwar river, a right bank tributary of the Indus River. The Project area is accessible by road at a distance of 270 Km from Rawalpindi and 300 Km from Peshawar. The plant's maximum power output is planned at 130 MW. Upon commissioning it will produce an annual energy of approximately 595 Gwh, out of which 187 Gwh will be available during a 4 hour/day period of peaking operation. USAID Consultants estimated a reasonable budget of $25 million, to complete the project.

The Project was approved by ECNEC on 2 September 2002 and a Revised PC I was approved on 20 August 2009. The Project on completion will generate 595 GWh annually and this power from Duber Khawar will be connected to Allai Khawar/Khan Khawar hydro power projects through 46 Km double circuit 132 Kv Line. Allai Khawar project is linked with National grid through 220 Kv double circuits. Expected completion of the project is by March 2014.

2.2 Allai Khawar

It is located in KP's remote district 'Battagram' on the Allai Khwar, a left bank tributary of the Indus River. The Project area is accessible by road and is at a distance of 245 Km from Rawalpindi and 270 Km from Peshawar. The plant's maximum power output is planned at 121 MW. Upon commissioning it will be able to produce an annual energy of approximately 463 gigawatt hours (GWh), out of which 160 GWh will be available during a 4 hour/day period of peaking operation.

The 121 MW Khan Khwar Hydropower Project was approved by ECNEC on 2 September 2002 and a Revised PC I was approved on 20 August 2009. The Project on completion will generate 463 GWh annually and this power from the power station at Besham will be brought by a 220 kV double

circuit National Grid along with Khan Khawar and Duber Khawar. The project was completed in June 2013, and is currently under Defect Liability Period with some remaining works to complete.

Both of these projects were identified by Sarhad Hydel Development Organization (SHYDO) under technical assistance of German Technical Corporation (GIZ) and were ready for implementation in 1999 and 2000 respectively. However, the EA documentation was completed and approved by the relevant Environmental Protection Agency in August 2010.

3.0 Evaluation of Project Issues with Respect to Environmental Impact Potential

Both run of river hydroelectric power projects and their respective activities were identified and addressed by separate Environmental Impact Assessment (EIA) and subsequent respective EMMPs prior to the execution of these projects.

The contents of the respective EIAs were designed to meet the standard guidelines of the Pakistan Environmental Protection Agency (PEPA). Brief information related to the earlier completed environmental studies of the respective projects is described below;

3.1 Duber Khwar Hydroelectric Power Project

Feasibility Report of the 130 MW Duber Khwar project was prepared by GTZ (German Agency for Technical Cooperation). EIA/EMMP was also done by GTZ working with SHYDO in Dec 1999 and made part of feasibility study. Factors such as displacement, biological resources and forest, water usage, disposal of materials and waste were studied. Socio-economic setting, climate change and mitigation of effect on environment were studied as well. Accordingly cost of implementation, including environmental mitigation and monitoring was calculated during study, and subsequently revised during construction. Monitoring of mitigation program was planned out. Land acquisition and land leasing cost, tree compensation, built-up property compensation and resettlement, sewerage and providing power transmission lines to water mills was determined. The cost allocated for these works $3.75 million per the revised PC-I. Approval/NOC of Environmental Impact Assessment was granted by Environmental Protection Agency (EPA) Department of KPK province.

WAPDA is implementing this project. Project Civil works contract was awarded to Sino Hydro of China and E&M works to Andriz of Austria. Lahmayer of Germany in association with NDC of Pakistan was awarded Project Consultant for monitoring of the project. Islamic Development Bank (IDB) has funded cost of civil works and cost of Consultancy Service.

3.2 Allai Khawar Hydroelectric Power Project

Feasibility Report of the project was prepared by GTZ long with SHYDO in 2000. EIA/EMMP (part of feasibility study –Appendix 6); was carried out by GTZ while working with SHYDO in May 2000. Factors affecting environment such as displacement, biological resources and forest, water usage, disposal of materials and waste were investigated. Socio-economic setting, climate and mitigation of effect on environment were studied. This component includes land acquisition and land leasing cost, tree compensation, built-up property compensation and relocation of flourmills and other mitigation cost. NOC of Environmental Impact Assessment of the project was approved by Environmental Protection Agency EIA Department of KPK.

WAPDA is implementing this project. Project Civil works contract was awarded to Donfong of China and E&M works to Andriz of Germany. Lahmayer of Germany in association with NDC of Pakistan was awarded Project Consultant for monitoring of the project. Islamic Development Bank (IDB) has funded cost of civil works and cost of Consultancy Service.

4.0 Period Of Performance

In the above context, USAID through its contractor, Advanced Engineering Associates International (AEAI), is seeking quick assistance from local engineering/environmental firms to carry out an engineering, environmental and social review / survey to verify the costs, designs, environmental and social compliance issues, and economic impact of the projects.

The duration of the assignment is **30-45 Calendar Days (1-1.5 months)** from the signing of the Contract / Purchase Order. The anticipated start date is the first week of March 2014. Contractor staff is authorized to work a six-day work week.

5.0 Specific Technical Requirements

The Contractor shall undertake the following:

- Complete review of the PC-1s as revised and/or amended, feasibility studies and other relevant project documents. Collect secondary data from relevant sources to compare with the information available in current project documents.
- Review of the projects, its objectives, and a statement of economic and social benefits.
- Review the engineering documents and ongoing work to determine cost of the remaining works based on current rates.
- Review of the requirements of the IEE (Tracking #: OAPA-14-Jan-Pak-0017) and 22 CFR 216 as well as required identification of new significant environmental effects detected during the Rapid Assessment
- Review of the safety requirements for the project including worker OHS, dam safety and other provisions related to safety
- Site / Field visits for all the stated requirements, meetings with stakeholders, collection of environmental and social data, collection of designs and cost estimates documents from WAPDA etc.
- Review project siting/design impacts identified in WAPDA IEE and identify any additional impacts associated with project siting/design
- Carry out an engineering, environmental and social review / survey to verify the costs, designs, environmental and social compliance issues, flaws and construction adequacy and economic impact of the projects
- Details of the security situation and identification of local tribal leaders who could serve as contact points for ensuring security arrangements.
- Describe the areas as they currently exist with the ongoing construction of the hydroelectric power projects, transmission lines etc. This task will require onsite assessment in the field and should cover different areas impacting the environment such as physical, biological, climate, water resources, geology and socio-economic. Including any resettlement and land acquisition, cultural heritage, indigenous people, etc. issues
- Review of all EIAs/EAs, EMMPs and other environmental documents, including compliance and performance monitoring reports, prepared and approved in 1999-2010 and conduct an independent rapid environmental due diligence analysis to determine:
  - The main environmental and social effects of the projects, both in the project area and in the surrounding area and the timescale of the impacts, the defined mitigation and monitoring measures and compliance.
  - Environmental mitigations required and the inspection and reporting already done to determine compliance with existing requirements established in the approved EIAs and signed contracts.
  - Evaluating understanding of environmental mitigation and monitoring requirements by the project implementation and construction staff.

  - Evaluation of existing environmental and social problems associated with the development of the hydroelectric power projects that should be resolved because they are resulting in adverse environmental and social impacts.
  - The size and extent of the impacts, both adverse and beneficial, (the effectiveness of the mitigation measures should be based as much as possible on quantitative data rather than qualitative assessments).
  - Any potential impact on human health, social fabric of communities, etc.
  - The impact on any rare species of plant or animal in the area.
  - Appropriateness of construction and operation practices, on-going supervision as well as implementation of environmental mitigation and monitoring measures (and Contractor's capabilities) as proposed in the original approved IEE/EA/EIA.
  - The significance of existing and potential adverse environmental and social impacts due to construction and operation of the hydroelectric power project and associated infrastructure, and update or develop an Environmental Monitoring and Mitigation Plan (EMMP) for each project with budget and responsibilities that should comply with GOP and USAID/ USG environmental regulations and best international practice.
  - Based on above prepare a summary for each project of the environmental issues, positive or negative impacts and proposed mitigations & monitoring (in tabular form) for the scope of activities under both projects in their area of influence. Highlight any changes in the environmental conditions & issues since the existing (original) reports and start-up of construction.

- Conduct an independent social assessment to determine:
  - Those groups that have benefited and those that have been left disadvantaged by the project, with a particular focus on women.
  - Identify any pending resettlement / land-take / legal claims / compensation issues.
- Identify responsibility for ongoing operations and maintenance and provide suggestions on the best approach to ensure them.
- Review and report in the on-going compliance with the environmental monitoring requirements of the existing EAs.
- Identify mitigating measures that may be necessary to ensure project completion and ongoing operations and maintenance, and how they should be incorporated into the project design.
- Draft a monitoring and evaluation scope of work to ensure project is successfully completed, expected impact in attained, mitigating measures are implemented, and future potential issues are avoided.
- Identify further assessments that may be necessary in order to determine project impact and viability.
- Review the comments of USAID Environmental Officers and address all concerns.

6.0 Deliverables

The Contractor shall produce and submit the following:

6.1 Inception Report including Work Plan: Within ten days after signing the Purchase Order the contactor will be required to submit an inception report including work plan. The inception report shall include but not limited to provision of detailed explanation of the available relevant environmental reports, literature, methodology and tools to be used, and findings. The work plan section shall include but not limited to provision of field visits' schedule for all the stated requirements, meetings with stakeholders, collection of environmental and social data, collection of designs and cost estimates documents from WAPDA, desk analysis, submission of draft and final reports. This inception report including the Work Plan shall be written in a range of 20-30 pages.

6.2 Biweekly reports and progress briefing that provide detailed explanation of the work progress against the approved work plan, issues and corrective measures. The report shall be organized by project (Duber Khwar and Allai Khwar), and where applicable, include photos of project activities. The biweekly report shall be in the range of 10-15 pages

6.3 Draft REA Report for Duber Khwar including EMMP (Two hard and two soft copies on CD). The REA report, except annexures, shall not exceed 250 pages.

6.4 Draft REA Report for Allai Khwar including EMMP (Two hard and two soft copies on CD). The REA report, except annexures, shall not exceed 250 pages.

6.5 Final Reports (two separate Reports)of Environmental Documentation Form for: 1) Duber Khwar and 2) Allai Khwar: The reports (two hard copies and a soft copy on CD for each) should include at a minimum the following:

1. Executive Summary including findings and recommendations
2. List of Acronyms
3. Conversion Table
4. Introduction
   - 4.1. Background
   - 4.2. Objective and Scope of Assignment
   - 4.3. Project Overview
   - 4.4. Review of the Past Environmental Assessment
   - 4.5. Document Structure
5. Legislative, Regulatory, and Institutional Frameworks
   - 5.1. National Legislative and Regulatory Framework
   - 5.2. Provincial Environmental Legislation
   - 5.3. Environment Guidelines
   - 5.4. Institutional Framework
   - 5.5. USAID Environmental Procedures
6. Project Description
   - 6.1. Project History
   - 6.2. Project Justification
   - 6.3. Project Objectives
   - 6.4. Project Location
   - 6.5. Project Components
   - 6.6. Implementation Arrangements
   - 6.7. Technical Review of Project
7. Overview of Baseline Conditions
   - 7.1. An Overview of Geographical Area (Respective Area of influence i.e. District(s) / Division(s) of KP province)
   - 7.2. Physical Environment
   - 7.3. Biological Environment
   - 7.4. Socioeconomic Environment
   - 7.5. Changes in Site Conditions/Observations Made during Site Visit
   - 7.6. Floods of 2010 and subsequent floods till date
8. Rapid Environmental and Social Assessment
   - 8.1. Impact Assessment Methodology
   - 8.2. Project Siting/Design Impacts Identified in WAPDA IEE
   - 8.3. Additional Impacts Associated with Project Siting/Design
   - 8.4. Impacts Related to Construction Activities

8.5. Impacts Related to Operation and Maintenance Activities
8.6. Beneficial Environmental and Social Impacts
8.7. Current EHS Mitigation and Monitoring, and Supervision on Site

9. Environmental Mitigation and Monitoring Plan
   9.1. Institutional Strengthening
   9.2. Environmental Mitigation and Monitoring Plan Construction and Operation
   9.3. Environmental Monitoring
   9.4. Environmental and Social Audit
   9.5. Budget for Environmental Mitigation, Monitoring and Institutional Strengthening

10. Multiple Project Maps, Design etc.
   10.1. Maps: Location, Land use, Salient design features, Construction material sources, topographic maps, Seismic Map, Sensitivity Map etc.
   10.2. Annexures: List of participants, Public consultations list, Entitlement and compensation matrix, location of sensitive receptors and their distances from proposed project, NEQs, Construction Noise Modeling etc.
   10.3. Tables: Salient Features of project, average monthly temperature, precipitation and relative humidity, floral species, herbs shrubs, grasses mammals, reptiles, birds reported in project area etc. that are affected by the project.

11. Bibliography and References

12. Appendices

Each REA report except annexures shall not exceed 250 pages.

7.0 Timeline for Deliverables

The following table summarizes the deliverables along with its timeframe.

Table 1: List of Deliverables and Timeline

S. No.	Name of deliverable	Timeline
1	Inception Report and Work Plan	Within 10 days of contract / Purchase Order signature
2	Bi-weekly Progress Report	Every alternate Monday
3	Draft Final Reports of EDF for Duber Khwar including EMMP (Two hard and two soft copies on CD)	Within 30 days of contract / purchase order signature
4	Draft Final Reports of EDF for Allai Khwar including EMMP (Two hard and two soft copies on CD)	Within 30 days of contract / purchase order signature
6	Final Reports of EDF including EMMP for Duber Khwar (Two hard and a soft copy on CD for each)	Within 45 days of contract / purchase order signature
7	Final Reports of EDF including EMMP for Allai Khwar (Two hard and a soft copy on CD for each)	Within 45 days of contract / purchase order signature

8.0 Consultant's Qualifications

8.1 Consultant shall demonstrate relevant experience, education, qualifications and capability of the Team Leader: Relevant qualifications, education, experience working in similar studies and assessments, and the ability to manage multidisciplinary team of experts in politically and security sensitive complex environment.

8.2 Technical Experts: Technical advisors (Hydelpower projects, Construction, Transmission Lines, Environment, Sociology) with similar experience in hydel power projects related environmental issues including impact on the local population.

8.3 Sociologists and Anthropologists (Socioeconomics, sociology, land and resettlement, gender and sustainable development) relevant qualifications, education, experience and professional background working in similar projects in Pakistan and abroad.

Proposed key personnel to carry out the Statement of Work in accordance with the following:

9.0 Payment Schedule

Payment is linked to the completion of contract deliverables according to the schedule below:

Table 2: Payment Schedule

Approval of Inception Report and Work Plan	10% of total cost
Submission and acceptance of Draft Final Reports of EDF for Duber Khwar including EMMP (Two hard and two soft copies on CD)	35% of total cost
Submission and acceptance of Draft Final Reports of EDF for Allai Khwar including EMMP (Two hard and two soft copies on CD)	35% of total cost
Submission and acceptance of Final Reports of EDF including EMMP for Duber Khwar (Two hard and a soft copy on CD for each)	10% of total cost
Submission and acceptance of Final Reports of EDF including EMMP for Allai Khwar (Two hard and a soft copy on CD for each)	10% of total cost

A deliverable will be considered completed once written acknowledgement of completion is provided by the COR.

10.0 References (Official Documents & Reports)

10.1 Required Readings

- USAID 22 CFR Part 216 and USAID ADS 204
- Relevant Government of Pakistan laws, regulations and policies
- USAID Initial Environmental Examination (Tracking #: OAPA-14-Jan-Pak-0017)
- Respective Project IEE, EIA, EA, EMMP, Engineering Design Documents/Drawings, Feasibility Studies

10.2 References

- Friends of Democratic Pakistan Report on Water March 2011 at http://www.wapda.gov.pk/pdf/BrochureFODPMarch2011.pdf
- Biological Diversity and tropical forestry Analysis at: http://pdf.usaid.gov/pdf_docs/PNACU858.pdf
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Annex II:
DKHP Impact Assessment

Impact reference	Impacted Aspect	Description	Information in EIA	Mitigation in EIA	Monitoring in EIA	Source/ Comment	Stakeholder comments	Compliance Status	Environmental Aspect	Project Phase
Project Design and Location										
DP1	Impacts on rest water availability	The water downstream of the weir is required for irrigation, water mills, micro-hydels, domestic use, wildlife and domestic animals, sanitation and a fishery.	The diversion of the flows from the reservoir to the headrace tunnel for power generation can deprive the downstream reaches of the Duber Nullah and impact the community at Duber village.	Careful management of water and guarantee of existing usage.		EIA	Community stakeholders did not complain about water availability downstream of Duber weir.	HBP team observed the release of environmental flow from Duber weir. A water supply scheme installed by WAPDA for irrigation purposes was also inspected. Locals reported that water available from the Duber nullah and water supply scheme was sufficient for their usage.	Physical	Design
DP2	Location of penstock	Impacts on the land-use due to the location of penstock.	As mentioned in the EIA, penstock alignment was passing through a graveyard. This original design has a potential impact on land-use in the project area.	The route and design of the penstock was re-evaluated in later feasibility studies. The route of the penstock was not changed, though mechanism of laying it was altered. The present design includes the penstock being laid underground.		EIA	No issues were reported by stakeholder on the land-use in the project area.	The penstock, on the basis of the later evaluation was laid underground and thus had no impacts on the land-use.	Physical	Design
DS1	Resettlement/ displacement of people	Impact of resettlement on communities settled on land expected to be occupied by project facilities such as reservoir, powerhouse, weir and access roads.	The displacement may affect the livelihood of the local community surrounding the project area.	Carefully planned resettlement programme including budget for compensation		EIA	Stakeholders had no issues regarding resettlement.	Compensation was paid to resettled houses, school building and a hut. Records of compensation paid were maintained by WAPDA project office personnel, which were reviewed during field visit.	Social	Design
DS2	Impacts on livestock due to the location of weir	Limited availability of water for livestock due to diversion of water flow at the weir.	The diversion of water through headrace for generation of hydroelectric power will reduce the availability of drinking water for animals. It is not a significant impact as adequate amount of water. will remain in canals and Duber Nullah	Careful planning and mitigation measures		EIA	No issue was reported by local community during consultation related to water availability for livestock.	Environmental flow was assessed for water availability downstream of Duber Nullah. Water flow in Duber Nullah was sufficient for drinking requirements of livestock.	Social	Design and Location
DE1	Impact of Project design on terrestrial ecological resources	Construction of Project infrastructure and creation of reservoir leading to habitat loss for flora and fauna.		Contractual obligation for Project staff and contractors to avoid woodcutting from forest areas in Project vicinity and restrict woodcutting to only designated areas.		Inadequate information in EIA	Stakeholders had no reservations regarding impact on terrestrial flora and fauna.	EIA says only 24 trees will be removed. The site visit could not confirm the exact numbers of trees removed. However, project infrastructure and construction activities have not directly impacted the nearby forests located at higher elevation.	Ecology	Design

Impact reference	Impacted Aspect	Description	Information in EIA	Mitigation in EIA	Monitoring in EIA	Source/ Comment	Stakeholder comments	Compliance Status	Environmental Aspect	Project Phase
DE2	Impact of Project design on aquatic ecological resources	The weir will present a barrier to upstream migration of fish. Tthe reservoir will disrupt the riverine habitat and insufficient environmental flow (rest water requirements) will dry out areas of Duber Nullah downstream of the weir with consequent loss of fish.		Project operations to release the recommended environmental and compensatory flow rate of 0.944 m3/sec downstream of the weir during Project operations.		Inadequate information in EIA	Stakeholders had no reservations regarding impact on fish fauna.	Environmental flow as discussed in the EIA was being released from Duber weir.	Ecology	Design
Construction Phase										
CE1	Impact of construction activities on terrestrial ecological resources	Blasting, noise, vibrations, illumination, air pollution and dust during construction may negatively impact the flora and fauna. Increased encroachment into pristine areas may increase the incidence of woodcutting and poaching.		Contractual obligation for Project staff and contractors to avoid woodcutting from forest areas in Project vicinity. Contractual obligation for Project staff and contractors to avoid illegal poaching.		Inadequate information in EIA	Stakeholders had no reservations regarding impact on terrestrial flora and fauna .	Not applicable as there is no protected forest in the project vicinity and no issues were reported by locals.	Construction	Contractors to avoid cutting wood from restricted forest areas and only to cut wood from designated areas. Consultation with the Forest Department is required for designation of areas, if this is in forest land.
CE2	Impact of construction activities on aquatic ecological resources	Construction of coffer dam and diversion tunnel will destroy the fish habitat and halt upstream migration of fish.		Release the recommended environmental and compensatory flow rate of 0.944 m^3/sec from diversion tunnel.		Inadequate information in EIA	Stakeholders had no reservations regarding impact on fish fauna.	While the weir may halt the upstream migration of fish, the fact that no threatened ecosystem or species has been reported from a zone of impact and almost all fish found in Duber Khwar are also found in River Indus and several other tributaries.	Ecology	Construction

Impact reference	Impacted Aspect	Description	Information in EIA	Mitigation in EIA	Monitoring in EIA	Source/ Comment	Stakeholder comments	Compliance Status	Environmental Aspect	Project Phase
CHS1	Noise and vibration from machinery and construction work	Impact on health and safety of workers during construction.	The increased level of noise and vibration during construction of tunnels, where blasting and movement of heavy machinery was required, may have significant impacts on the workers and adjacent communities.	During construction phase, the contractors were required to maintain the registers to record worker grievances regarding noise and vibrations. Personal Protective Equipment (PPE) was required to be provided by the contractors to both skilled and unskilled workers to avoid any adverse impacts of noise.		EIA	No issues were reported	The team reviewed the grievance record and incident/accident registers. Andrtiz Hydro GmbH HSE officer was interviewed who provided information to ensure that measurements were taken to mitigate the impacts of noise and vibrations.	Health & Safety	Construction
CP1	Excavation waste	Impacts on landform due to excavation of material and quarry area.	Dumping of excavated material in ravines, which were identified during feasibility studies, may have an impact over the natural course of the rain water. Erosion of excavated material due to the flow of rain water may also degrade the existing water quality. Dumping of excavated material over vegetation may also impact the ecology of the project area.	Planned disposal and utilization of dumping sites		EIA	The local communities reported no issues.	During inspection, the HBP team observed that sufficient measures as mentioned in the EIA were adopted for rehabilitation of quarry area.	Physical	Construction
CP2	Dust emissions	Impacts due to construction related dust emissions.	Dust associated with the implementation of the project may have adverse impact on the machinery, workers and communities in the Project area. Impacts include choking of the exhausts of the machinery, visual problems and health hazards related to dust.	Continuous sprinkling of water for dust suppression.		EIA	Consultation with the local community and project staff reported no issue regarding dust emissions.	During inspection of the project location, considerable amount of dust was noted due to movement of vehicles which was mainly due to the road damaged by 2010 floods. No residual dust impact was observed due to construction of the project.	Physical	Construction
CP3	Soil erosion and slope stability	Impacts due to construction of access roads such as soil erosion and slope destabilization.	New roads need 10 ha of land and may have direct or indirect impacts on soil erosion and cause drainage issues; impact wildlife; and require removal of forests.	EIA mentions that mitigation will be through design and compaction of land to avoid erosion.			The local communities reported no issues.	The HBP team observed no major impacts due to the construction of the access roads. The old access road was severely damaged by 2010 floods and a new road was constructed to access the weir site.	Physical	Construction

Impact reference	Impacted Aspect	Description	Information in EIA	Mitigation in EIA	Monitoring in EIA	Source/ Comment	Stakeholder comments	Compliance Status	Environmental Aspect	Project Phase
CP4	Waste disposal	Waste associated with construction activities and construction campsite could have significant impacts on the quality of soil if not properly dumped. In addition to this, discharge of liquid water into the Duber Nullah could potentially degrade the surface and ground water quality and increase occurrence probability of water borne diseases		Not applicable.		This is an additional impact identified by the HBP and is not addressed in the EIA.	The local communities reported no issues.	Physical inspection and community consultation did not indicate any soil or water contamination near the construction campsite. Monitoring data was not available to the team for review.	Physical	Construction
CS1	Water availability	Impacts on community water use.	Water is required downstream of the weir for irrigation, water mills, micro-hydels, domestic use, domestic animals, and fishery. The diversion of water for construction of the weir and through headrace for generation of hydroelectric power could reduce the availability of water for these uses.	Release of environmental flow at the rate of 0.944 m^3/s to meet water requirements of the community residing downstream of the weir.		EIA	No issues were reported on the availability of water downstream of the weir.	During field visit, an adequate amount of water was noted downstream of the weir. However, no mechanism was adopted to calculate the discharge to ensure compliance.	Social	Construction
CS2	Impacts on existing traffic due to movement of project related vehicles	The transportation of heavy machinery on KKH is an issue due to the size of the road and already existing transportation on the road.		Not applicable.		This is an additional impact identified by the HBP and is not addressed in EIA.	The local communities and people working in the transport sector reported no issues.	Not applicable	Social	Construction
CS3	Water availability	Impacts on water use by the community downstream of Duber weir.	Water downstream of the weir is required for irrigation, water mills, micro-hydels, domestic use, wildlife and domestic animals, sanitation and a fishery. The construction of the weir requires dry conditions, which may need blockade and altering of the Duber Nullah natural flow and can deprive the downstream reaches of the Duber Nullah and impact the community at Duber village.	Provision of a diversion tunnel was considered in order to supply water to the community residing downstream of the Duber Nullah.		EIA	The local community reported no issues as the diversion tunnel was releasing adequate amount of water to meet the community's water requirements.	As mentioned in the EIA, a diversion tunnel was constructed to release the water downstream of the weir construction site.	Social	Construction

Impact reference	Impacted Aspect	Description	Information in EIA	Mitigation in EIA	Monitoring in EIA	Source/ Comment	Stakeholder comments	Compliance Status	Environmental Aspect	Project Phase
CS4	Cultural impact	Impacts due to construction camp site.	The proximity of the campsite to adjacent communities can result in social conflicts.			This is an additional impact identified by the HBP and is not addressed in EIA.	Local communities did not report any social issues concerning the construction camp.	During investigation, HBP team observed that construction camp is at a reasonable distance from the local community. Provision of a boundary wall, metal gate and security guards were employed at the construction camp to avoid security concerns of the workers and the local communities.	Social	Construction
Operation Phase										
OE1	Impact of Project operations on terrestrial ecological resources	Disturbances include noise and light during Project operations may negatively impact terrestrial flora and fauna. Increased encroachment into pristine areas may increase the incidence of woodcutting and poaching.		Contractual obligation for Project staff and contractors to avoid woodcutting from forest areas in Project vicinity. Contractual obligation for Project staff and contractors to avoid illegal poaching .		Inadequate information in EIA.	Stakeholders had no reservations regarding impact on terrestrial flora and fauna.	WAPDA staff or local communities reported no cases of extensive woodcutting, poaching or encroachment into pristine areas.	Ecology	Operation
OE2	Impact of Project operations on aquatic ecological resources	The weir will present a barrier to upstream migration of fish; the reservoir will disrupt the riverine habitat;and insufficient environmental flow (rest water requirements) will dry out areas of Duber Nullah downstream of the weir with consequent loss of fish.		Project operations to continue to release the recommended environmental and compensatory flow rate of 0.944 m^3/sec downstream of the weir during Project operations.		Inadequate information in EIA.	Stakeholders had no reservations regarding impact on fish fauna.	While the weir may halt the upstream migration of fish, the fact that no threatened ecosystem or species has been reported from a zone of impact and almost all fish found in Duber Khwar are also found in River Indus and several other.	Ecology	Operation
OP1 & OS1	Sewerage scheme of locals	Impacts on sewerage disposal scheme of the local community.	The decrease in the flow of water downstream of Duber Nullah will impact the sewage disposal scheme of the local community and may have significant impact on the existing ground water quality.	Provision of sewerage system to a number of houses		EIA	No issues were reported by the local communities.	Septic tanks and soakaways were being used by the local communities. Reduction in flow of Duber Nullah was not a major impact on sewerage disposal according to the local communities.	Physical and Social	Operation
OP2 & OS3	Impacts on rest water availability	Social and environmental impact on downstream of Duber weir due to diversion of the nullah.	The water downstream of the weir is required for irrigation, water mills, micro-hydels, domestic use, wildlife and domestic animals, sanitation and a fishery. The operations of the project require a maximum head of 1,218 m.a.s.l. This may need blockade of water at weir which may deprive the communities residing downstream of weir from rest water.	Release of environmental flow with rate of 0.944 m^3/s		EIA	No issues were reported.	The project has completed its 30 days reliability run on April 28, 2014. Release of the environmental flow was observed from the weir. WAPDA ensured that the environmental flow determined in a study carried out in 2010, will be released in future.	Physical and Social	Operation

Impact reference	Impacted Aspect	Description	Information in EIA	Mitigation in EIA	Monitoring in EIA	Source/ Comment	Stakeholder comments	Compliance Status	Environmental Aspect	Project Phase
OS2	Economic Impacts	Positive impact due to more energy available in the national grid.	The construction of DKHP will add 130 MW of electric power in the national grid. The generated power will help reduce the gap between energy demand and supply in the country. The additional power may also help uplift socioeconomic condition of the rural areas in project vicinity by provision of electricity at reduced cost.			EIA		The power is fed to national grid through NTDC owned transmission lines from where it is dispatched to the load centers.	Social	Operation
OS4	Employment	Positive impact due to availability of employment opportunities.	Positive impacts on the socioeconomic conditions of the area by employing able individuals from the communities surrounding project area.			This is an additional impact identified by the HBP and is not addressed in EIA.	Local communities reported that employment opportunities were given to them during construction of the project facilities. Particularly people working in the transport sector benefitted greatly from the construction activity at the weir and powerhouse site.	The project is near to its completion and no employment opportunities for the indigenous people have yet been announced in the project area.	Social	Operation
OS5	Dam safety	Dam safety plan to ensure procedures are in place for dam failure	No information	-	-		-	Dam Safety Plan in case of a dam failure does not exist	Social/Physical	Operation

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