



**GOVERNMENT OF PAKISTAN**  
**WATER & POWER DEPARTMENT**  
**GILGIT- BALTISTAN**



**INITIAL ENVIRONMENTAL EXAMINATION (IEE) REPORT**  
**CONSTRUCTION OF 14 MW NALTAR-V HYDROPOWER PROJECT**  
**DISTRICT GILGIT**

**October, 2014**

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**SECTION**

**0**

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# **SUMMARY**

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## 0. SUMMARY

The proposed Naltar – V Hydropower Project (Naltar – V HPP) is a run-of-river scheme, about 0.5 Km downstream of Naltar Paen Village on Naltar River. The powerhouse is located near village Nomal.

The lands in the project areas are proprietary as well as state land. Proprietary land used for cultivation. The project will consume 162.2 kanals of land out of which 24% of cultivated, 0.3 % of residential land, 11.8% cultivable waste land and 77.7 % state land that is likely to be consumed by the Project. One residential unit has to be relocated.

About 26 shade trees and 15 fruit trees (41 trees) lie in project area and have to be cut. General Flora of the project area includes Poplar, Chir, Bakian, Apple, Apricot, Pear, and Walnut. Afforestation is proposed at the ratio of 1:4; about 164 trees have to be replanted with the assistance of forest department.

Ambient air quality monitoring data is not available for the project area. No major sources of air pollution, viz., industries, exist in the project area except for road traffic in the valleys of Naltar and other nullahs. Due to presence of ample plantation, the quality of air is good. Quality of air along roads is impaired to some extent.

The main surface water resource of the Project area is the Naltar River besides spring water. In general, water of the nullah/river and springs are safe for consumption but the potable water would require appropriate treatment, before use for drinking by non-local construction crew.

The socio-economic environment of the project area is a mixture of rich and poor with a low percentage of middle income groups. People are relying for their earning from small agricultural land holdings and/or providing services on daily wages. Maize and wheat are staple food of locals. Wheat and maize production is about 200 kg and 160 kg per kanal, respectively as derived from census survey analysis.

It is recommended that the proprietary land should be compensated in cash in accordance with the Land Revenue Act and prevailing practice in Gilgit Baltistan to be determined by the Revenue /Acquisition Collector. The LAC may form a committee to determine the value of the disrupted assets. The villages of the project area should be facilitated with proper drainage and sewerage systems. The project area should be rehabilitated after the completion of project.

The total environmental cost comes to about Rs. 30.4 million.

It is concluded that the project activities of most of the components will have adverse effects of low-to-medium level at local environment while the overall environmental impact rating is low-adverse.

There would be trained staff at the project site for environmental management and monitoring. Water and Power Department – Gilgit Baltistan as the Implementing Agency will develop its internal capacity to implement and monitor the measures in the environmental management and monitoring plan by hiring two consultants one as supervisory consultant (Environmental and Resettlement Specialist) another part – time consultant for external monitoring.

In view of the fact that most of the impacts are able to be mitigated and the project will produce very useful hydropower with benefits to the province in particular and Pakistan in general, the Project is recommended for construction. The project area people will get benefit from the implementation of the project.

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# **INTRODUCTION**

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## **1. Introduction**

### **1.1 General**

Pakistan is rich in hydropower potential but unfortunately, Pakistan's investment in hydropower generation has remained hostage to politics for many decades, while no significant progress has been achieved. On the other hand, the Federal and Provincial Governments are trying to facilitate private investors to promote hydel generation. Pakistan is endowed with a hydel potential of approximately 40,000 MW, most of which lies in the Khyber Pakhtunkhwa, Gilgit - Baltistan, Azad Jammu and Kashmir and to a lesser degree in Punjab. Electric power is a stimulator for the socio-economic uplift of the country, yet only half of the country's population has access to it. After the creation of Pakistan, the country faced numerous problems including dearth of electrical power. Since then efforts have been made to exploit the hydropower potential of the country. However, abundant hydel potential remains untapped, which needs to be harnessed.

Naltar – V Hydropower Project was first mentioned as part of the master plan for electrification of Gilgit – Baltistan (GB) formerly known as the Northern Areas on the basis of proximity to Gilgit as main load centre .

Water and Power Department (WPD), Gilgit – Baltistan is the Proponent of this project on behalf of GB government.

### **1.2 Purpose of the Project**

The project objective is to generate 14 MW of electricity on a least cost basis to meet the increased energy demand. The main objectives of the Naltar – V HPP are to assist the government of Pakistan (GoP) and GB provincial governments in their efforts to:

- 1) Develop domestic energy resources and reduce load-shedding in a cost-effective and environmentally sustainable manner, thereby supporting the country's long-term energy development objectives.
- 2) Reinforce and complement the reform program for the power sector.
- 3) Strengthen the WPD – GB capability to address environmental and resettlement issues related to hydropower projects and
- 4) Further rationalize the use of non- renewable resources.

### **1.3 An Overview of the Project**

Naltar – V HPP will exploit the water resources of Naltar River for power generation. The permanent works will comprise thirteen main components, viz., Tyrolean Weir, Gravel Trap, Sedimentation Basin, Steel Pipe, Junction Basin, Inverted Siphon & Collection Basin, Headrace Culvert, Forebay, Penstock, Powerhouse, Switching Station, Access Road and Grid Station. The Tyrolean Weir will be located near Naltar Village on the Naltar River. The Powerhouse will be located at near Nomal Village.

Tyrolean Weir height is 7 m and length is 30.2 m. Penstock length is 4.12 km long. The designed hydropower capacity is 14 MW.

## 1.4 Need for the Environmental Study

WPD – GB awarded contract to a joint venture consortium of consultants<sup>1</sup> to prepare detailed design review of the proposed Naltar – V Hydropower Project prepared by other consults. This IEE report is essential part of the design review report.

The development projects bring about changes, both positive and negative, in the environmental and social settings of the project area. The intensity and level of change, however, depends upon the nature of the project and the baseline environmental conditions of the area. For the last four decades this aspect has gained momentum both at official and public level. As a result of this, official regulations and laws have been promulgated for the protection and conservation of the physical, biological and social environment. The law makes it mandatory to carry out Initial Environmental Examinations (IEE) or detailed Environmental Impact Assessment (EIA) of the development projects depending upon the nature and magnitude of the impacts.

Pakistan Environmental Protection Agency (Pak-EPA) issued regulatory guidelines for Environmental Assessment Policy and Procedures for filling, review and approval of environmental assessment (1997); IEE will suffice for a hydropower project only when:

- Hydropower generation capacity is less than 50 MW.

The donor agencies i.e. World Bank (WB), recommend IEE for the category “B” project which have:

- Insignificant adverse environmental impacts, most of them are reversible or precedent.
- These impacts may not affect an area larger than the sites or facilities subject to physical works

### 1.4.1 Justification for IEE

#### **According to Pak - EPA:**

For Naltar– V HPP an IEE will recommend as the power generation is less than 50MW. Accordingly, the project falls under Schedule-I of Pak-EPA regulations.

#### **According to Donor Agencies:**

The project is relatively small size (14 MW) and it will have minor environmental impact, with irreversible nature and not site-specific as well, it is classified as a Category “B” project in accordance with WB, ADB’s & IFC Environmental Assessment Guidelines.

## 1.5 Scope of the IEE Study

The brief scope of IEE study includes:

- Assessment of the existing status of environment and socioeconomic aspects.

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<sup>1</sup> Associated Consulting Engineers-ACE(Pvt.) Ltd.; Engineering General Consultants EGC (Pvt.) Ltd and Technical Engineering and Management Consultants

- Identification of potential impacts on various environmental components due to activities envisaged during construction and operational phases of the proposed Hydro-electric project.
- Prediction of significant impacts on major environmental components.
- Delineation of Environmental Management & Monitoring Plan (EMMP) outlining measures to minimize adverse impacts of the proposed project.

## 1.6 Approach Adopted for IEE Study

The Consultants carried out the IEE study of Naltar– V HPP in a systematic manner. This included collection of secondary data, maps and related literature, field surveys for primary data collection, public consultation, and desk studies.

## 1.7 Structure of the Report

This report is a part of the feasibility study of Naltar– V Hydropower Project. This Initial Environmental Examination (IEE) report comprises ten sections and a summary. The sections are as follows:

**Section 1, Introduction**, gives an introduction of the Project, Consultants' scope of services for IEE studies and approach adopted by the Consultants for reaching compliance with the TOR.

**Section 2, Legal and Regulatory Framework** describes national laws applicable during the implementation of the Project. National and international guidelines are required to be complied during preparation of IEE report as well as followed during the implementation of the Project. It also describes the need of inter and intra agency coordination.

**Section 3, Description of the Project**, gives a rather detailed account of the Project particularly emphasising those project components which are of importance in relation with environmental and social aspects.

**Section 4, Project Alternatives Considered**, provides a brief account of the country's need of electric energy discusses various alternative sources exploited or to be exploited to curb the energy crisis in the country, discusses the role of the present project in this context. The section also deals with various alternatives considered for project layout in consideration of technical, economic and environmental aspects.

**Section 5, Information Disclosure, Consultation and Participation**, deals with the outcome of the consultation/scoping sessions carried out with the local communities, knowledgeable people, public representatives, etc. It discusses the concern of various tiers of the people and provides an outline how these have been addressed within the framework of the project.

**Section 6, Environmental and Social Baseline Conditions** this section discuss various environmental and social entities i.e. Biodiversity, Fauna and Flora, Water, human environment etc. prior to the project.

**Section 7, Project Impacts and Mitigation/Resettlement Actions**, provides an analysis on the environmental and social impacts of the project and discusses measures to mitigate adverse impacts and enhance environment of the project affected areas.

**Section 8, Environmental Management and Monitoring Plan** and Institutional Requirements, provides plans and costs for implementation of environmental management and monitoring. It proposes an organizational setup required for implementation of mitigation / resettlement actions and in the light of this identifies strengthening needs institutional arrangement presently existing within WPD – GB and allied departments.

**Section 9, Estimated Environmental Cost** estimates an environmental cost comprises the compensation for trees plus Afforestation, monitoring and resettlement, etc. is estimated in this chapter.

**Section 10, Conclusions & Recommendations**, sums up the report and the conclusions resulting from the study as well as recommendations for making project environmentally sustainable.



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**LEGAL AND ADMINISTRATIVE  
FRAMEWORKS**

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## **2. Legal and Administrative Frameworks**

### **2.1 General**

This Section provides an overview of the legal frameworks and environmental assessment process in Pakistan as well as a list of key environmental legislation and guidelines applicable to hydropower projects. It also provides an overview of Pakistan Environmental Protection Act (PEPA) and World Bank's Operational Policies and applicable Environmental, Health and Safety Guidelines.

### **2.2 Statutory Framework (An Overview)**

The development of statutory and other instruments for environmental management has steadily gained priority in Pakistan since the late 1970s. The Pakistan Environmental Protection Ordinance (PEPO), 1983 was the first piece of legislation designed specifically for the 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 and early 1990s, which concluded 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 (PEPA), 1997 conferred broad-based enforcement powers to the environmental protection agencies. The publication of the Pakistan Environmental Protection Agency Review of IEE and EIA Regulations (IEE–EIA Regulations), 2000 provided the necessary details on the preparation, submission, and review of initial environmental examinations (IEE) and environmental impact assessments (EIA). In addition to the PEPA 1997, Pakistan's statute books contain a number of other laws that have clauses concerning the regulation and protection of the environment.

#### **2.2.1 Constitutional Provision: Amendment XVIII to Pakistan's Constitution**

The Amendment XVIII (Eighteen Amendment to the constitution of Pakistan) was passed by National Assembly on April 8, 2010, Senate approved it on 15th April 2010 and President of Pakistan signed it on April 19 2010.

Prior to the 18<sup>th</sup> Amendment to the Constitution of Pakistan in 2010, the legislative powers were distributed between the federal and provincial governments through two 'lists' attached to the Constitution as Schedules. The Federal list covered the subjects over which the federal government had exclusive legislative power, while the 'Concurrent List' contained subjects regarding which both the federal and provincial governments could enact laws. The subject of 'environmental pollution and ecology' was included in the Concurrent List and hence allowed both the national and provincial governments to enact laws on the subject. However, as a result of the 18<sup>th</sup> Amendment this subject is now in the exclusive domain of the provincial government. The main consequences of this change are as follows:

- The Ministry of Environment at the federal level has been abolished. Its functions related to the national environmental management have been transferred to the provinces. The international obligations in the context of environment will be managed by various ministries and departments of the federal government.

- The Pakistan Environmental Protection Act, 1997 (PEPA, 1997) is applicable to the provinces. The provinces are required to enact their own legislation for environmental protection. It is understood that to ensure legal continuity PEPA, 1997 continues to be the legal instrument in Gilgit Baltistan for environmental protection till enactment of new law.

It is anticipated that the provincial acts will be based on the PEPA, 1997 and will provide the same level of protection. The following discussion is, therefore, based on the provisions of PEPA, 1997.

## 2.3 Environmental Legislation

### 2.3.1 Pakistan Environmental Protection Act, 1997

PEPA, 1997 is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The Act is applicable to almost all environmental parameters pertaining to air, water, soil and noise pollution, and handling of hazardous wastes, as well as to the social and socioeconomic aspects.

The Act provides the framework for: protection and conservation of species, wildlife habitats and biodiversity; conservation of renewable resources; establishment of standards for the quality of the ambient air, water and land; establishment of Environmental Tribunals; appointment of Environmental Magistrates; and IEE and EIA approval. Penalties have been prescribed for those who contravene the Act. The key features of the Act have a direct bearing on the proposed project requirement for an IEE and EIA for development projects. The Pak – EPA has delegated the power of review and approval of environmental assessments to the provincial EPAs. The following are the key features of the Act that have a direct bearing on the area:

- **Section 11 (Prohibition of Certain Discharges or Emissions)** states that “Subject to the provisions of this Act and the rules and regulations made there under, 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 NEQS”.

NEQS have been established for gaseous emission, liquid effluent, ambient air quality, noise, and drinking water. The proposed project needs to comply with all applicable standards.

- **Section 12-2b (Review of IEE and EIA)**. The Federal Agency shall review the EIA report and accord its approval subject to such conditions as it may deem fit to impose, or require that the EIA be re-submitted after such modifications as may be stipulated or rejected, the project as being contrary to environmental objectives.

The IEE of the proposed Project will be submitted to the Gilgit Baltistan – EPA (GB-EPA) for approval.

- **Section 14 (Handling of Hazardous Substances)** requires that “Subject to the provisions of this Act, no person shall generate, collect, consign, transport, treat, dispose of, store, handle, or import any hazardous substance except;
  - ✓ (a) under a license issued by the Federal Agency and in such manner as may be prescribed; or

- ✓ (b) in accordance with the provisions of any other law for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement, or other instrument to which Pakistan is a party.” Enforcement of this clause requires the EPA to issue regulations regarding licensing procedures and to define ‘hazardous substance.’

As per Article 14(1), the requirements of Article 14 are applicable in such manner as may be prescribed’. PEPA, 1997 defines that prescribed to mean as prescribed under the rules made under the Act. Hazardous Substances Rules were drafted by (Pak-EPA) in 2003 but were never notified. Therefore this article of the PEPA, 1997 is not enforceable and will not affect the proposed project. However, best industry practice and internationally acceptable guidelines for hazardous substances would be used for the proposed project.

### 2.3.2 Pakistan Environmental Protection Agency Review of IEE & EIA Regulations, 2000

The EPA prepared the regulations during year 2000 for “Review of IEE and EIA” under the powers conferred upon it by the PEPA. These Regulations categorize development projects for IEE and EIA into two schedules: Schedules I and II.<sup>2</sup> Projects are classified on the basis of the expected degree and magnitude of environmental impacts. The projects listed in Schedule – I include those where the range of environmental issues is comparatively narrow and the issues can be understood and managed through less extensive analysis in the form of an IEE, whereas the projects listed in Schedule – II are those which are likely to cause significant adverse impacts and hence require extensive analysis in the form of an EIA.

The following sections of the IEE-EIA Regulations, 2000 have bearing on the proposed Project’s EIA:

- **Regulation 6:**

- ✓ (1) The Federal Agency may issue guidelines for preparation of IEE or EIA including guidelines of general applicability and sectoral guidelines indicating specific assessment requirements for planning, construction and operation of projects relating to a particular sector.
- ✓ (2) Where guidelines have been issued under sub-regulation.
- (1), an IEE or EIA shall be prepared, to the extent practicable, in accordance therewith and the proponent shall justify in the IEE or, as the case may be, EIA and departure there from, The relevant guidelines are the Guidelines for the Preparation and Review of Environmental Reports and the Guidelines for Public Consultation. No sectoral guidelines for Dams & Hydroelectric Power Projects are issued.

- **Regulation 8:**

- ✓ (1) Ten paper copies and two electronic copies of an IEE or EIA shall be filed with the Federal Agency;
- ✓ (2) Every IEE and EIA shall be accompanied by
  - (a) an application, in the form set out in Schedule IV; and

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<sup>2</sup> Detail about this regulation is present at the Pak-EPA website (<http://www.environment.gov.pk/info.htm>).

- (b) Copy of receipt showing payment of the review fee.

The prescribed procedure for review of IEE by the EPA is described in Figure 2.1. The key features are:

- If it considers necessary, the EPA can form a committee of experts to assist the EPA in the review of the IEE. The EPA may also decide to inspect the project site.
- **Article 12(4)** of PEPA 1997 binds the EPA to communicate its approval or otherwise within a period of four months from the date the initial environmental examination or environmental impact assessment is filed complete in all respects in accordance with the prescribed procedure, failing which the initial environmental examination or, as the case may be, the environmental impact assessment shall be deemed to have been approved, to the extent to which it does not contravene the provisions of this Act and the rules and regulations made there under.' Regulation 11 of the IEE-EIA Regulations 2000, states that the EPA shall make every effort to carry out its review of the EIA within forty-five days, of issue of confirmation of completeness.

#### 2.4 Approval from Gilgit Baltistan Environmental Protection Agency (GB – EPA)

As per the IEE & EIA, 2000 Regulations and 18<sup>th</sup> Constitutional Amendment, propose project will be required to submit the EIA report to GB – EPA and seek approval on the same from GB – EPA. Ten hard copies and 2 soft copies of the IEE report will need to be submitted to GB – EPA. GB – EPA will grant its decision on the IEE as per the rules and procedures set out in the 2000 Regulations. The following rules apply.

- A fee is payable to GB – EPA with application for review of the IEE.
- The IEE submittal is to be accompanied by an application in the format prescribed in Schedule IV of the 2000 Regulations.
- GB – EPA is bound to conduct a preliminary scrutiny and reply within 10 days of the submittal of the report a) confirming completeness, or b) asking for additional information, if needed.
- In the review process GB – EPA may consult a Committee of Experts, which maybe constituted on the request of the Director General (DG) GB – EPA.
- Where an IEE is approved, GB – EPA can impose additional controls as part of the conditions of approval.
- GB – EPA is required to make every effort to complete the IEE review process within 45 days of the issue of confirmation of completeness. However, GB – EPA can take up to 4 months for communication of final decision.
- The approval will remain valid for the project duration mentioned in the IEE but on the condition that the project commences within a period of three years from the date of approval. If the project is initiated after three years from approval date, the proponent will have to apply for an extension in the validity period. The GB – EPA on receiving such request grant extension (not exceeding 3 years at a time) or require the proponent to submit

a fresh IEE if in the opinion of GB – EPA changes in baseline conditions or the project so warrant.

- After receiving approval from ‘V’ the proponent will acknowledge acceptance of the conditions of approval by executing an undertaking in the form prescribed in Schedule VII of the 2000 Regulations.
- The 2000 Regulations also require proponents to obtain from GB – EPA, after the end of construction phase of the project, a confirmation that the requirements of the IEE and the conditions of approval have been duly complied with.
- The GB – EPA in granting the confirmation of compliance may impose any additional control regarding the environmental management of the project or the operation, as it deems necessary.

## **2.5 Other Environmental Related Laws in Gilgit Baltistan**

The scope of environmental law implied by the legal definition of environment given in PEPA, 1997 results in numerous laws enacted since the nineteenth century being classified as environmental laws. These include laws pertaining to forests, water resources, wildlife, land, agriculture etc. Laws that may have relevance to environment are enlisting as follow while detail is given in IUCN web link.

- KANA notification, 1988
- Northern Areas Nautor Rules & Amendment, 1978
- Land Acquisition Act, 1894
- Gilgit Private Forest Regulation, 1970
- Forest Act, 1927 & Forest Act Amendment Order, 1993
- Northern Areas Forest Rules, 1983
- Northern Areas Fisheries Act, 1975 & Amendments & Rules
- Northern Areas Wildlife Preservation Act, 1975
- Wild Birds and Animals Protection Act, 1912
- Prevention of Cruelty to Animals Act, 1890
- Motor Vehicle Ordinance, 1965
- Explosive Substances Act, 1908
- Explosives Act, 1884

## **2.6 National Environmental Guidelines and Policies**

### **2.6.1 National Conservation Strategy (NCS), 1992**

The Pakistan NCS is the principal policy document for environmental issues in the country, which was developed and approved by the Government of Pakistan on 1 March, 1992. The NCS works on a ten-year planning and implementation cycle. It deals with fourteen core areas, as follows:

- Maintaining soils in cropland;
- Increasing irrigation efficiency;
- Protecting watersheds;
- Supporting forestry and plantations;
- Restoring rangelands and improving livestock;
- Protecting water bodies and sustaining fisheries;
- Conserving biodiversity;
- Increasing energy efficiency;
- Developing and deploying material and energy renewable;
- Preventing and abating pollution;
- Managing urban wastes;
- Supporting institutions for common resources;
- Integrating population and environmental programs; and
- Preserving the cultural heritage.

### **2.6.2 National Environment Policy, 2005**

This policy was implemented in 2005 to provide an overarching framework for addressing the environmental issues facing Pakistan. It gives directions for addressing sectoral issues and provides means for promoting conservation and environmental protection in water, air and waste management, forestry, and transport. The policy aims to promote protection of the environment, the honoring of international obligations, sustainable management of resources and economic growth.

### **2.6.3 National Resettlement Policy, March - 2002 (Draft)**

National Resettlement Policy has, therefore, been formulated to not only cover the affected persons (APs) in existing systems but also to ensure an equitable and uniform treatment of resettlement issues all over Pakistan. This Policy will apply to all development projects involving adverse social impacts, including land acquisition, loss of assets, income, business etc.

It has addressed to those areas, which are not looked after in LAA and will be applicable wherever the people, families or communities are affected by any public sector or private development project, even when there is no displacement. The Policy also aims to compensate for the loss of income to those who suffer due to loss of communal property including common assets, productive assets, structures, other fixed assets, income and employment, loss of community networks and services, pasture, water rights, public infrastructure like mosques, shrines, schools, graveyards etc.

#### **2.6.4 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 IEE consultant;
- Need to incorporate suitable mitigation measures into every stage of project implementation;
- Need to specify monitoring procedures; and the

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

#### **2.6.5 Policy and Procedures for Filing, Review and Approval of Environmental Assessments, 2000**

These policies and procedures define the policy context and the administrative procedures that govern the environmental assessment process, from the project prefeasibility stage to the approval of the environmental report.

#### **2.6.6 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 impact assessment.

#### **2.6.7 Guidelines for Sensitive and Critical Areas, 1975**

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

### **2.7 National Environmental Quality Standards**

The National Environmental Quality Standards (NEQS) were first promulgated in 1993 and were last revised in 2000. The NEQS<sup>3</sup> specify standards for industrial and municipal effluents, gaseous emissions, ambient air requirements and emission levels for Sulfur dioxide and Nitrogen oxide, vehicular emissions and noise levels. The PEPA specifies the imposition of a pollution charge in case of noncompliance with the NEQS. Standards for disposal of solid waste have not been promulgated as yet.

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<sup>3</sup> These NEQS are available at the Pak-EPA website (<http://www.environment.gov.pk/info.htm>).



## **2.8 International Treaties and Conventions**

Important international environmental treaties that have been signed by Pakistan and may have relevance to the Project are listed in Table 2.1. 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. However, the implementation mechanism for most of these treaties is weak in Pakistan and institutional setup mostly non-existent.

## **2.9 World Bank's Environmental and Social Guidelines**

The principal World Bank publications that contain environmental and social guidelines are listed below;

- Pollution Prevention and Abatement Handbook 1998: Towards Cleaner Production;
- Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross-Sectoral Issues; and
- Social Analysis Sourcebook.

### **2.9.1 Operational Policies (OPs) of the World Bank**

Developers seeking financing from the World Bank are required to comply with the applicable environmental and social safeguards, OPs and Bank Procedures (BPs). A summary of the key objectives of the relevant safeguards policies considered for the Project is provided in Table 2.2.

## **2.10 The Project's Category**

A project's category is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts in the project's area of influence.

### **2.10.1 Environmental Category**

As per WB depending on the significance of project impacts and risks, the assessment may comprise a full-scale environmental impact assessment (EIA) for category 'A' projects, an initial environmental examination or equivalent process for category 'B' projects, or a desk review.

### **2.10.2 Involuntary Resettlement Category**

A project's involuntary resettlement category is determined by the category of its most sensitive component in terms of involuntary resettlement impacts. The involuntary resettlement impacts of supported project are considered significant if 200 or more persons will experience major impacts, which are defined as (i) being physically displaced from housing, or (ii) losing 10% or more of their productive assets (income generating) and comprehensiveness of the resettlement plan are commensurate with the significance of the potential impacts and risks. A proposed project is assigned to one of the following categories depending on the significance of the probable involuntary resettlement impacts: The level of detail and comprehensiveness of the resettlement plan are commensurate with the significance of the potential impacts and risks. A proposed project is assigned to one of the following categories depending on the significance of the probable involuntary resettlement impacts.

### **2.10.3 Indigenous people's Category**

The project is also classified on the basis of the impact on the indigenous people, which however is not applicable for this project, and hence not being discussed.

Projects are assigned to one of the four categories shown in Table 2.3.

Further during the Project Design and Preparation, the need for Initial Environmental Examination (IEE) is assessed and reviewed. The project category can change after the IEE study too.

### **2.11 Environmental & Resettlement Category of Naltar-V HPP**

ADB/WB/IFC has categorized the project as Category "B" project for Environment and as Category "B" for involuntary resettlement. So, in preparing IEE for Naltar-V HPP, the requirements/ guidelines laid down by WB/IFC/ADB and Pakistan Environmental Protection Act 1997 have been followed. In this respect land acquisition and resettlement aspects have been focused with reference to ADB Policy. Scope of land acquisition and resettlement as well as compensation payment based on views of affected persons/ market conditions has been dealt with in subsequent sections of this Report.

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# TABLES

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**Table - 2.1: International Environmental Treaties Endorsed by Pakistan**

International Conventions	Description
The Convention on Biological Diversity (1992)	The Convention requires parties to develop national plans for the conservation and sustainable use of biodiversity, and to integrate these plans into national development programmes and policies. Parties are also required to identify components of biodiversity that are important for conservation, and to develop systems to monitor the use of such components with a view to promoting their sustainable use.
The Convention on Conservation of Migratory Species of Wild Animals, (1979)	The Convention requires countries to take action to avoid endangering migratory species. The term "migratory species" refers to the species of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries. The parties are also required to promote or co-operate with other countries in matters of research on migratory species.
The Convention on Wetlands of International Importance, Ramsar (1971).	Obligates Pakistan to identify and protect wetlands in the country. So far 18 sites in Pakistan have been declared as wetlands of International Importance or Ramsar Sites.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973)	The convention requires Pakistan to impose strict regulation (including penalisation, confiscation of the specimen etc.) regarding trade of all species threatened with extinction or that may become so, in order not to endanger further their survival
International Union for Conservation of Nature and Natural Resources Red List (2000)	Lists wildlife species experiencing various levels of threats internationally. Some of the species indicated in the IUCN red list are also present in the project area.
Climate Change Convention and Kyoto Protocol (1992)	The convention aims at stabilizing greenhouse gases (GHGs) concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. To achieve the objective of the convention, all parties are generally required to develop national inventories of emission; formulate and implement national and regional programs of mitigation measures; all developed country parties were specifically obliged to take measures to limit GHG emissions by the year 2000 at 1990 levels and the developing countries including Pakistan to take all measures in support of the protection of atmosphere without any formal commitment on the quantified reduction of these gases in a time frame.

**Table - 2.2: Summary of the World Bank Policies and Their Triggering**

<b>Directive</b>	<b>Policy</b>	<b>Description</b>	<b>Triggered = ✓, Not Triggered= x</b>	<b>Comments</b>
Environmental Assessment	OP 4.01	This OP requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable. This OP also categorizes the projects on the basis of the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.	✓	As the Project falls into Category B, an IEE has to be carried out.
Natural Habitats	OP 4.04	The conservation of natural habitats, like other measures that protect and enhance the environment, is essential for long term sustainable development. Through this OP, the WB therefore supports the protection, maintenance, and rehabilitation of natural habitats and their functions.	x	Not triggered as the Project will not adversely impact natural habitats or protected areas.
Forestry	OP 4.36	The objective of this Policy is to assist the WB's borrowers to exploit the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development, and protect the vital local and global environmental services and values of forests.	x	There will be no disruption to forests associated with the Project works.
Pest Management	OP 4.09	Through this OP, the WB supports a strategy that promotes the use of biological or environmental control methods and reduces reliance on synthetic chemical pesticides.	x	Not triggered as the Project will not use or promote the use of pesticides.
Indigenous Peoples	OP 4.20/OP 4.10	The policy requires projects to identify whether indigenous peoples are affected by the project and, if so, to undertake specific consultation activities and to avoid or mitigate impacts on this potentially vulnerable group.	x	Not triggered as no Indigenous People or ethnic minorities will be affected by the Project.
Physical Cultural Resources	OP 4.11	The World Bank's general policy regarding cultural properties is to assist in their preservation, and to seek to avoid their elimination.	x	No known areas of cultural heritage will be impacted by the Project. Procedures will be in place to deal appropriately with any chance finds.
Involuntary Resettlement	OP/BP 4.12	The World Bank aims to avoid involuntary resettlement where possible. Where necessary or acquisition of land or other assets is necessary, the policy sets out requirements for participation in resettlement planning, mandates compensation for assets at replacement cost, and expects the borrower to see that incomes and standards of living of affected persons are improved or	✓	Involuntary resettlement will take place because of the Project development.

Directive	Policy	Description	Triggered = ✓, Not Triggered= x	Comments
		at least restored to what they were prior to displacement. The document also identifies the need for a Resettlement Plan, an abbreviated Resettlement Plan or otherwise.		
Public Disclosure of Information	BP 17.50	This BP deals with the World Bank policy on disclosure of information. It is a mandatory procedure to be followed by the borrower and Bank and supports public access to information on environmental and social aspects of projects.	✓	Public Consultations and scoping sessions will be conducted.

**Table -2.3: WB's Project Categories**

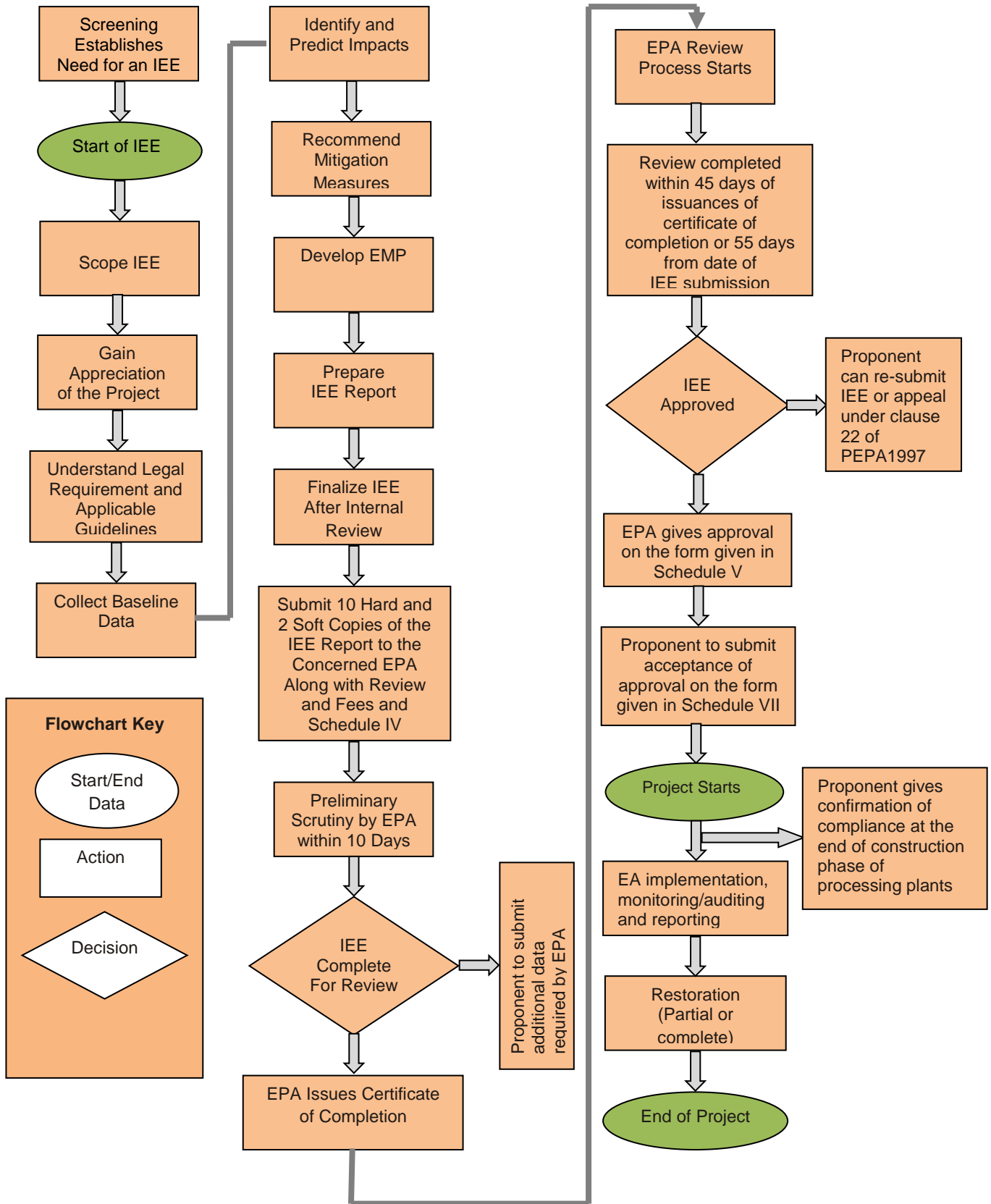
Category	Project Description and Requirements	
	Environment	Resettlement
Category 'A'	A proposed project is classified as category 'A' if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.	A proposed project is classified as category 'A', if it is likely to have significant involuntary resettlement impacts. A resettlement action plan, including assessment of social impacts, is required.
Category 'B'	A proposed project is classified as category 'B' if its potential adverse environmental impacts are less adverse than those of category 'A' projects. These impacts are site - specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category 'A' projects. An initial environmental examination is required.	A proposed project is classified as category 'B' if it includes involuntary resettlement impacts that are not deemed significant. A resettlement plan, including assessment of social impacts, is required.
Category 'C'	A proposed project is classified as category 'C' if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.	A proposed project is classified as category 'C' if it has no involuntary resettlement impacts. No further action is required.
Category 'FI'	A proposed project is classified as category 'FI' if it involves investment of funds to or through a 'FI'	A proposed project is classified as category 'FI' if it involves the investment of funds to, or through, a financial intermediary

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# **FIGURES / MAPS**

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**Figure 2-1: Process Flow Diagram for IEE**





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**PROJECT DESCRIPTION**

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### 3. Project Description

#### 3.1 General

The proposed Naltar-V Hydropower Project has its Tyrolean Weir site located on Naltar River about 0.5 km downstream of Naltar Paeen Village. Naltar River is a right bank tributary of Hunza River. It joins with Hunza River about 4 km downstream of Nomal Town. The project entails diversion of Naltar River flows through a steel pipe line to Nomal village, thereby utilizing the head generated to produce power. The powerhouse site is proposed on the right bank of Naltar River near Nomal Town.

Naltar-V hydropower Project is the lowest of the Naltar river cascade and located between longitude 73°-45'-0" and 75°-0'-0" East and latitude 35°-30'-0" and 36°-20'-0" North a few km upstream of its confluence with Hunza River near Nomal village which is about 30 km from Gilgit. Powerhouse is proposed on right bank of Naltar River close to Nomal Village.

#### 3.2 Project Location and Access Routes

Gilgit is located at the main Karakorum Highway (K.K.H) which starts from Havelian in Abbotabad District. Gilgit is some 549 km from Rawalpindi and Islamabad the Capital of Pakistan. Havelian is connected to other parts of the country through good roads and railway networks. The Gilgit is about 470 km from Havelian.

Distance from Gilgit to Nomal is 30 km which is accessible through two options. One via suspension bridge on Gilgit River while the second via Gilgit – Sust road. Nomal Village to Tyrolean Weir of Naltar V, a shingle road for truck and dumper also exists.

The main railway link from Karachi ends in Havelian about 470 km from Gilgit. The railway is designed for about 22 tone axle load, a main free width of 4.1m and free height of about 5.8 m which is sufficient to carry the project the project equipment. Salient Features of the HPP

Salient features have been described as under.

<b>1. General</b>	
<b>Project</b>	<b>Naltar-V Hydropower Project</b>
Location	100 m downstream from Naltar-IV Powerhouse. 500 m downstream of Naltar Paeen Village (District Gilgit) Gilgit - Baltistan, Pakistan
SOP Coordinates	Tyrolean Weir site (E 73°-45'-0", N 36°-20'-0") Powerhouse Site (E 75°-0'-0", N 36°-20'-0")
River	Naltar
Type	Run-of-River
Purpose of Project	To add badly needed affordable electricity to the National Grid
<b>2. River System</b>	
Catchment Area at Tyrolean Weir Site	250 km <sup>2</sup>
Mean Annual discharge	9.45 m <sup>3</sup> /s
<b>3. Main Structures</b>	
Tyrolean Weir Fixed Sill Type Height	7.0 m
Length	30.2 m
Flood Discharge (Q <sub>1000</sub> years)	390 m <sup>3</sup> /s
<b>4. Connecting Channel</b>	
Height	2.5 m

Width	3.0 m
Cross Section	7.50 m <sup>2</sup>
Length	20 m
<b>5. Gravel Trap</b>	
No of chambers	1.0
Length	21 m
Height	7.0 m
Width	6.0 m
<b>6. Sedimentation Basin</b>	
No of chambers	1.0
Effective height each	7.0 m
Width	6 m
Effective length	66 m
<b>7. Penstock</b>	
Diameter	1.50 m
Total length	4.12 km
<b>8. Powerhouse</b>	
Machine hall length	30.8 m
Machine hall width	15.6 m
Total height	9.5 m
<b>9. Head</b>	
Intake Level	465 m
Tailrace water level	133.50 m
Head Loss	20m
Net head	309.75 m
<b>10. Hydro Mechanical Equipment</b>	
Pelton Turbines Units	3
Horizontal shaft speed	600 rpm
Net head	309.75 m
Discharge per unit	1.8 m <sup>3</sup> /s
<b>11. Electrical Equipment</b>	
Generators Units	3
Speed	600 rpm
Capacity	5.68 MWA
3 main transformers	7/10 kV
Switchgear	66 kV
Power Energy	
Design Discharge	5.4 m <sup>3</sup> /s
Energy Output	85.1 GWh
Power	14.1 MW
Transmission line 132 kV	28 KM
132 kV line and 11 kV interfacing	

### 3.3 Technical Design

The project has been planned to generate 14 MW power by designing the following structures; Tyrolean Weir having un-gated spillway, low level flushing outlets and energy dissipation arrangements.

#### 3.4.1 Tyrolean Weir Structure

The Tyrolean Weir is divided into 3 parts. One 1m segment is designed as a fish pass through which the residual water is released. The exact dimension and design of the fish pass are to be determined during final design. An 8 m wide Tyrolean sections proposed near right bank in

order to collect the required discharge for power operation. It can pass 6.2 m<sup>3</sup>/s of discharge, required flushing discharge for gravel and sedimentation basin. Design discharge for power generation has been selected to be 5.4m<sup>3</sup>/s.

A fixed sill type Tyrolean Weir having 12 m width and 7 m height has been chosen and proposed on the left bank. The construction of the Tyrolean Weir is done in single stage by diverting river water on left bank.

### 3.4.2 Intake and Connecting Canal

The Tyrolean intake is proposed on the right bank and is in form of trough and placed in the diversion Tyrolean Weir toward right bank. The trough has 8 m length, 1.5 wide and 1m deep. Coarse trash racks is proposed at its top with 8% inclination toward downstream. The trough is connected with gravel trap via connecting canal having size of 1.5 m and 1.0 m with bed slope at 3%.

The intake is designed to be closed in times of extremely high floods in order to avoid excessive sediment inflow and damages to the conduit system and hydro-mechanical equipment. The limit of 50 m<sup>3</sup>/s has to be verified during the proposed model testing.

### 3.4.3 Gravel Trap

A gravel trap structure having length 21 m is proposed at the end of connecting canal. It is hoper type structure and help in removal of gravel and somewhat coarse material than 0.5 mm. A vertical lifting gate is provided at downstream end in order to close the power canal and hence power plant. Stoplogs grove is proposed on upstream side for closure during maintenance of sand trap.

Flushing section is provided on left side and will lead the flushed gravel back in to Naltar River downstream of Tyrolean Weir. It is equipped with vertical lift gate and is capable of passing flow more than flushing discharges i.e. 5.4m<sup>3</sup>/s.

### 3.4.4 Sedimentation Basin

A single chamber sedimentation basin has an active length of 66m, a total length of 84m including the transition. The structure is designed to remove all grains over 0.2 mm during periods of full or more discharge. The calculation results in the following necessary values;

- Chamber width 6.00m
- Effective depth 5.00m
- Effective length 66.0m
- Flushing Section depth 1.85m

The electrical equipment as well as the flushing gates is housed in the operating building. The operating building will be some 10m long and 5.2m high. It is also used as a storage facility in the intake area.

### 3.4.5 Headrace Canal

The headrace canal bridges the approx. 450m gap between the sedimentation basin and the forebay.

The design of the headrace canal is based on the following considerations:

- Minimum height of canal is 2m due to accessibility of its covered parts
- Optimization of cost of roof slabs which increase with width
- Design discharge of 5,4m<sup>3</sup>/s

The final dimensions chosen are:

- Width 2.70 m
- Height 2.30 m
- Water depth 1.70m

The chosen profile provides a slope of 1:1,700 by using Manning's formula ( $n=0.016$ ). The full supply velocity is 1.32 m/s, minimum supply is about 1.4 m<sup>3</sup>/s; operation of one turbine at 80% of its design discharge with a corresponding velocity of about 0.13m/s. The canal section consists of concrete with RCC slabs at top at places where it crosses steep sloped or avalanches area. Bridge/culvert has to be constructed where canal crosses Naltar road.

### 3.4.6 Forebay

Forebay will be pond type and having 24.0m length and 16.0m width. A transition of 13.0 m length is provided between the headrace.

Spill Tyrolean Weir is provided in the headrace part which leads the water in to spill channel in case of shut down of turbine units. The full supply level is 463.75 while the minimum level is 461.75. In first part spill channel is designed as baffle chute and rest as simple canal and has been designed for 5.4 m<sup>3</sup>/s. Downstream side of the spill channel a gate is provided for temporary closer in case of ice or cleaning of Forebay.

The penstock off-take in the flow direction at the intake of penstock fine trash rack and gate along with stoplogs grove is provided. Penstock intake is placed 1m above the bed of the Forebay (458.20 level) so that bed load could not enter. A chunnete is proposed at the downstream end of the Forebay for collection of bed load and ultimately discharging in to spill channel. The plant operation guidelines for the hydraulic design of the Forebay have been defined as follows:

Startup time for all turbines: 30 seconds (full discharge: 5.4 m<sup>3</sup>/s)

Closing time for all turbines: 10 seconds (full discharge 5.4m<sup>3</sup>/s)

It is not unusual for relative small discharge plants to start up all units at the same time, whilst simultaneous breakdown of all units is unlikely but has to be considered in the hydraulic dimensioning. In the hydraulic calculations the most unfavorable frequency of turbine operation as basis for determination of the maximum and minimum possible surge levels in the Forebay is considered. The safety factor according to Thoma for the system stability is sufficient. The final dimensioning of the surge structure will need basic detail specification of the manufacture of the hydro-mechanical equipment.

### 3.4.7 Penstock

The penstock has been designed to support 30% overpressure which may be produced by the speed governing system.

The 1.5m diameter penstock starts at the Forebay runs in a general southeast direction till anchor block-23 except between anchor block-4 and 5 and anchor block-13 and 15 where it is in southwest direction. From anchor block 23 till to powerhouse the direction is generally east-north direction; except block 24 to 25 the direction is in east-south. The alignment is such that it

crosses the contour lines. This design calls for 29 anchor blocks where penstock bends in horizontal and vertical direction. At the powerhouse the penstock ends in a manifold, cover by a heavy anchor block which again is integrated into the concrete structure of the powerhouse. The radius of manifold should be minimum to avoid pressure losses and possible uplift forces in the pipe.

The wall thickness of the 1.5 m diameter penstock will vary between 8 and 20 mm, for steel quality ST 52-3 according to DIN 17100 (German standard). All welded joints should be X-rayed. The thickness and steel quality may be further optimized during final design. The whole penstock is embedded. The proper measures are proposed for protection against corrosion. External protection is done by using PE foil tapes.

In order to protect the PE foil, must be bedded on a 30 cm thick cover of the same material should protect the penstock periphery.

### **3.4.8 Powerhouse**

The powerhouse is located on the right bank of the Naltar. The power station area comprises the following parts:

- A substructure housing the pump sumps and tailrace canals
- A super structure above ground comprising the machine hall and necessary operating facilities including control room, stores, workshops and administrative rooms
- Open switchyard area

A short access between powerhouse and existing road is constructed. The mean water level of Naltar River is assumed to be at level of 130.5m. The highest flood level according to a 1,000 year flood is at level of 133.00m. Thus, the power house floor at the entrance of the main turbine hall is placed at level of 138.00m, well above the highest flood level.

The manifold at the upstream side of the building is embedded in concrete which is to be integrated into the powerhouse concrete block.

### **3.4.9 Tailrace**

The tailrace structure comprises 3 canals directly discharge in to Naltar river may be founded on rock and no extra safety measures at the end of the tailrace canals against erosion has been foreseen, except some riprap in the bed.

## **3.5 Construction Schedule**

It is anticipated that the Project would take about 36 months for its completion and commissioning.

## **3.6 Construction Camp and Workforce**

Land will be acquired in Naltar Paeen and Nomal villages for residential camps for the Contractor's supervisory staff and residential camps for Client and Consultants staff. A force of 150 persons at the peak construction period: May to October, consisting of labour, Contractor's supervisory staff, Client Staff and Consultant staff will be required. Majority of unskilled and to some extent semi-skilled and skilled workforce will be employed from the local area. However, the contractor will engage specialized workforce including engineers, geologists and

construction management staff from the outside area. Social conflicts may arise. A residential colony and camp for senior staff could be constructed. This camp could be used primarily for powerhouse and diversion channel construction and may be utilized by Contractor for senior supervisory staff residences. The power project site is 28km from Gilgit and it is one hour journey by road. The senior staff can reside at Gilgit City.

The materials used for the construction of the Naltar – V HPP includes coarse aggregates, fine aggregates (sand), rock for stone pitching and riprap, earth, water, cement and steel.

### **3.7 Construction Machinery**

Some of the materials used in construction are toxic and hazardous in nature. Hydrocarbon compounds are toxic to various degrees. All the carbon-based compounds containing chlorine are highly toxic and carcinogenic. Common toxic materials used in the construction technology are fuel, lubricants, transformer oil, paints and varnishes, chlorine, acids and nitrogen gas etc. The use of toxic materials without safeguards can cause acute and longtime damage to workers' health. All concrete additives will require care. Even the empty plastic containers will be returned to the suppliers and none will be sold to local people because the food store will be converted to poison.

### **3.8 Excavated Material**

The Project will generate about 92,800m<sup>3</sup> of rock material (mostly constituted of sandstone and siltstone) from excavation for the Project components. Depending upon the quality of the excavated stone material, some quantity will be used to meet the requirement of aggregate, rock be used as fill material at cofferdams, stone pitching, etc. However, bulk of the excavated material will need to be disposed of. This material will be disposed off near the powerhouse area. It will also be required that these areas are re-habilitating after appropriately dumping and leveling of the material.

### **3.9 Power Transmission Line**

Preliminary studies reveals that transmission lines will be connected with 132kV switch yard and this line will be further connected with Gilgit Grid Station where it will be step-down to 11 KV for distribution. However, detail discussion will be done after the completion of Power Transmission Line study.

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**PROJECT ALTERNATIVE CONSIDERED**

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## **4. Project Alternative Considered**

### **4.1 General**

This section deals with the need of power in the country and discusses available alternatives. This also provides brief information about the government's policy for power generation and position of the present project with respect to the policy. Emphasizing the need of this project in meeting the power demand of country, the chapter analyzed various optional sources of power generation including various hydropower projects in pipeline. In this context, the following options have been considered.

- No Action
- Alternative Resources of Power Generation, their exploitation status in the country and Alternative Hydropower Generation Resources
- Project Design Alternative

### **4.2 No Action**

Pakistan is facing critical shortfall of electric energy since long, particularly during the last few years. It has been estimated that during the last five years the annual power demand had been increasing by 4.8% that is likely to increase by 8 to 10% by the end of this decade. Existing installed generation capacity of the country is 17,772 MW. Out of these 17,772 Megawatts, the Water and Power Development Authority (WAPDA) of Pakistan owns 9,884 MW, another 5,417 are owned by private, Independent Power Producers (IPPs), the Karachi Electric Supply Corporation (KESC) has capacity of 1,756 MWs while the rest is the installed capacity of nuclear and other cogenerating industries. Thermal plants using oil, natural gas, and coal account for about 68% of this capacity, with hydroelectricity making up 29.4% and nuclear plants 2.6%. Hydroelectric generation which is about 30% of the National total generation is generally constrained somewhat due to the multipurpose nature of most of the facilities. Irrigation demands normally control the seasonal operation of reservoirs and the resulting distribution of energy production. Currently WAPDA is facing a shortfall of about 5,000 MW during peak hours, which may increase up to 5,529 MW by year 2010. This demand enhancement of installed capacity is 2,000 MW per year.

With this scenario, Pakistan is forced to exploit every source of electrical power generation including hydro, oil, gas, coal, nuclear, wind, solar etc. Even realizing constraints in the public sector investment and to take up the task on fast track, the Government of Pakistan framed a policy in 1994 to attract private investors for power generation by using thermal resources. This policy was revised in 2002 to include hydropower in private sector, which previously fell under the jurisdiction of WAPDA but now WPD – GB is also following the same policy to increase hydroelectric generation in Gilgit Baltistan involving private sector to build and operate power house.

As a result of Electrical Power Policy of 1994, a number of thermal power projects have been installed in the country. These include Uch Power Plant (550 MW), Hubco Power Plant (1,300 MW), and Liberty Power Plant (235 MW) besides privatization of WAPDA' Kot Addu Power Plant (1,500 MW). Besides, during this period three power generation projects, namely Ghazi-Barotha Hydropower Project (1,450 MW), Chashma Hydropower Project (184 MW) and Chashma Nuclear Power Plant (325 MW) were implemented in public sector. Similarly, despite

lately enhancement in the power generation capacity, there is still a wide gap between power generation and peak hour demand of power supply.

To cater for this gap of power supply and also to meet the future power demand, Pakistan is in need of exploitation of all resources of power generation. Therefore, the option of “No Action” cannot be adopted. This option will not only affect the domestic sector but also hamper the development of industrial, commercial and agriculture sectors of Pakistan.

### 4.3 Alternative Sources of Power Generation

The available resources of power generation in Pakistan are hydro, natural gas, coal, to some extent oil, wind in the coastal regions, nuclear and solar. Of these, hydro resources are of the prime importance for Pakistan. It is not only due to the fact that hydropower is the cheapest renewable power generation source but also because the country is endowed with ample hydro resources for power generation up to 40,000 MW, out of which only about 7,000 MW has been exploited so far, which forms about 30% of the total power generation capacity of the country while the remaining about 70% is thermal from oil, gas, coal and nuclear in the descending order. Two decades ago, the power generation capacity was almost in the reverse order, hydropower contributing up to 70% and thermal about 30%. As a result of this, the power generation cost has increased tremendously. This is because of the fact that indigenous oil production is very low, the operation of oil-fired power plants are dependent on rather expensive imported oil. Natural gas resources of Pakistan are currently facing shortfall. Therefore, its further utilization for electric power generation will affect its domestic and industrial use unless it is imported at high cost. The poor economy does not allow the import of fossil fuels, particularly oil, on a large scale. Too much reliance on imported oil is critical from energy security point of view.

Apart from this, a large fraction of the population lives in remote areas and is still waiting to be connected to the national electricity grid. To help these remote communities in particular, and to overcome energy shortages in general, Pakistan needs to develop its indigenous energy resources like hydropower, solar and wind. More than 1,000 km long coastline in south and some places in northern mountainous areas provide an excellent resource of wind energy. This vast potential can be exploited to produce electricity on both community and wind farm scales.

In spite of the fact that Pakistan has recently discovered large reserves of coal in Thar Desert in Sind Province, its development and exploitation for electric power generation would take long time because Pakistan lacks technology and financial resources to develop this lignite type of coal. Large investment is needed and it will take considerable time to develop it. The use of wind and solar energy for electric power generation is still at a preliminary stage in Pakistan. Pakistan lacks technology in these sectors, thus much reliance has to be made on technical and logistic assistance of the developed countries. Recently, the very first wind energy project has been launched in Thatta District of Sindh with power generation capacity of 45 MW to act as a pilot project. Still there is long way to exploit the full wind resources of the coastal area of Pakistan.

As far as use of solar energy for electric power is concerned, Pakistan's effort in this sector is almost negligible. This is because solar photovoltaic systems are prohibitively expensive in terms of installation costs. Power from them is also available intermittently; only when energy from the sun is available, unless large scale storage batteries are also installed. This will further escalate the installation cost. In public sector Government of Punjab has embarked on first solar energy project near Bahawalpur. The work is still in initial stages. It is relevant to state that solar

energy potential is high in all parts of Pakistan. Pakistan has 3.5~7 kWh/m<sup>2</sup> per day solar irradiation<sup>4</sup> compared to 2.5~3.2 in Germany. Though expensive in initial capital cost, people can use it to get electrical power in Pakistan. Small scale solar energy is slowly gaining acceptance due to excessive load shedding in the country. Solar cells are imported from abroad, because these are not manufactured in the country. Level roof tops of buildings are ideal for the installation because it eliminates the land cost.

In the light of this, the only option left with Pakistan is the exploitation of vastly available renewable and cheap resource of hydro-energy. WAPDA has prepared a plan for exploitation of this energy source under “Vision 2025”. As a follow up, a number of projects have been undertaken both in public and private sectors. Some of these are at the implementation stage while others are in different stage of planning. The former category includes Khan Khwar (72 MW), Allai Khwar (121 MW), Duber Khwar (130 MW), Jinnah (96 MW) and Neelum-Jhelum (969 MW). the latter projects include Basha-Diameer (4,500 MW), Dasu (4,320 MW), Bunji (7,100 MW), Golen Gol (106 MW), Palas Valley/Spat Gah cascade complex (about 2,500 MW) and many more small hydel projects in Gilgit - Baltistan, Azad-Jammu and Kashmir and Khyber Pakhtunkhwa.

#### 4.4 Project Alternatives

The project layout is proposed on the right bank of the Naltar Gah and considered more suitable than on left bank due to unstable slopes, avalanches and non-availability of access road along left bank.

##### 4.4.1 Tyrolean Weir

Two alternatives for locating the diversion Tyrolean Weir were analyzed that is 30m and 90m downstream of Naltar – IV outfall. The later is selected due to sufficient spacing for placing gravel and sand trap.

##### 4.4.2 Headrace

Alternatives for headrace were studied with regard to suitability in the existing topographic, geological and construction and management environment. After various considerations and analysis it was concluded that lengthy penstock is the only solution left technically feasible and hence selected for further studies.

##### 4.4.3 Forebay

Two alternatives for the Forebay location have been analyzed on the right side of existing road at 4.2 km from powerhouse and the other near the powerhouse, however, the former location was selected as the latter involved in head loss of about 100 m.

##### 4.4.4 Powerhouse

Two sites of powerhouse have been studied:

- Although powerhouse upstream from intake of old Nomal power plant, not selected due to pronounced environmental impacts

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<sup>4</sup> Renewable and Alternate Energy Association of Pakistan (REAP) Islamabad.

- Powerhouse near old Nomal power plant, selected for further studies with the consideration that remaining potential will be developed as and when needed by adding more turbines at old Nomal power plant as has been done by Chinese Contractor for Naltar – IV Hydropower plant.

#### **4.4.5 Tailrace**

Two alternatives for placing the tailrace have been studied one as separate tailrace for each turbine and the second one as combine tailrace for all turbines. The separate tailrace has been selected for further study due to ease in construction and flexibility in operation.

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**INFORMATION DISCLOSURE,  
CONSULTATION AND PARTICIPATION**

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## **5. Information Disclosure, Consultation and Participation**

### **5.1 General**

Project planning and design for environment clearance and issuance of NOC by EPA of Gilgit Baltistan require the involvement of host community and other general stakeholder's consultation, where the project is disclosed in series of meetings with the people. The aim is to build up knowledge and support for the project & utilize the local wisdom in planning and design by identifying the likely concerns of the community and introduce built-in mitigation measures through design. These consultations with the host communities and general stakeholders are done as right of the people and not as pity on people or gratis favor from Proponent.

The Environmental Protection Act, 1997 as well as international donors (e.g. the World Bank, ADB, etc.) place great importance on involving primary and secondary stakeholders for determining the environmental and social impacts associated with project implementation. In order to gather local knowledge for baseline, understand project affected person's perceptions regarding impact significance, and propose meaningful mitigation measures, participation of stakeholders has been part of the Project IEE process. An attempt has been made to consult with a full range of stakeholders to obtain their views on project interventions which have been carried out during IEE preparation. The following sections give details of the consultation carried out.

The present IEE has been prepared after consulting with local communities, non - governmental organizations (NGOs) and concerned government departments/ organizations dealing particularly with related fields and to ensure that their views and concerns have been taken into account in the study.

### **5.2 Objectives of Consultations**

Public consultation plays a vital role in studying the effects of the Project on all the stakeholders and in the successful implementation and execution of the projects and its activities. Public involvement is a compulsory feature of environmental assessment, which leads to better and more acceptable decision making. The main objectives of the Consultation process are:

- Information dissemination, education, and liaison,
- Identification of problems and needs,
- Collaborative problem solving,
- Reaction, comment and feedback on project, and;
- Documenting mitigation measures proposed by the stakeholders.

### **5.3 Scoping Sessions**

The environment and social experts visited the project site during 27<sup>th</sup> to 2<sup>th</sup> October, 2011 to acquire firsthand knowledge of the project area and the host communities. This also provides opportunity to develop linkages for future contacts and meetings.

A series of scoping sessions were carried out with local communities and local government representatives. The meetings were held at various locations. Generally, people were found to

be aware of the need of the proposed project, and indicated their support for the present WPD – GB Project. Local communities demanded that they must be part of a continuous consultation process with other stakeholders at different stages of the project including the design, construction and operational periods. Summary of scoping sessions carried out at project area are shown in Table 5.1.

#### **5.4 Focus Group Discussions & Identification of Stakeholders**

During the field survey, significant efforts were made to identify the possible categories of stakeholders and their stakes. During the field survey, different stakeholders identified were the villagers, local residents, government officials, shop owners, public representative, NGO's and general public. All the stakeholders had different types of stakes according to their professions.

##### **5.4.1 Stakeholder's Concerns and Addressal**

Main concerns raised by the stakeholders were the royalty of the proposed Naltar – V HPP and free electricity for the affected villages.

#### **5.5 Gender Consultations**

Besides the public consultation, gender consultation was also carried out at different locations in study area. During consultation sessions with women, they were briefed about the project and its main features. Women's main concerns were:

- Drinking water is contaminated with other particles and people have to use this contaminated water;
- Problems of proper disposal of solid waste and sewage issues;
- Needs to introduce computer as a subject in the schools;
- Lack of cold drinking water in summer in the school;
- Lack of health facilities, especially for women;
- Inadequate building structure, lack of furniture, lack of teaching staff in the Girls Primary School.
- Needs of a vocational training center for women in the area.

#### **5.6 Perception of Respondents about the Project**

Representatives of households were asked about their understanding regarding: positive and negative impacts of the project, upon employment opportunities, mobility of the villagers, income generation activities, living standard, availability of electricity, agricultural activities, deforestation and drinking water.

Table 5.2, shows that a large number of respondents were of the opinion that the project will have positive impact and expressed their views that the project will provide good opportunities in all the fields. The Photographs of the consultations/scoping sessions are given in Photograph 5.1 & 5.2.

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# TABLES

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**Table - 5.1: Summary of Public Consultation 14 MW Naltar – V Hydroelectric Project**

Sr. No.	Participant Name	Participant Father's Name	Participant's Profession	Address	Date	Issues Raised / Concerns Expressed / Suggestion & Requests	Proposed Measure	Action Taken / Proposed
<b>At Weir Site</b>								
1.	Anayyat Shah	Sassif Khan	Farmer	Naltar Paeen	29-11-2011	<ul style="list-style-type: none"> <li>• Provided information on project and environmental and social setting of the Project area.</li> <li>• There are 6 number of affectees in the vicinity of the Weir site having land holding of 5 -10 kanals per household.</li> <li>• The rate of land is 3 to 4 hundred thousand per Kanal.</li> <li>• Crop and tree compensation should be fair and timely</li> </ul>	<ul style="list-style-type: none"> <li>• Land holding is small so impact of land acquisition should be minimum.</li> <li>• Compensation should be paid as per prevalent market rates or according to Land Acquisition Act 1894..</li> <li>• Compensation should be paid adequately and timely.</li> </ul>	<ul style="list-style-type: none"> <li>• Water and Power GB will peruse relevant efforts.</li> <li>• Water and Power Department Gilgit Baltistan should pay Compensation as per prevalent market rates or according to Land Acquisition Act 1894 and timely.</li> <li>• Water and Power Department Gilgit Baltistan should pay compensation of crop of trees fairly and timely at least 15 days</li> </ul>
	Ghulam Hussain	Zarmast Khan	Farmer					
	Ghulam Hussain	Dudel Khan	Farmer					
	M. Shifa Haider	Tullah Khan Dudel Khan	Shop Keeper					
	Hajjat Ali	Dudel Khan	Private Servant					
	Barket Ali	Dudel Khan	Govt. Servant					
	Abid Hussain	Dudel Khan	Labor					
	Ghulam Raza	Naib Khan	Driver					
	Rais Khan	Naib Khan	Farmer					
	Ali Jan	Naib Khan	Jobless					
	Ali Haider	Naib Khan	Student					
	Taifor Shah	Naib Khan	Private Servant					
		Sultan Shah	Farmer					

Sr. No.	Participant Name	Participant Father's Name	Participant's Profession	Address	Date	Issues Raised / Concerns Expressed / Suggestion & Requests	Proposed Measure	Action Taken / Proposed
						<ul style="list-style-type: none"> <li>• Local skilled and unskilled labor should be used where possible.</li> <li>• They support the construction of project and expect that they will get more stable power supply in the region with the provision of electricity and high voltage connection.</li> <li>• Local norms should be honored.</li> <li>• Establishing construction camp on our leveled agricultural land will not only deprive them from the only</li> </ul>	<ul style="list-style-type: none"> <li>• Skilled and unskilled labor should be preferred from the project area especially among the affectees.</li> <li>• Construction work should be completed timely.</li> <li>• Contractor and labor should respect the local norms.</li> <li>• Contractor should establish construction camps on waste land and</li> </ul>	<ul style="list-style-type: none"> <li>• Water and Power Department should bind the contractor to employ skilled and unskilled labor from the project area especially among the affectees.</li> <li>• Water and Power Department should bind the contractor to complete all work timely.</li> <li>• Water and Power Department should bind the contractor to respect local norms.</li> <li>• Water and Power Department should bind the contractor to establish Construction camp on waste land or</li> </ul>

Sr. No.	Participant Name	Participant Father's Name	Participant's Profession	Address	Date	Issues Raised / Concerns Expressed / Suggestion & Requests	Proposed Measure	Action Taken / Proposed
						<p>earning source there, but also disrupt social life.</p> <ul style="list-style-type: none"> <li>Excavated material should be dumped in proper place.</li> <li>Free electricity should be provided to affected villages.</li> </ul>	<p>should not disturb their productive agriculture land.</p> <ul style="list-style-type: none"> <li>Contactor should dump the excavated material at proper places according to the approved locations and level with dressing of sweet soils on the top for its use by the people for agricultural purposes or by Forest Department for plantation.</li> <li>It will be discussed with Water and Power GB.</li> </ul>	<p>will utilize the existing construction camp of Nalter – IV HPP.</p> <ul style="list-style-type: none"> <li>Relevant clause will be included in contractor's agreement.</li> <li>This point will be discussed with Water &amp; Power department of Gilgit – Baltistan.</li> </ul>
<b>Powerhouse Site</b>								
2.	Ibahim Ramzan	Rustan Khan Rustan	Jobless Shop Keeper	Nomal	30-11-12	<ul style="list-style-type: none"> <li>Description of the project.</li> <li>The river water is</li> </ul>	<ul style="list-style-type: none"> <li>The contractor</li> </ul>	<ul style="list-style-type: none"> <li>Water and Power</li> </ul>

Sr. No.	Participant Name	Participant Father's Name	Participant's Profession	Address	Date	Issues Raised / Concerns Expressed / Suggestion & Requests	Proposed Measure	Action Taken / Proposed
	Shouket Ali	Khan	Driver			<p>used for running microhydels irrigation, livestock and domestic needs of Nomal village through Nomal irrigation channel. There will be no water in the river main stream after diversion of water in power channel. The Project should maintain irrigation channel or make substitute arrangement.</p> <ul style="list-style-type: none"> <li>• All the labor should be hired from affected villages.</li> <li>• Local skilled and unskilled labor should be used where possible.</li> <li>• River pollution by chemicals, lubricants, fuel oil etc. and by construction camps</li> </ul>	<p>will make arrangement during construction of the project for release of water from weir to maintain existing irrigation channel to meet the demand of downstream Nomal community.</p> <ul style="list-style-type: none"> <li>• Skilled and unskilled labor should be preferred from the project area especially among the affectees.</li> <li>• Contractor should follow sound construction management</li> </ul>	<p>will bind the contractor to make arrangement during construction of the project for release of water from weir to meet the demand of inhabitants of downstream reach of the river.</p> <ul style="list-style-type: none"> <li>• Water and Power Department should bind the contractor to employ skilled and unskilled labor from the project area especially among the affectees.</li> <li>• Water and PowerGB should bind the contractor to follow Sound construction</li> </ul>
	Ashor Ali	Rustan Khan	Jobless					
	Mehmood Ali	Rustan Khan	Private Servant					
	Ibrahim	Khan	Farmer					
	Alif Khan	Hakim Khan	Farmer					
	Shakoor Ali	Hakim Khan	Labour					
	Mirza Ali	Hakim Khan	Labour					
	Ramzan Ali	Hakim Khan	Labour					
	Aashoor Ali	Hakim Khan	Farmer					
		Hakim Khan						
		Hakim Khan						

Sr. No.	Participant Name	Participant Father's Name	Participant's Profession	Address	Date	Issues Raised / Concerns Expressed / Suggestion & Requests	Proposed Measure	Action Taken / Proposed
						<p>wastes.</p> <ul style="list-style-type: none"> <li>• Free electricity should be provided to affected villages.</li> <li>• The rate of land is 5 hundred thousand per Kanal. As land of our villages is being affected by this project, and we are sacrificed, therefore they were showing fears of getting low or no compensation.</li> </ul>	<p>for the prevention of river pollution.</p> <ul style="list-style-type: none"> <li>• It will be discussed with Water and Power GB</li> <li>• Compensation should be paid as per prevalent market rates or according to Land Acquisition Act 1894.</li> </ul>	<p>management to avoid river pollution and compliance with NEQS.</p> <ul style="list-style-type: none"> <li>• This will be negotiated later with Water &amp; Power Department of Gilgit – Baltistan.</li> </ul> <p>Land Compensation will depend on current market rates. Fair and early compensation will be given to the affectees.</p>

**Table –5.2: Perception about Hydropower Project**

<b>Perception</b>	<b>Increase (%)</b>	<b>Decrease (%)</b>	<b>No Affect (%)</b>
Employment Opportunities	96.10	3.9	0
Mobility (Access to Resources)	86.36	11.0	2.60
Income Generation Activities	88.96	7.8	3.25
Unemployment	6.49	92.9	0.65
Living Standard	55.19	28.6	16.23
Facilities / Amenities	87.66	9.7	2.60
Electrification	99.35	0.0	0.65
Agriculture	51.30	44.8	3.90
Housing	73.38	13.0	13.64
Forestation	55.19	41.6	3.25
Deforestation	16.88	80.5	2.60

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# PHOTOGRAPHS

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**Photolog of Public Consultation:**



Photo #5.1: Shows Public Consultation at Nomal Village



Photo # 5.2: Shows Public Consultation At Naltar Paen





Photo # 5.3: Stakeholder Meeting with Director EPA – GB



Photo # 5.4: Focus Group Discussion with the Peoples of Project Area



Photo # 5.5: Public Consultation with the peoples of Naltar

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**ENVIRONMENTAL AND SOCIAL  
BASELINE CONDITIONS**

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## **6. Environmental and Social Baseline Conditions**

### **6.1 General**

The environmental and social baseline conditions have been established on the basis of information gathered through structured interviews, formal and informal scoping sessions and group discussions with the communities of various settlements located along the river and in the vicinity of sites selected for construction of Project components. In addition, information was also gathered from officials of various departments including departments of Forestry, Wildlife, Agriculture and Revenue. The information available from the limited secondary source has also been used for drawing inferences.

### **6.2 Delineation of the Area of Project Influence**

From environmental viewpoint the project area is defined as the areas of project influence. Some of these areas are directly impacted while others may be influenced indirectly. For Naltar - V HPP study area will be the ground surface up to 2,000 meters from project area. For this Project the areas of most concerns are as follows:

- Areas falling in the vicinity of the structures viz. Tyrolean Weir, Powerhouse, Tailrace Channel and upstream and downstream portals of the penstocks etc.
- Areas to be used for establishing construction camps and colony.
- Areas likely to be submerged by water impoundment.
- Areas likely to be used for dumping of spoil material from excavation the sites where Tyrolean Weir and powerhouse are going to be located.
- Areas to be used for developing haul tracks.
- Quarry areas.
- About 5 km stretch of the river reach from Tyrolean Weir up to the Powerhouse that is going to be deprived from the river flows during low-flow season or reduced flow for its practical diversion into the Pipe line for power generation.
- Majority of residential area is not going to be directly impacted by the Project; however, the area is likely to have indirect mixed type effects. Primarily, the induction of heavy machinery and vehicles when transporting construction material from quarries falling on other side of the town will cause traffic congestions and hazards, while on the other hand the induction of outside workforce will be beneficial in boosting the local business.

### **6.3 Land Resources**

#### **6.3.1 Physiography**

The Naltar – V HPP is located generally in Naltar valley of Gilgit District of GB. The valley is drained by small tributaries and ultimately joins Naltar River. The area is extremely rugged and mountainous with deep narrow valleys. It comprises parallel ridges having wide range of elevation. The mountain slopes are generally steep to very steep in upper reaches but moderate near the mountain basis. The bed rocks have a soils cover with varying thickness

depending upon relief and aspect. Areas of steeper slopes, with less vegetation, have comparatively thicker soils cover. In between the mountain range are the generally narrow and somewhat open valleys here and there. The streams are flanked by narrow belts of land built up of the materials washed down from the catchment slopes.

### 6.3.2 Geology

Gilgit has high mountain ranges and deep valleys. It is surrounded by the great Himalayas in the South, Karakoram Range in the North, Hindi Raj in West. There are number of mountain peaks above 6,000 meters in this hilly range and several passes in these ranges which link District Gilgit with other parts of the country and also to other countries. Some of the well-known passes are Khunjarab Pass, Shandur, Darkct which link the Chinese Province Sinkiang, and Chitral district, the largest valley of the District is Gilgit, which is thickly populated and more than 50 kilometers long. It stretches from Jaglot in the East to Hanzal village in the West. The width of the valley varies from two (2) to six (6) km.

The entire Gilgit valley is mountainous, cut into deep and steep side valleys by Gilgit River and its numerous tributaries. The permanent snowlines in the region lie between 3900 to 4500 m a. s. l. The glaciers in the Gilgit region are disposed longitudinally i.e. northwest to southeast and transversely northeast to southwest. The important glaciers are Bargot, Phuparash, Karku and Majnee.

The slope of the Naltar Gah is 9.3%, High mountains surround the stream having steep gradient between Naltar Bala and Naltar Paeen section; The valley has an elevation of 2000 to 3200 m.a s.l. with surrounding mountains towering to about 5800 m.a.s.l. in certain ranges.

### 6.3.3 Geology of the Project Area

The project area is dominantly occupied by the overburden material of varied nature. Only about 10% of the project area is comprised of bedrock of basic igneous origin. However, the bedrock is covered with overburden transported from elsewhere through water avalanches or land slide. As such, about 90% of the project area superficially comprised overburden of alluvium and colluviums in nature. About 10% of road route passes through sound rocks of igneous origin.

### 6.3.4 Seismicity

The project area is located in the “Gilgit” seismic province and mostly shows E-W trending folds and faults. The deformation within this zone is primarily the result of thrusting and of deep crustal buckling processes associated with the collision of the plates.

Some 50 earthquakes took place during the years 1964 and 1992 within a distance of 100 km, 18 of which were of a magnitude of  $M \geq 5$ . The strongest earthquake occurred in December 28<sup>th</sup> 1974 in the village of Shitgal in Duber Khwar with a magnitude of 6.2 and an epicenter at approximately 20 km depth.

The assessment of the seismic probabilistic hazard in the project area affected by fault ruptures during the earthquake shows the following results for 50% (10%) of probability of exceedance:

- Design life 50 years                      0.15 g (0.24 g)
- Design life 100 years                      0.18 g (0.28 g).

The seismic design parameters for the project (50 years lifetime) are recommended as a Maximum Design Earthquake (MDE) of 0.25 g with 10% probability of exceedance with a corresponding return period of 475 years and an Operation Basis Earthquake (OBE) of 0.15 g with 50% probability of exceedance and 75 years return period.

### 6.3.5 Soils

According to reconnaissance soil survey, carried out by Soil Survey of Pakistan, indicated that the soil of project area has shallow soil at mountains and valley has mainly loamy soil. Figure 6.1, provides generalized picture of project area's soil profile.

### 6.3.6 Present Land Use

The total geographic area of the district is 1,480,000 ha. The area is rugged and mountainous the cultivated lands are concentrated in alluvial fans near habitation. Total agriculture land is about 250 ha. Rest of the area is either under Forests/Pastures or is barren land belonging to the Government. Land use statistic of Gilgit District is given in Table 6.1.

## 6.4 Climate

The climate in this region is mainly determined by the altitude and precipitation in the form of rain and snowfall. The lower altitudes generally experience humid and arid conditions, the higher altitudes experience sub humid and very cold condition.

At Gilgit the mean maximum temperature is 41 °C in July and 13.5 °C in January. The mean minimum temperatures are 14.4 °C in July and -4.8 °C in January respectively. July is hottest month while the January is coldest one. The climate of the Naltar is nearly wet. The summer season is pleasant while winter is severe cold. During winter the northern Winds blow constantly bringing the temperature down considerable. Widespread snowfall occurs in Naltar valley.

Naltar like other areas in extreme Northwest of Pakistan receives only 572 mm precipitation of which 75% occurs in winter and spring. Maximum precipitation is in the months of April and May and average monthly precipitation of April is 102 mm. June is the clearest month with average monthly precipitation of 6 mm. Climatological data in the form of average monthly precipitation, maximum daily precipitation and average, maximum and minimum temperature at different surrounding Climatological stations in the region are shown in Table 6.2.

## 6.5 Water Resources

Water of Naltar River is mainly used for irrigation, domestic purposes, Hydel-plants operations, running water mills and for carrying domestic waste water. The present scheme will affect the water requirements of inhabitants of the Nomal village living along Naltar Gah. There is no tributary on either side of Naltar Gah between the Tyrolean Weir and powerhouse of Naltar-V hydropower project.

The catchment area is located at the western slope of Hunza River between the Karakoram and the Himalayan ranges. The catchment area extends over 270km<sup>2</sup> with a mean elevation of 3,821 m.a.s.l. the maximum elevation within the catchment area is about 5,454 m.a.s.l. and the

minimum elevation at the confluence is about 1,500 m.a.s.l. The catchment is characterized by a number of glaciers of varying sizes.

Table 6.3 and Figure 6.2 provides average monthly and annual flows ( $\text{m}^3/\text{s}$ ) of Naltar Gah at Naltar-V intake Tyrolean Weir taken from the Feasibility Report. The total sediment load, including suspended and bed load, for Naltar Gah has been estimated at about  $5.794 \times 10^4$  tons/year, whereas a value of  $390 \text{ m}^3/\text{s}$  has been taken as design flood, which is equivalent to 1000 year return period flood based on the selected approach.

### **6.5.1 Use of Local Water Resources**

The water resources of the Naltar Valley comprise perennial flows of the Naltar Nullah, its tributaries and springs. There will be need of water not only for construction purposes but also for meeting the consumptive and non-consumptive needs of the campsite, workshop, washing yard, etc. There will also be consumptive and non-consumptive needs of water during Project operation phase. It is obvious that these needs will be met from the existing resources of the valley.

### **6.5.2 Present use of Naltar Nullah**

There are three channels fed by Naltar River, all channels originate from about 50 meters upstream of the propose powerhouse location of Naltar- V. During the field visit discharge of this water channel was measured on 30<sup>th</sup> October 2011 at three locations:

- (a) Near proposed powerhouse site
- (b) Before existing micro-hydel
- (c) After existing micro-hydel.

Discharge of water may be variable in different months of the year depending upon the water use and irrigation requirement of inhabitants of Nomal village. Detail of this diversion channel/water course is given in Table 6.4.

### **6.5.3 Water Quality**

In the vicinity of the project area, the inhabitants appreciate the consistent good quality water provided by the Naltar Gah. According to the locals, the water quality does not alter or deteriorate even during the rainy season.

Water samples were collected at three locations: i) intake Naltar irrigation channel; ii) fall at channel and iii) culvert at road channel. Due to logistic problems like non-availability of instruments, laboratory facilities and remoteness of site, water was tested only for drinking parameters. Table 6.5 shows the results of water sample collected in January, 2012 and tested in EPA Laboratory Gilgit Baltistan. The water quality is fair, and may be used for drinking. Future water quality can change due to multiple reasons; therefore it is advisable that disinfection of water be carried out before domestic use.

## **6.6 Physical Resources**

### **6.6.1 Ambient Air**

The air quality of the project area and its vicinity is fresh and clear under normal condition. There is no source of air pollution, as there is no major vehicular movement or industrial setup in its vicinity. The only source of pollution observed in the site is burning of firewood and kerosene oil, which has a minor effect. The vegetation cover in the area is very thick and the level of ambient dust does not increase during windy conditions.

### **6.6.2 Noise**

The natural noise level in the project area is high without traffic, mainly due to the flowing water colliding against rocks and boulders. During the tourist season people travel to Naltar valley using different types of jeeps. The vehicles traveling on the jeepable and motor track, which runs along the Naltar Gah have very little contribution to the noise level in the project area.

### **6.6.3 Wastewater**

The villages within the project area do not have any drainage, sewerage or treatment system for sewage collection and disposal. According to a sample survey less than 92 % of the houses have improvised pour flush pit latrines. The remaining 8 % of the households use dry pits or defecate in the fields.

Wastewater from kitchen, bathing and washing is discharged into small drains leading directly to small fields outside the houses. The health and hygiene practices are very primitive. There are no solid waste collection points or disposal practices in the area. People tend to throw their solid waste outside their houses depending upon convenience. Animal waste especially cow dung is composted for farm manure or used for burning after drying.

## **6.7 Climate Change**

Climate Change is being considered as a critical factor behind changing rainfall patterns, the visible increase in precipitation during monsoon seasons, and more frequent extremely dry periods. Also the influence of climate change on air temperature such as minimum and maximum averages and the frequency of heat waves are often mentioned. More than 13 percent of the Upper Indus Basin consists of glaciers and the melting of ice caps and shrinking & retreat of glaciers is attributed to climate change. All these results have a considerable influence on the hydrology of the Indus Basin, the water availability and on the occurrence of floods and droughts.

Four aspects are potentially of relevance, namely:

- Effects of the project on the local (micro) climate;
- Prevention of GHG emissions (mainly CO<sub>2</sub>) by using hydropower instead of fossil fuels for generating electricity;
- Emission of GHGs from the reservoir (CO<sub>2</sub>, but most critical methane) from decomposing vegetation after impounding of the reservoir; and



- Effects of the expected global climate change on the project.

These points are shortly commented here:

- Effect on microclimate: large water bodies (lakes, but also large reservoirs) can have an effect on ambient temperature and humidity in their surroundings; however, the proposed project is Run – of – River (ROR) project, therefore it is considered too small to have any such effect at a detectable level.
- Prevention of GHG emissions: generating the same amount of energy by fossil fuel thermal power plants would lead to considerable emissions of GHGs, mainly CO<sub>2</sub>. Preventing this emission could entitle the project to co-financing according to Clean Development Mechanism (CDM). This aspect, which can influence the overall economy of the project, is discussed in Economic and Financial Analysis, of the Feasibility Study.
- Emission of GHGs from reservoirs: this effect, which can be quite considerable, is observed in large and deep storage reservoirs in which vast quantities of biomass (vegetation) are submerged and left to decompose in the water. This is the case mainly in moist tropical regions, where dense tropical forest is submerged. Reservoir of the HPP is very small, there is a very small amount of biomass much of which might even be cut and used as fuel wood before impoundment), and the reservoir has no real storage capacity. For these reasons, there will be no such emission in this project.
- Potential effects of climate change on hydrology (precipitation) and its consequences for the project are discussed in the Feasibility Study (Hydrology). Apparently, available information is scarce and contradictory and does not allow any clear conclusion on such effects.

No measures in these matters need to be taken, and the issues are not discussed any further

## 6.8 Biological Resources

The valley can be classified into 7 ecological zones, where different habitats exist. These zones are shown in **Figure: 6-4**.

Zone 1 Normal-Naltar Paeen (NNP)

Zone 2 Naltar Paeen Proper (NPP)

Zone 3 Bala-Paeen Transition (BPT)

Zone 4 Naltar Bala Proper (NEP)

Zone 5 Chimorsoh-Bidilo-Bishgiri (CBB)

Zone 6 Bishgiri-Bangla-Sibli BBS)

Zone 7 Kooto-Lakes-Shingo (KLS): and the food is available easily in the form of small insects.

### 6.8.1 Forests

The forest area in Gilgit district including Naltar, Nagar, Hunza, Jaglot, is 56 square miles. The forests comprise of Blue Pine, Spruce, Juniper, Coproses. Cuprases Saro are artificial forests planted by Forest Department. The local staff of the department looks after the forest.

Normally a Juniper tree takes 500 years to gain a full height of 40 ft but in a healthy environment it reaches the same height within 150 to 200 years. Cutting of trees in forest area is strictly prohibited. A Ranger from Forest Department pays visit to the forest weekly for inspection.

### 6.8.2 Forest types

The vegetation of the area can be divided into the following types:-

- i. Dry temperate coniferous forests.
- ii. Oak forests.
- iii. *Fraxinus xanthoxloides* open scrub.
- iv. Sub-alpine scrub.
- v. Alpine Herbaceous vegetation
- vi. Cultivated plants.

### 6.8.3 Natural Vegetation

Natural flora of the area and under forest types consists of grasses, herbs, shrubs and trees. Trees species found in Naltar valley are given in Table 6.6.

### 6.8.4 Pastures

The natural pastures are found above tree limit from about 3810 m.a.s l. Only herbaceous plants grow and the density of ground cover depends on available moisture and soil depth. The most common grasses/plants are *Astragalus spp*; *Polygonum ssp*: *saxirrag spp*, *vxyiropis Coty dalis spp*: and *potentilla spp*. These Pastures are used herds of cattle from April to October.

Besides these natural pastures, large blank areas within the forest are also used as pasture during different months depending on their altitude. Common are *Salix spp Juniperus spp. Rosa spp. Berberis vulgaris, spp. LONICER spp. Prunus jacquemontii, Betula utilis. Rhamnu minuta. Heracleum thomsoni. Ribes villosum Ephedra gerardiana. Vibumum continifolium. spiraca lindleyana. Daphne oleoides.*

### 6.8.5 Wildlife

Naltar is characterized by alpine meadows where mountains extend above coniferous forest tree line. Typical annual grasses are found in this region. Snow Leopard, Himalayan Ibex, Red Fox, Long-tailed Marmot, lesser strews, Royle's Vlountain Vole, Ermine and Chines Birch Mouse abode these high altitude. Naltar Gah lies in lower reaches and characterized by having steppe forest. Naltar Bala with very scattered settlement and meager population is almost a wilderness. Considering its wildlife resources to be protected and preserved it has been declared a game reserve. Its total area is 49750 hectares (Figure 6.3). Shooting, trapping of wild animals is not allowed except with a special permit. The number of animals or birds killed or captured is also restricted and specified in the permit. Snow leopard is already declared as endangered species. Naltar is rich in wilderness. World Wild Fund declared the area a game sanctuary as a means of protection and preservation for the endangered wildlife species. The

causes of illegal shooting and mismanagement had been the factor of depletion of the wildlife in the past. Now with the stoppage of shooting, the number of wildlife has increased to a greater extent. The wildlife species found/existing in the area include Ibex, Snow leopard, Brown Bear and Fox. Among birds Chakkor and Ram Chakkor are found in abundance. Predators such as Kite, Falcon, Hawk, Asiatic Vulture and Beard Vulture are also found.

Asiatic Ibex is probably the most abundant capridae in Pakistan in term of relative number (Schaller 1977). Distribution of Ibex is restricted to relatively Dry Mountain of Northern Pakistan, which includes the inner Himalaya Hindukush, Pamir and Karakoram. Population numbers for Northern areas (Gilgit, Diamer and Baltistan) were estimated to be between 9,000 to 100,000 Ibex in 1993 (Hersel et al 1977). Mammalian species recorded so far from the Naltar Valley is given in Table 6.7.

Local inhabitants were interviewed about sighting of game animals. Their observation was that Markhor and Ibex descend to village Naltar Bala on right side of the stream.

### **6.8.6 Avifauna**

Though Gilgit lies on Indus flyway, mass migration birds during their passage to south have not been observed. Poaching and illegal hunting is not common due to strict watch and ward system. However, the decline in wildlife has been witnessed over number of years in all Northern areas.

Site-specific information is available on avifauna. Some migratory birds on their journey may stay to side valleys. Locals did not report sighting of mass migration through Naltar valley. Avifauna is documented by WWF and presented in Table 6.8.

### **6.8.7 Reptiles**

Lizards and snakes are also found in the project area/The amphibian fauna of Naltar is also documented. The fish fauna has already been described. Amongst invertebrates aquatic insects were also found. Genera of Trichoptera (caddis flies) larvae have been reported from various streams having similar habitat as that of Naltar Gah.

As the main Naltar Gah stream is fast running and there are very few pools and puddles hence snails were not observed. Similar habitat also discourages the breeding of mosquitoes and black flies larvae. Field observations on insect pest problem did not show any serious attack on orchards.

### **6.8.8 Fisheries and Aquatic Life**

Naltar Gah is a perennial stream fed by rainfall and snow melt. The stream length is approximately 42 km and the total catchment area is 234 km<sup>2</sup>. The quality of water is good, as anthropogenic pollution at present is bare minimum. The use of fertilizer and pesticides is also limited. The liquid waste is being discharged in the fields. The water is running fast and big boulders, cobbles, gravel and pebbles constitute the bed of stream. The rooted vegetation on either bank of the stream is sparse and at a distance adding little to the biomass of the stream in the form of falling leaves and litter. Due to fast running nature of the stream filamentous algae and other macrophytes are not found except in some backwater where pool-like situation exists. Very few pools and puddles are located along its course. No specific site data for indigenous or

native species are available. However, site-specific data of exotic species is available. The exotic species found are brown trout and Kamloop.

The indigenous and exotic species of fishes found in Naltar Gah is presented in Table 6.9.

Introduction of trout in Gilgit valley goes back to 1908 when the fish was brought by British and introduced into different stream. Department of Fisheries GB has established a hatchery in 1978 in Naltar Gah. Rainbow trout, Kamloop and Australian brown trout fish is found in Naltar stream but Fisheries Department has stopped stocking Naltar Gah after floods. Previously increased trout fish production has decreased after the flood.

There are seven hatcheries in Gilgit Baltistan. According to Deputy Director Fisheries GB seeds were provided to private sector for the improvement of fish production in Gilgit Baltistan. The breeding season is observed from 15 October to 15 March. For breeding purposes fish prefers slow running water with gravel and pebbles for nesting and laying 500-600 eggs. Upstream movement for breeding has not been observed. Population estimates could not be made, as no baseline data is available with Department of Fisheries or any other source. Fisheries laws in vogue allow only fishing with rods and fly line Department issues license for fishing to locals and foreigners. The license fee is Rs 100 /day. The license issued is valid for only one day. The fishing is allowed only from April to October.

There is no commercial fishing in the project area. The fishes caught are for the personal consumption. The survey showed that very few people consume fish as part of their diet.

## **6.9 Human Resources / Socio-Economic Set-up of the Project Area**

### **6.9.1 Demography of Project Area**

Naltar Payeen (weir site) and Nomal (powerhouse site) both are located in Union Council (UC) Nomal in Tehsil & District Gilgit. The total population of the study area works out as 11,800 persons. The proportion of male and female works out as 47.0% and 53.0%, respectively. The average number of family members per household calculates to be 8.0.

The overall population of age 10 years and below is 25%, adults are 65% and 15% are old of the total population.

Project area is deprived of quality education and health facilities. The people have to go at far places for schooling and health facilities.

### **6.9.2 Casts / Tribes**

Ethnic diversity is a characteristic feature of Naltar valley. People from different ethnic composition have distinct socio-cultural traditions, language and way of life. Major tribe in the area is Yashkun, Shin and Gujjars. Gujjars migrated to Naltar valley from Punjab some two hundred years back. They speak Shina, which is commonly understood all over Gilgit valley. In addition to this, people also own the land in Naltar valley from Gilgit, Hunza, Naltar Paeen and Nomal. These people cultivate their land but prefer to stay in their own areas.

### **6.9.3 Literacy and Education Attainment in Project Area**

Based on the socio-economic survey of sampled households, the overall literacy rate (number of literate persons per 100 populations) is concluded as 84.6%. It is about 86.3% for males and 75.5 for females which show that the residents of the Project Area know the importance of education. Details are given in Table 6.10. Table depicts the education level of the selected population of the Project Area which shows that the ratio of intermediates, graduates and post graduates is low as compared to those having qualifications up to primary, middle and matric.

### **6.9.4 Education Facilities in Project Area**

Based on the socio-economic survey, it was found that there are ten primary, 2 middle school and 4 high schools in the Project Area. There is only one college in the whole Project Area. The students have to move to Gilgit for degree or higher education. Village-wise education facilities found in the Project Area are shown in Table 6.11.

### **6.9.5 Health Status in Project Area**

Health care is provided by BHUs in project area two in Naltar and three in Nomal. There is no qualified doctor, only dispensers give medicine to the patient's. In emergency, patients especially in maternity cases, are taken to Gilgit hospital. Some old experienced women in this field make deliveries at home. The interviews with local population in the project showed that seasonal diarrhea, gastrointestinal fever and cold and tuberculosis/asthma are common. The children and women are particularly more vulnerable. Women health care Center and better health facilities should be provided, especially LHV: may be trained and appointed in the villages.

### **6.9.6 Agricultural Practices in Project Area**

Maize and Potato is cultivated on 100% and 80% of available agricultural land in project area respectively. Onion and Peas are partially cultivated in project area. Detail is given in Table 6.12.

Average production of wheat, maize and Potato is 103, 173 and 1,000 Kg/kanal, respectively. Wheat is cultivated for the individual families for self – needs and average cultivated landholding per family is about 2- 14 Kanals.

Potato is major crop in the project area and in few terraces barley is also grown. Potato is sold in down country and other necessities of life are bought from Gilgit Market. Fruit trees were also reported in project area. Walnut, apricot, apple and almond are found in abundance. Cherries of Nomal are famous for their taste and quality.

### **6.9.7 Land Ownership Status in Project Area**

People living in the project area own the land with legal documentation. The river and nullah beds along with side slopes are state owned land. Mostly people are resident owner having inherited ownership status. On the other hand, the reservoir will cover proprietary land and shamlat as well. The survey results indicate that the landholdings are small as shown in Table 6.13.

### 6.9.8 Land Size Holding and its Market Value

Results of the survey reveal that out of the total landholding in the project area is 39.8 % is available for cultivation, 14.7% grazing land and 7.6% forest land. 5.1 % wasteland and 2.0% is Mountains. This distribution is shown in Table 6.14 with average rates per kanal.

### 6.9.9 Use of Natural Resources by Households

Information was collected about the natural resources upon which the households are depending to sustain their livelihood. These include source of drinking water, fuel or wood required for cooking and heating the houses during winter etc. The following paragraphs describe the analysis thereof:

#### 6.9.9.1 Source of Drinking Water

Water is collected by the family members either from spring, well or from the river for the purpose of drinking, washing or bathing. The analysis of the collected data reveals that 40% households use drinking water from spring; 60% from the River.

#### 6.9.9.2 Fuel Use – Wood Cutting

Gas or any other planned or regular source of fuel is not available to the residents of the area. Reply to questions about the use of fuel for heating and cooking indicates that the wood is the only material used for the purpose.

The family members collect the dead trees and cut trees from the jungle and fields. The fuel wood is stored at home for a period of week to fortnight. All the families (100%) collect both the trees cuts and dead wood.

The liabilities for collection of fuel wood lies equally upon each member of the family, however adult women and men play pivotal role in this activity. Adult males of 53.3% households collect firewood. Children of 13.3% households collect firewood and there is 33.3% household of which both gender collect wood.

Who gets Fuel wood	
Gender	%
Male	53.3
Both	33.3
Children	13.3

#### 6.9.10 Main Occupation in Project Area

Most of the people are govt. servants and 26.6% are working as shop keeper. Agriculture, labour, driver and teacher are other main occupations. Generalized view of occupations of the head of households in project area is given in Table 6.15.

The analysis has revealed that average income per household per month, of the study sample works out around Rs. 20,000.

A detailed analysis of the households in the project area reveals that a typical household makes maximum expenditures (38.0%) on food followed by travelling and social cultural activities. Education (10.2%) is little bit expensive for the people of the Project area. Table 6.16 shows percent of expense on different items made by a typical household in the project area.

### **6.9.7.1 Household Assets**

During field survey, data was also collected on the assets possessed by the households (HHs) which reflect that 100.0% and 80.0% of households' possess cell phone and TV respectively. Radio is available in 20.0% of the households and vehicle is owned by 5.0% households. Average number and percentage of assets with their average per unit price is given in Table 6.17.

### **6.9.7.2 Other Assets**

Results of social survey show that mature fruit and shade trees are possessed by more than 80% HHs. Shop/business is owned by 26.7 % of HHs. 6.7% HHs having khokha/rehri for earring their livelihood. Average price per unit of the assets is given in the Table 6.18.

### **6.9.7.3 Livestock**

Socio economic field data reflects that livestock holding per surveyed household is very high. On the average, 80% households possess cow. 53.3% HHs owned Goat and 33.3% Sheep. Survey results reflect that there is no Buffalo, Horse, Donkey and Mule owned by HH in project area. (See Table 6.19).

### **6.9.11 Housing**

Based on household survey, 48% Pacca and 52% Kacha housing structures exist in Naltar Paeen village (weir site). While at Nomal village (powerhouse site) 55% Pacca and 45% Kacha housing structure exist and 95.0% of houses in Naltar and Nomal have electricity facility.

The interviewees were asked about the period of their livings in the villages. None of respondents was newly settled. About 26.7% replied that they have been living there for a period of less than fifty years. 73.3% households replied that they have been living there since centuries.

### **6.9.12 Hydel and Water Mills**

At present there are three hydropower stations which include two micro-hydels on Naltar Gah. No water mill was observed between proposed Weir and powerhouse during the site visit.

### **6.9.13 Food Sufficiency and Security**

Survey Results shows that 86.6% of the respondents do not experience any shortage of food in any part of the year. However, according to 13.4% of the respondents food deficiency is faced in winter months December to February.

### **6.9.14 Gender Situations**

There seem to be a clear cut division of labour among locals. Women are responsible for activities including cutting and collection of wood from forest (consuming almost 4hours daily) agriculture sowing, watering, weeding, livestock, poultry rearing, taking care of household activities and bringing up of children. Female population also carries out drying of apricot and mulberry however men also participate in during leveling of land and sowing of crop. The girls remain in the villages doing household work and helping their families in the household: farming and caring livestock.

### **6.9.15 Women Participation and Decision Making**

In addition to collection of information directly from the women of the project area, the male respondents were also asked various questions exploring the role of women in the domestic activities and their involvement in decision making about various activities. The findings of the survey have been summarized in Table 6.20.

### **6.9.16 Perception about the Project**

More than 90% respondent said that employment, living standard, mobility, income generating activities, facilities/amenities, electrification, agriculture and forestation increases due to this project. Their replies upon different entities have been shown in Table 6.21.

### **6.9.17 Social Amenities**

The findings of the analysis of field survey on the provision of social amenities/infrastructure for the households reveals that drinking water, mosques, graveyards, dispensary, irrigation schemes, suspension/foot bridge, access road, water mill, electricity and primary & secondary/higher schools for boys/girls, are those amenities which are available to either all or to a large proportion of households. Comparatively to these services, hospital, market and disposal of solid and liquid waste are not available in the area. No facility of private hydel-power generator in the project area is available. Availability of social amenities and the degree of efficiency according to residents is depicted in Table 6.22.



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# TABLES

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**Table – 6.1: Land Use Statistic of Gilgit District**

Sr. No.	Land Use	Area (ha)	Sr. No.	Land Use	Area (ha)
1	Total geographic area	1,480,000	6	Cultivated area	18,132
2	Total reported area	98,000	7	Cropped area	25,425
3	Uncultivated area	80,000	8	Irrigated area ;	16,514
4	Forest area	41,588	9	Cropping intensity	140%
5	Cultivable waste	4,452			

Source: Agricultural Statistic of GB

**Table - 6.2: Mean Monthly Precipitation and Temperature at Naltar & Gilgit.**

Month	Precipitation (mm)		Temperature [°C]	
	Naltar	Gilgit	Naltar	Gilgit
January	28.3	4.2	-6.8	3.5
February	44.6	6.6	-3.9	6.5
March	85.1	14.8	0.9	11.7
April	70.3	23.5	6.0	16.7
May	80.5	23.8	8.8	20.1
June	66.5	8.4	14.0	24.5
July	50.3	15.3	17.5	27.4
August	59.3	14.6	16.7	26.6
September	40.6	7.8	13.4	22.4
October	27.7	7.3	6.0	16.0
November	6.9	2.7	1.5	9.5
December	12.0	4.3	-4.2	4.8
<b>Annual</b>	<b>572</b>	<b>130.4</b>	<b>5.8</b>	<b>15.8</b>

**Table - 6.3: Average Monthly and Annual Flows (m<sup>3</sup>/s) of Naltar Gah**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1980	3.42	3.13	3.43	4.16	8.01	19.67	29.02	25.33	14.98	7.46	4.33	3.49	10.53
1981	3.13	2.74	2.64	3.82	11.68	15.57	30.51	25.98	11.33	6.03	3.93	3.23	10.05
1982	2.96	2.82	2.67	3.60	8.67	15.54	21.87	27.18	9.63	4.84	3.73	3.42	8.91
1983	3.24	3.01	2.58	2.97	8.24	13.75	23.92	32.31	19.76	6.21	4.01	2.86	10.24
1984	2.74	2.60	2.57	2.85	4.21	18.45	28.31	35.78	13.69	5.30	4.17	3.30	10.33
1985	2.86	2.70	2.71	3.23	5.74	14.24	30.85	29.46	15.63	6.86	3.76	3.16	10.10
1986	2.81	2.66	2.56	3.13	6.06	13.64	28.94	25.07	13.94	8.45	4.41	3.36	9.59
1987	3.01	2.78	2.61	2.89	5.16	12.62	18.89	22.55	17.58	7.26	4.18	3.71	8.60
1988	3.23	2.89	2.64	4.35	9.05	16.33	30.81	26.55	14.36	5.72	4.42	3.70	10.34
1989	3.14	2.87	2.76	2.89	4.66	13.45	20.63	20.19	13.71	6.92	4.32	3.60	8.26
1990	3.25	2.97	2.67	2.90	11.25	20.29	28.99	28.68	19.86	8.33	4.51	3.76	11.45
1991	3.20	2.98	2.97	3.28	5.49	14.94	21.97	23.54	18.98	5.71	3.74	3.36	9.18
1992	3.14	2.96	2.74	3.00	5.37	11.46	22.86	22.60	13.07	6.50	4.68	3.57	8.50
1993	2.90	2.69	2.46	3.92	6.73	14.20	22.16	19.70	14.19	7.04	4.44	3.35	8.65
1994	3.03	2.75	2.63	2.78	7.91	16.55	34.72	32.82	15.38	6.26	4.13	3.36	11.03
1995	2.22	1.83	1.62	1.58	6.14	11.85	30.65	21.74	10.18	4.67	2.59	2.04	8.09
1996	1.80	2.24	2.40	2.23	2.91	9.88	19.89	29.27	16.39	10.09	4.51	3.03	8.72
1997	2.56	1.97	1.81	2.80	3.89	8.41	22.78	22.76	11.65	7.36	4.91	4.01	7.91
1998	3.12	2.70	2.61	2.61	7.21	11.08	37.31	23.71	11.29	5.81	3.45	3.45	9.53
1999	3.07	2.92	2.32	2.69	10.25	19.55	32.89	35.77	16.45	6.78	3.92	2.50	11.59
2000	3.05	2.62	2.51	3.44	12.20	17.46	22.70	21.78	14.76	5.80	4.45	3.23	9.50
2001	3.03	2.83	2.69	4.21	11.62	21.42	31.80	26.14	12.99	6.72	4.03	3.15	10.89
2002	2.87	2.78	2.71	3.44	7.57	17.38	20.36	23.89	13.89	7.12	4.05	3.30	9.11
2003	3.02	2.75	2.45	3.38	5.93	17.71	29.46	22.56	16.73	6.33	4.83	3.64	9.90
2004	3.25	3.06	3.04	4.11	8.02	14.38	20.25	20.92	14.77	6.59	4.44	3.66	8.87
2005	4.81	4.50	3.54	4.92	12.19	23.62	38.25	21.91	14.71	7.44	4.77	4.33	12.08
2006	4.80	5.08	5.26	4.82	11.12	13.57	18.94	22.76	14.92	11.27	9.27	8.18	10.83
2007	7.13	6.58	5.84	7.62	14.88	18.04	25.63	19.45	15.14	11.99	9.97	8.33	12.55
2008	7.80	6.90	6.69	7.47	11.87	19.07	22.66	19.12	14.80	11.94	9.76	8.07	12.18
2009	7.20	6.89	6.58	6.26	10.65	14.67	21.40	23.00	15.05	11.20	9.03	6.91	11.57
<b>Average</b>	<b>3.53</b>	<b>3.27</b>	<b>3.09</b>	<b>3.71</b>	<b>8.16</b>	<b>15.63</b>	<b>26.31</b>	<b>25.08</b>	<b>14.66</b>	<b>7.33</b>	<b>4.89</b>	<b>3.97</b>	<b>9.97</b>

Source: SWHP

**Table – 6.4: Details of Water Channels in Project Area**

Location	Purpose	Nature	Width (m)	Velocity (m/sec)	Discharge	
					m <sup>3</sup> /sec	ft <sup>3</sup> /sec
Near Proposed powerhouse site	Irrigation + Power generation	perennial	2.54	0.78	1.81	64.07
Before existing microhydel	Irrigation + Power generation	perennial	1.99	0.95	1.44	50.77
After existing microhydel	Irrigation	perennial	1.68	0.86	0.66	23.39
<b>Average</b>					<b>1.30</b>	<b>46.07</b>

**Table – 6.5: Water Quality Results of Naltar Gah**

Sampling Point	Volume Filtered (ml)	E. coli found	Temp. °C	pH	Turbidity	Color	Odor	Taste
Intake Naltar Irrigation Channel	100	0	5	8.2	<5 NTU	No Obj	No Obj	No Obj
Fall at Channel	100	0	5	8.2	<5 NTU	No Obj	No Obj	No Obj
Culvert at Road Channel	100	0	5	8.2	<5 NTU	No Obj	No Obj	No Obj

**Table – 6.6: Natural Vegetation in Naltar Valley**

<b>Location</b>	<b>Plant Name</b>	<b>Family</b>	<b>Altitude m.a.s.l.</b>
<b>Naltar Paean Proper</b>	Imputiensspp	Balsaminaceae	2000
	Chenopodiumspp	Chenopodiaceae	1995
	Artimisiasspp	Compositae	2150
	Nepetaspp	Labiatae	2200
	Rumexspp	Polygonaceae	2100
	Pedicularisspp	Scrophulariaceae	2200
<b>Bala-Paean Transition</b>	Hiphophaerhumnoides	Elaeagnaceae	2100
	Rumexhastatus	Potygonaceae	2225
	Juncusspp	Jucaceae	2350
<b>Naltar Bala</b>	Anaphlisnepalensis	Compositae	2650
	Gnaphuliumspp	Caryophyllaceae	2700
	Hiphuliumspp	Chenopodiaceae	2850
	Hiphophaerhamnoides	Elaeagnaceae	2800
	Juncusspp	Juncaceae	2850
	Ribesorientalis	Grossulariaceae	2875
	Micromerabiflora	Labiatae	9200
	Trifoliumpratense	Leguminacea	2950
	Morusspp	Mdraceae	2800
	Epilobiumspp	Onagraceae	2900
	Parnassia	Parnassiaceae	2899
	Plantagospp	Plantaginaceae	2900
	Rumexhustatus	Polygonaceae	2800
	Polygonuhustatus	Polygonaceae	2800
	Setariasss	Poaceae	2775

**Table – 6.7: Wild Fauna of Naltar Valley**

<b>Sr. No.</b>	<b>Species</b>	<b>Known Status</b>
1	Carniyora, Wolf, Canis Lupus	Less Rare
2	Red Fox, Vulpes, Vulpus Montana	Common
3	Himalayan Otter, LutraLutra	Threatened
4	Snow Leopard, PantheraUncja, Artiodactyla	Endangered
5	Himalayan Ibex, Capra Ibex Sibirica	Fair
6	Astor Markhor. CapraFalconeriFalconeri, Lagomorpha	Endangered
7	Cape Hare, Lepus Capensis	Fair
8	Royle'sPika, OchotonaRoylei, Rodentia	Uncommon
9	Chinese Birch Mouse, SicityConcolor	Less Common
10	Himalayan Field Mouse, ApodamusRusigs	Common
11	House Mouse, MusMusculus	Common

*Source: Forest department Gilgit*

**Table – 6.8: List of Avifauna Found In Naltar Valley**

<b>Sr. #</b>	<b>Common Name</b>	<b>Scientific Name</b>
1	Ferruginous Duck	Aytyanyroca
2	Lammergeier of Bearded Vulture	Gyapetusbarbatus
3	Himalayan or Griffon Vulture	Typshimalayensis
4	Hen Harrier	Circus cyaneus
5	Pallid Harrier	Cirucmaccrourus
6	Aquila chrysaetus	
7	Sparrow Hawk	Accipter nisus
8	Kestrel, Falco tinnunculus	
9	Lesser Kestrel	Falco naumanni
10	Himalayan Snowcock	Tetraogallushimalayensis
11	Chukar	Alectorischukar
12	Himalayan Monal	Lophophorusimpejanus
13	Black-winged Stilt	Himantopushimantopus
14	Little-ringed Plover s	Charadriusdubiu
15	Solitary Snipe	Gallinagosokitaria
16	Redshank	Tringatotanus
17	Common Sndpiper	Actitishypoleucos
18	Rock Pigeon	Columbia Livia
19	Oriental Turtle Dove	Streptopeliaorientalies
20	Eurasian cuckoo	Cuculuscanorus
21	Northern eag;e Owl	Bubo bubo
22	Tawny Owl	Strixaluco
23	European Nighjar	Capromulguseuropeus
24	Common Swift	Apus upus
25	Kashmir Roller	Coraciasgrrulus
26	Hoopoe, Upapaepops, Picidae	
27	Eurasian wryneck	Jynxtorquilla
28	Himaliayan Pied Woodpecker	Dendrocopshimalayensis
29	DmsllDkylstk	Alaudagulgula
30	Northern Crag Martin	Ptyonoprognerrupestris
31	Tree Pipit	Anthustrivialis
32	Yellow-headed or Citrine wagtail	Motacillacitreola
33	Yellow-headed or Citrine wagtail	Motacillaflavaleucocephala
34	Grey Wagtail	Motacillacinerea
35	White wagtail	Motacilla alba alboides
36	Long-tailed Minivet	Pericrocotusethologus
37	White-cheeked Bulbul	PhcnnotusLeucogenysleucogenys
38	Brown Dipper	Cincluspaqllasii
39	Alpine Accentor	PrunellaCollaris
40	Blue Throat	Lusciniasvecica
41	Black-breatedRubythroat	Lusciniapectoralis
42	Orange-flanked Bush Robin	Tarseigercyanurus
43	Blue-headed Redstart	Phoenicuruscaeruleocephalus
44	Black Redstart	Phoenicurusochruros
45	Guldenstad's Redstart	Phonicuruserythrogaster
46	Plumbeous Redstart	Rhyaccornisfuliginosus

<b>Sr. #</b>	<b>Common Name</b>	<b>Scientific Name</b>
47	Stonechat	Saxicolatorquata
48	Pied Wheatear	Oenathepleschanka
49	White-capped Redstart	Chaimarrornisleucocephalus
50	Blue Rock Thrush	Monticolasoliatarius
51	Little Forktail	Enicurusscoulre
52	Large-billed Bush Warble	Bradypterus major
53	Western or Large-crowned leaf, Warbler	Phylloscopusoccipitalis
54	Tytler's or Slender-crowned Leaf,	Phylloscopustylteri's
55	Yellow-browed Leaf Warble	Phylloscopussinvorodos
56	Yellow-browed Leaf Warble	Phylloscopusinornatus
57	Tickel,s Leaf Warbler	Phoscopussindianus
58	Mountain Chiffchaff	Phtylloscopussindianus
59	Golcrest	Regulusreulus
60	White-browed Tit Warbler	Leptopoecilesophiae
61	Sooty or Dark-sided Flycatcher	Myuscicapasibirica
62	Kashmir Flycatchyer	Ficedulasubrurura
63	Spotted flycatcher	Muscicapastriata
64	Himalayan Laughung Thrush	GarrulaxLineatus
65	Black Crested Tit	Parusrufonuchalis
66	White-cheeked Nuthatch	Sittaleucopsis
67	Himalayan bar – tailed Tree Creeper	Certhiahimalayana
68	Common Tree creeper	Certhiafamiliaris
69	Golden Oriole	Oriolusoriolus
70	Magpie	Pica pica
71	Nutcracker	Nucifragacaryocatactes
72	Red-billed Chough	Pyrrhocoraxpyrrhocorax
73	Himalayan Jungle Crow	Corvusmacrorhynchosintermedius
74	Migratory House Sparrow	Passer Domesticusbacterianus
75	Eurasian Goldfinch	Cardueliscarduelis
76	Mongolian Finch	Bucanetesmongolicus
77	Common Rosefinch or Scarlet,	Carpodacuscrythrinus
78	Red Poll	Carduelisflammea
79	Rock Bunting	Emberizacia

**Table – 6.9: Fishes reported from Naltar Gah**

Brown Trout	<i>Salmotrutafario</i>
Rainbow Trout	<i>Salmogairdneri</i>
Kamloop	<i>SalmogairdnehKamloop</i>



**Table – 6.10: Educational Status and Literacy Rate**

Education Level	Male %	Female %	Literacy Rate (%)		Overall (%)
			Male	Female	
Illiterate	5.9	20.8	<b>86.3</b>	<b>75.5</b>	<b>84.6</b>
Read Quran	2.0	3.8			
Primary	11.8	7.5			
Middle	17.6	18.9			
Matric	17.6	15.1			
F.A.	7.8	18.9			
B.A.	19.6	9.4			
M.A.	9.8	0.0			
NOSA*	0.0	5.7			
<b>Total</b>	100.0	100.0			

\* NOSA: Not of School Age

**Table – 6.11: Educational Facilities Available in the Villages of the Project Area**

Sr. No.	Category of Institutions	Institutions (No.)			
		Village Naltar		Village Nomal	
		For Boys	For Girls	For Boys	For Girls
<b>1</b>	Primary School	3	2	5	3
<b>2</b>	Middle School	0	0	1	0
<b>3</b>	High School	1	0	1	2
<b>4</b>	College	0	0	1	0
	<b>Total</b>	<b>4</b>	<b>2</b>	<b>8</b>	<b>5</b>

**Table – 6.12: Area Sown and Average Yield of Major Crops**

Crop	Area Sown (Kanal)	Out Put (kgs/Kanal)
Potato	71	1000
Maize	61	173
Wheat	52	103

**Table – 6.13: Formal Documentary Proof of Immoveable Property**

Type of Documents	%
Legal Documents	13.3
Informal Documents	0.0
Inherited	86.7
Possession Only	0.0

**Table – 6.14: Land Size Holding and its Market Value**

Land Type	% of land Type	Avg.Land Rate (Rs./ Kanal)
Cultivable Area	39.8	535,333
Cropped Area	23.6	532,000
Grazing Land	14.7	258,333
Waste Land	5.1	100,000
Forested Land	7.6	192,857
Meadows	7.1	75,000
Mountains	2.0	50,000

**Table – 6.15: Occupation of Head of Households (HHs)**

Occupation	Frequency (%)
Govt. Service	33.3
Shop Operator	26.6
Teacher	13.3
Driver	13.3
Agriculture	6.6
Labour	6.6
	100.00

**Table – 6.16: Itemized Expenses in Percentage of a Household**

Item	% Expense by a HH	Average Monthly Expenses (Rs)
Food	38.0	9,333
Clothing	7.6	1,871
Education	10.2	2,513
Health	8.6	2,115
Fodder for Animals	9.5	2,338
Veterinary Services	3.3	800
Social & Cultural Events	11.5	2,818
Traveling	11.2	2,750

**Table – 6.17: Assets Owned by HHs**

Type	% HH Owning Assets	Avg. Price (Rs./Unit)
Radio	20.0	900
TV	80.0	6,667
Telephone / Cell	100.0	4,608
Vehicle	5.0	242,000

**Table – 6.18: Other Assets Owned by Households**

Type	% HH Owning Assets	Avg. Price (Rs./Unit)
Shop / Business	26.7	394,000
Khokha / Rehri	6.7	5,000
Mature Fruit Trees	80.0	4,000
Mature Shade Trees	66.7	2,000

**Table – 6.19: Livestock Owned by Households**

Type	% HH Owning Assets	Avg. Price (Rs./Unit)
<b>Goat</b>	53.3	5,417
<b>Sheep</b>	33.3	6,065
<b>Cow</b>	80.0	46,842
<b>Poultry</b>	66.7	336

**Table – 6.20: Participation of Women in Activity and Decision Making**

Nature of Activities	Participation by Women %	
	In Activity	In Decision Making
Household Activities	93	73
Child Caring	94	81
Farm/Crop Activities	77	57
Livestock Activities	76	45
Sale & Purchase of Land/ Immoveable Property	47	35
Social Obligation (Marriages, Other Function)	68	48
Local Representation (Connector Political Activities)	67	39

**Table - 6.21: Perception about Hydropower Project**

Perception	Increase (%)	Decrease (%)	No Affect (%)
Employment Opportunities	100.0	0.0	0.0
Mobility (Access to Resources)	93.3	0.0	6.7
Income Generation Activities	93.3	0.0	6.7
Unemployment	6.7	86.7	6.7
Living Standard	80.0	6.7	13.3
Facilities / Amenities	93.3	0.0	6.7
Electrification	86.7	6.7	6.7
Agriculture	86.7	6.7	6.7
Housing	86.7	6.7	0.0
Forestation	86.7	6.7	6.7
Deforestation	13.3	86.7	0.0

**Table – 6.22: Access of Households to Social Amenities (%)**

Social Amenities	Access to House	Efficiency		
		Excellent	Good	Poor
Water Supply	100.0	26.7	46.7	26.7
Drinking Water Points	100.0	13.3	8.6	3.8
Washing / Bathing Points	100.0	13.3	19.6	8.7
Primary School (Boys / Girls)	100.0	0.0	6.1	9.1
Secondary / Higher School (Boys / Girls)	33.3	0.0	0.0	100.0
Dispensary / BHU	100.0	0.0	53.3	46.7
Hospital	53.3	0.0	37.5	62.5
Mosque	100.0	60.0	26.7	13.3
Market	60.0	11.1	66.7	22.2
Graveyard	100.0	33.3	40.0	26.7
Telephone Connection	100.0	33.3	53.3	13.3
Electricity Connection	100.0	60.0	40.0	0.0
Bridge Crossing	100.0	33.3	33.3	33.3
Water Mill	46.7	13.3	26.7	6.7
Irrigation Scheme	60.0	20.0	26.7	13.3
Access Road	100.0	33.3	13.3	53.3

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# **FIGURES / MAPS**

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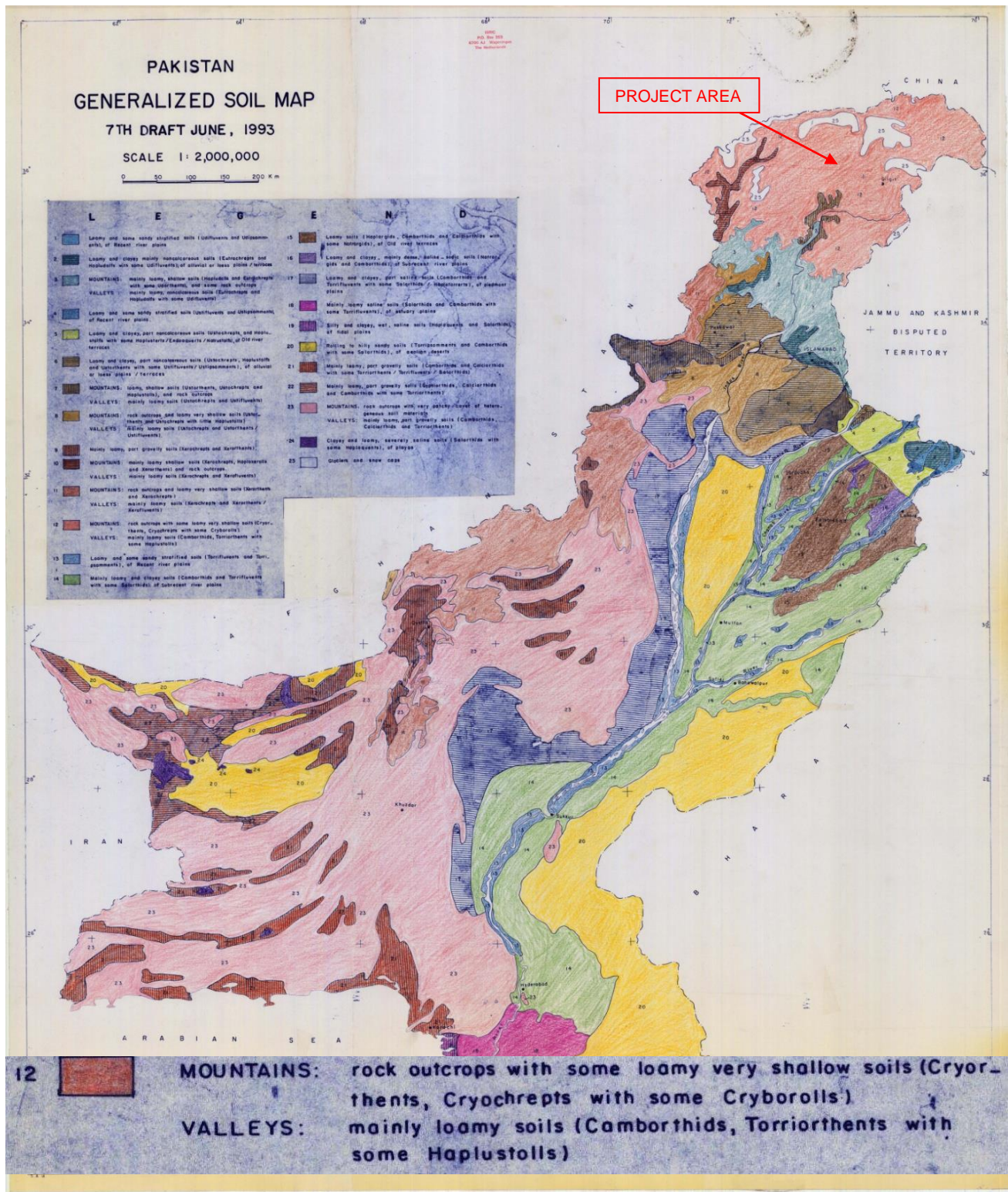
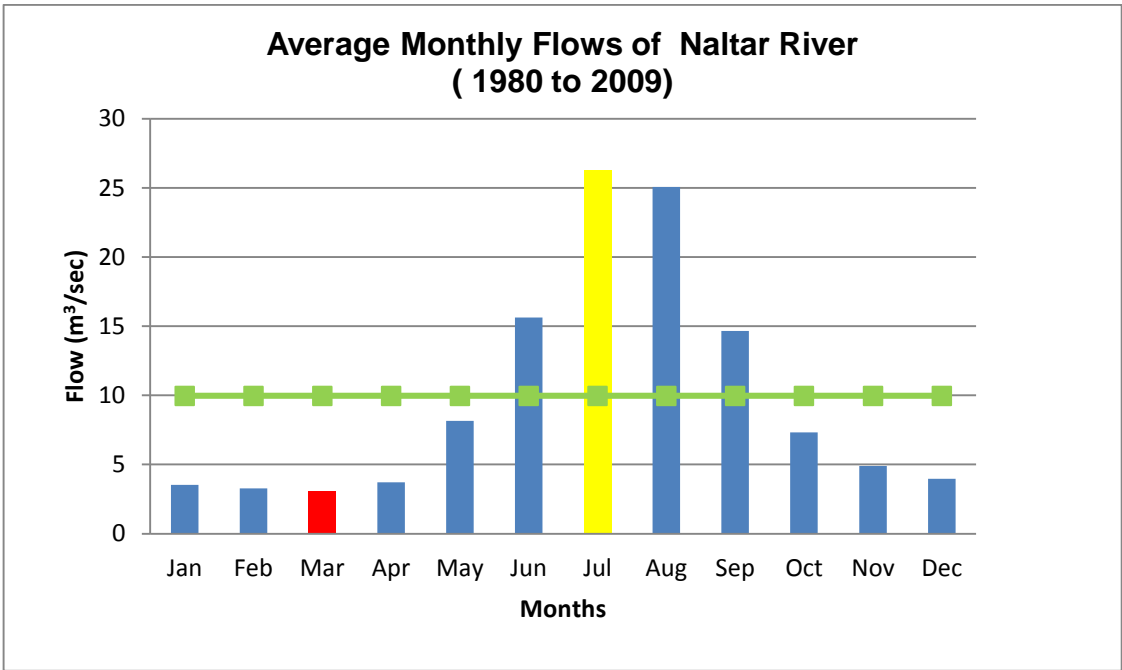
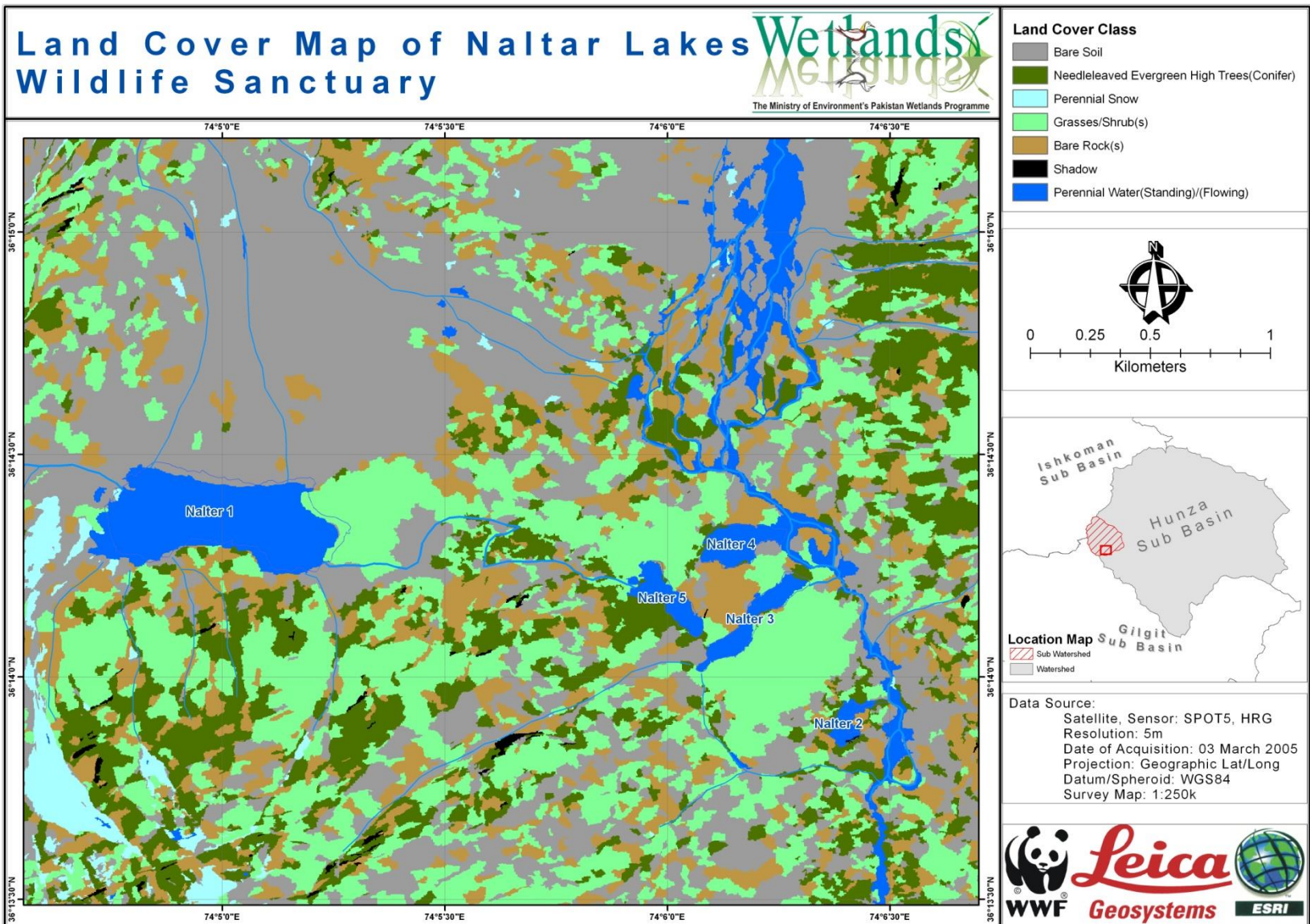


Figure – 6.1: Project area's Soil Profile



**Figure – 6.2: Average Monthly Flows of Naltar /Ghah River**



**Figure – 6.3: Wildlife Sanctuary Locations at Naltar Valley**



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**PROJECT IMPACTS AND MITIGATION /  
RESETTLEMENT ACTIONS**

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## **7. Project Impacts and Mitigation / Resettlement Actions**

### **7.1 General**

This section describes the potential impacts of the Project on the environmental and social setting of the Project area both in pre and post project conditions. The chapter also deals with the proposed actions for mitigations requirements of the Project.

Initial Environmental Examination (IEE) has been carried out in line with guidelines issued by the Pak – EPA and international donor agencies. The assessment has generally been based on the factual site condition in the light of experience gained from similar projects and discussions held with the local communities and knowledgeable people.

### **7.2 Project Area and Study Area (Area of Influence)**

Before proceeding to the environmental analysis of the project, it is imperative to delineate the project area and study area.

#### **7.2.1 Project Area**

The project area is the area that is directly impacted by the project. These include areas where major construction activities are going to take place for construction of project structures, establishment of construction camps and colonies, borrow areas, quarrying and spoil disposal areas, construction of access and haul tracks, etc. In case of hydropower projects the downstream flows are also reduced due to retention and diversion of water. Therefore, the downstream reach up to a certain limit, most likely till another tributary discharges its flow into the concerned Nullah, is also considered as primary affected area.

Strictly speaking, the project area is directly related to the circumstances where land is to be acquired; people are affected in so far as their physical displacement or relocation is involved. Likewise, removal of vegetative cover for construction may also be considered as a primary impact.

#### **7.2.2 Study Area**

Besides the project area referred to above, the construction-related and subsequently traffic-borne noise and air pollution may influence areas at large distances away from the primary affected areas. The project construction as well as operational activities may have a variety of direct and indirect effects on the physical, biological and human resources of the project area and its environment. For Naltar – V HPP study area will be 2 km from project area in all directions.

Study area depends on many factors relating to the environmental settings, type of resources and the project-related parameters. The situation becomes even more complicated when the indirect impacts are also taken into consideration. For example, game reserve areas or habitats located even at a relatively large distance from the construction areas may come under stress due to the increase in number of visitors resulting from the improved access condition. Even noise levels may be disturbing to the wildlife. Similarly, it may enhance the benefits of archaeological/recreation sites due to increase in the number of visitors.

### 7.3 Project Impact Matrix

Table 7.1: exhibits impacts of the Project in the form of a matrix. This illustrates the impacts of various components of the Project during construction as well as operation phases on various physical, biological and social environmental parameters qualitatively. The evaluation ranking of effects on various environmental parameters has been indicated with symbols denoted as “O” for insignificant or none, “L” for low, “M” for medium and “H” for high while type of effect is designated as “A” for adverse and “B” for beneficial. Likewise “NA” denotes for not applicable and “ND” for not determined.

In general the impact assessment has been made specific to the areas likely to be affected directly by the Project components. It is a fact that the noise generated by the construction activity may scare wildlife inhabiting in the forests. Therefore, this aspect has also been considered and an environmental parameter has been included in the matrix indicated as “Wildlife (Scaring/Facilitating)”. It has been assessed that while the construction activities of the Project will not disrupt the natural habitats, however the noise generated by the construction machinery may result in adverse effects on the wildlife but of very low level or insignificant. On the other hand creation of an impoundment during the operation of the Project will be beneficial for the wildlife through providing a feeding and drinking ground (this, however would be significant if at certain times the river would be dry).

There are habitations located in the close vicinity of the Project affected areas moreover an area of about 162.6 kanal (cultivable, residential, cultivated waste and waste land) will be submerged.

As settlements exist near the major construction areas, the impacts in respect of health and safety hazards will be significant for the local communities. Similarly, from the public receptor point of view, the impacts of noise and air pollution hazards will be significant. However, the risks in respect of these parameters will be there for the crew working at the site. In consideration of these factors, and assuming that the contractors will take every precaution for protecting the workforce from the construction hazards through providing safety equipment and imparting training to the workforce, the level of impact from these parameters has been kept at “Low” adverse except for access road improvement works.

The preceding paragraphs have provided a generalized overview of the Project Impact Matrix, while detailed account on the effects of the Project on various environmental and social parameters, particularly with reference to potential effects of the Project is given in the subsequent sections.

#### 7.3.1 Rapid Environment Assessment (REA) Checklists

A rapid environment assessment of the project area was carried out and is reported in Table 7.2:

## A – ENVIRONMENTAL IMPACTS AND MITIGATIONS

### 7.4 Land Resources

#### 7.4.1 Impacts

This section explains how the proposed project could potentially affect the land resources through change in land use, soil erosion and contamination, and describes mitigation measures to manage these impacts.

- Summary of the anticipated impact of proposed project area described in tabular form below while detail discussion of these impacts, are narrated in subsequent section.

**Summary of Impacts**

Sr. No	Description of Land and Land Based impacted assets	Unit	Quantity
1	Land	Kanal	162.6 kanals
2	Residential Unit	No	1
3	Structures (Religious, public, Private)	No	0
4	Animal Sheds	No	0
5	Trees	No	41

- Soil erosion may occur in the workshop areas as a result of improper runoff drawn from the equipment washing-yards and improper management of construction activities particularly in the vicinity of natural streams. Soil erosion may also occur at quarry areas, if unmanaged blasting is carried out.
- The reduction in vegetative cover will reduce the binding capacity of the soil and susceptibility to erosion by the force of rainfall, resulting in increased soil erosion and removal of plant nutrients. The loss of vegetative cover can increase propensity for landslides.
- Extraction of stones from side slopes or picking from the nullah beds for acquiring aggregates or use in construction of masonry or gabion walls will lead to destabilization of the slope and enhance soil erosion.
- The possible contamination of soil by oils and chemicals at campsites, workshop areas, and equipment washing-yards may limit the future use of land.

#### 7.4.2 Mitigation Measures

The mitigation measures, which will be carried out during construction as well as operation stages for land resources are as under:

- Good engineering practices will be used that will help control soil erosion both at construction sites and in peripheral areas, particularly in borrow and dumping areas and along the haul tracks. Soil erosion and landslide remedial measures will be based on geotechnical, geomorphic and hydrological conditions of the project area and these will vary from site to site. However, the following measures will be adopted as per site conditions.
- For mild valley side slope vegetative cover will be provided to check the erosion. The plantation for slope protection will constitute fast growing indigenous trees with deep root

system for anchoring the soil material and under growth of bushes and creeping grasses having capability of developing mesh of shallow fibrous roots to protect the slope against pitting from rain water.

- Along cross-drainage structures of the access road where embankments are more susceptible to erosion by water runoff stone pitching or a riprap will be provided across the embankment.
- Proper monitoring of the soil erosion and landslide prone areas will be carried out during operation phase and soil conservation measures (if needed) will be carried out like provision of physical structures e.g. retaining walls, etc.
- The contractor will be required to train its workforce in the storage and handling of materials like oils, diesel, petrol, other chemicals, concrete and cement, etc., that can potentially cause soil contamination. The contractor will be required to prepare a training manual and module for all the construction related activities along with the schedule of training program and submit to the supervising consultants for approval.

## 7.5 Impact on Water Resources

### 7.5.1 Impacts

- During construction phase, the breeding ground of the aquatic life, if any, falling in the nullah reach between the u/s and d/s coffer dams, will be lost. This impact takes place during construction phase and is semi-permanent.
- The reduced or no flow in the downstream reaches during operation phase of the project may affect the aquatic life. Compulsory 0.25 m<sup>3</sup>/s environmental flow will be released by the operator and its record maintained.
- As discussed in Section 6, the water resources are more or less free from chemical and biochemical contamination; however some level of microbiological contamination has been detected in both surface and spring waters. This may create health hazards in the workforce of the Project. Water disinfection with chlorine before use is recommended.
- Natural streams and subsurface water may be contaminated from the spills of chemicals, oil, lubricants, detergents, etc. through runoff from the construction area, construction camp, workshops and equipment washing-yards.

### 7.5.2 Mitigation Measures

Measures to be adopted to mitigate the adverse impact on water resources and surface drainage patterns are discussed below:

#### a) Measures to Subside the Effects of Change in Flow Regime

- As far as depletion of water of the Naltar River reach between u/s and d/s coffer dams is concerned, it is unavoidable because it is required for the construction of Tyrolean Weir and appurtenant structures.
- To achieve the targets of the Project, reduction in the time-based flow downstream of the T. weir is also unavoidable. However, it is required that some releases may be made for

sustainability of aquatic life and consumptive and non-consumptive use by the downstream communities.

- The factors that need to be considered for the downstream release of the compensation water generally include the following:
  - Requirements for diluting waste water discharges contributed by the communities in the downstream reaches till a downstream tributary discharges its flow in the Naltar River. As per regulation of Pak – EPA, the dilution factor is required to be 10 times the volume of wastewater contributed into the channel with BOD<sub>5</sub> limit of 80 PPM. No discharge of the wastewater is allowed if its BOD<sub>5</sub> is more than 80 PPM in which case the effluent must be treated to lower the BOD<sub>5</sub> below 80 mg/l before release to the river water body provided 10 times dilution is achieved
- Mostly people use spring water for their consumptive and non – consumptive purpose; they do not depend on the river. The springs used for water supply will be protected against pollution.
- Watercourse or water channel will be relocated as shown in Figure 7.3 and Photograph 7.1 and 7.2. Flow will be maintained as per Table 6.4 of section 6 by feeding the water channel from the tailrace.
- Wastewater effluent from contractors' workshops and equipment washing-yards will be passed through an oil skimmer and to gravel/sand beds to remove oil/grease contaminants before discharging it into natural streams. Similarly, the wastewater effluent from the campsite will be treated before disposal into a stream. According to local laws, the BOD<sub>5</sub> concentration in sewage must be brought down to less than 80 mg/l before being discharged into a natural stream with a capacity to dilute the effluent further by 10 times. Project waste water will be passed through settling tanks to remove TSS and reduce the concentration below 200 mg/s as per NEQS before discharge to the Nullah.
- The spoil material from the excavation will be dumped at appropriate places. The Contractor will also ensure that no spoil material is disposed into river/stream/nullah and into any other water body along the project site. As far as possible barren/waste lands available along the hill slopes and terraces will be used for disposal of the excavated waste material. All waste rock and soil will be laid in layers of 100-200 mm thickness and compacted.

## 7.6 Physical Resources

### 7.6.1 Impacts

- The emission of dust from the batching plant or construction machinery and batching plant can be very harmful for the site worker and the local population. The emission/dust could cause skin and respiratory disease e.g. skin rashes, lung problem etc. Roads and traffic will be affected due to the heavy vehicles movement in the area carrying plants and material. Contractor could select the suitable location provided the following control measures are in place.
- Excavating activities will generate dust and pollute the surrounding area. The emission from the plants used in earth work activities will also degrade the air quality of the site. Exhaust of

noxious gases from movement of heavy machinery will further pollute air which will adversely affect health and vigor of plants.

- Construction activities particularly blasting site near the powerhouse area could generate noise and disturb the natural habitat.

## 7.6.2 Mitigation Measures

- Air quality should be monitored on regular basis near the plant by the contractor.
- All vehicles, machinery, equipment and generators used during construction activities will be kept in good working condition to minimize the exhaust emissions.
- Proper Personal Protective Equipment's (PPEs) will be issued to the site worker (all contractor's laborer and consultants supervisory staff and engineering staff) and make sure the workers wears the PPE properly during working on site.
- The plant has to be Zero Emission Plant. This will include washed aggregate and enclosed cycle automatic injection system of material in to the mixing chamber.
- It is contractor's contractual obligation to use and provide clean and smoke free fuel in the labor camp.
- The Contractor will regularly spray water on the site traffic routes to minimize the dust pollution.
- The Contractor will use vehicles and machinery of good condition and well-tuned engine that will reduce noise hazards according to permissible limits as fixed by Pak EPA ( noise is 85 dB (A) while the WHO noise guidelines prescribed a limit of 55 dB (A)), these limits will be observed during operation phase of the project. The WHO guideline values for community noise, in specific environment, is as shown in Table 7.3 and Table 7.4 provides an indication of relative sound dB (A) levels compared to various activities for reference.
- Monitor noise level on regular basis and maintain the level within the NEQS level by the contractor

## 7.7 Biological Resources

### 7.7.1 Impacts

- Proposed project will impact about 41 trees and during construction activities the Contractor's workers may damage the vegetation and trees (for use as fire-wood to fulfill the camps requirements). The cutting of trees will cause degradation of local environment as under.
- During the construction phase, there will be adverse impacts on the mammals and reptiles of the area due to construction activities involving excavation, blasting, access roads, movement of labor, carriage of goods and machinery to various sites along the Project area. Mammals will avoid these areas. Same will be the case with reptiles. Some reptiles may be killed during the earthworks operations. Movements of the mammals and reptiles will be restricted during the construction phase.

- Birds will try to find shelter and food somewhere else and will tend to move away from the project area due to the activities mentioned above for fear of being hunted/ trapped. Unmanaged blasting activities may harm birds.
- The night illumination must be directed downward to protect the migratory birds from deception that can lose their flight path if lights are left open to sky.
- There is no definite record about fish availability. There is no commercial fishery in the area. Even traditional fishermen do not exist. However, some fishing activities are carried out for household use and recreational purpose.

### 7.7.2 Mitigation Measures

- It is estimated that against cutting of about 41 trees WPD-GB will make a provision of compensatory plantation at the ratio of 1:4. As such, the total compensatory plantation comes to about 164 trees or more to minimize the impacts on flora. The planted trees to be looked after for two years and protected from munching by goats.
- A tree plantation program will be formulated by the WPD-GB with the help of local Forest Department of GB and about 164 trees will be planted. The WPD-GB will enter into an agreement with the Forest Department to implement the program under deposit work. As the land along the slopes generally belong to the communities/individual owners, the Forest Department will involve the communities carrying out plantation on the lands. The Department may also involve the communities on participatory basis to construct dry stone masonry check dams to break the length of the slope thus abating the erosion problems.
- Open fires should be banned in the area to avoid hazards of fire in the project area.
- Hunting, poaching and harassing of wild animals will be strictly prohibited and Contractor will be required to warn its labor accordingly.
- Special measures will be adopted to minimize impacts on the wild birds, such as avoiding noise generating activities during the critical periods of breeding.
- The intake structure will be designed and constructed to allow the minimum mean monthly 0.25 m<sup>3</sup>/s of water flow to always be maintained in the Naltar River for the maintenance of riparian as well as aquatic ecosystem of downstream.

## B – SOCIAL IMPACTS, MITIGATIONS AND RESETTLEMENT

### 7.8 Human Resources

#### 7.8.1 Impacts

- It is estimated that the project will involve acquisition of about 162.6 kanal of land which includes, 24 kanal of cultivated land, 0.3 kanal of residential, 3.8 kanal of cultivable waste land and 126 kanal of state owned cultivable waste land.
- Establishment of contractor's camp, works area, hauls roads to spoil disposal, batching plant, etc. It is estimated that about 8 kanal of state owned cultivable and uncultivable



waste land is required. Breakdown of land required for the project is given in Table 7.5 and Figure 7.1, 7.2 & 7.3

- The project will disrupt 1 residential unit located near proposed reservoir area. Total area of this structure is 0.3 kanal and having 'C' type construction category.
- Owing to small land holdings, agriculture production hardly meets the household requirements of the farming communities for maize grain and vegetables. Its contribution to the household income is very small as compared to other sources that include rearing of livestock, sale of timber and herbs; however, it constitutes the bulk of the food consumed by the resident population. Therefore, any loss of such land will pose an immediate threat to the affected people. For this reason, any loss of agricultural land, even if temporary, has to be avoided or else needs to be adequately compensated. The relevant legislation foresees compensation for lost agricultural land at current market prices. However, it has to be considered that land in a remote area, with low productivity, has a very low market price. This is not an acceptable compensation under WB OPs, and a satisfying solution will have to be found and agreed upon with the population. A one - time payment is not an acceptable compensation.
- The rural women actively participate in outdoor socio-economic activities such as livestock rearing, fetching of drinking water, etc. Their privacy may suffer due to the project activities. Moreover, it will cause hindrance to the mobility of local women for working in the field, herding livestock, bringing drinking water from springs, picking fuel wood, etc.
- The induction of outside labour may create social and gender issues due to the unawareness of local customs and norms.
- During the social field survey of the project, no indigenous or vulnerable household group of people was identified. So no impact on these people is envisaged due to the implementation of the project.
- Occurrence of accidents/incidents during the construction activities, particularly from blasting and excavation activities is a common phenomenon. Safety of general public residing at the top of the hill where blasting/excavation is to be carried will particularly be at stake. The local people, particularly the children and women, may get injuries or even fatalities.
- Contractor's staff while working at steep hilly slopes may slip and get injuries.
- No historical or archeological site has been observed or reported along the project area.

### 7.8.2 Mitigation Measures

- a) As per Law the land is a provincial subject. Therefore, on request of WPD – GB, the Provincial Government of GB will depute a Land Acquisition Collector (LAC) for carrying out acquisition of land, built-up property and other disrupted infrastructures; and trees and crops. WPD – GB will provide support staff and logistic facilities to the LAC for accomplishing the task.
- LAC will determine current and fair market price of the land and other infrastructures. In this respect, under the provision of LAA, the LAC may form a committee to determine the value

of the disrupted assets. For Naltar-V HPP, during stakeholder meeting with land revenue department, land rate were discussed. LAC will involve Provincial Building Department for evaluating the cost of built-up property, Forest Department for evaluating the cost of trees and other vegetation, Department of Horticulture for evaluating the cost of fruit trees and Agriculture Department for evaluating the cost of standing crops. Value of affected shade tree in project area is determined after the consultation of forest representative is Rs.800/tree and for fruit tree is 1,000 according to their size and age.

- The built-up property will be compensated on *replacement cost* basis in consideration of the current construction cost of the facilities, if not better, at least of level similar to the one disrupted.
- The contractor will ensure that the mobility of the local communities, particularly women and children, and their livestock is not hindered or endangered by the construction activities. The contractor will provide alternate and safe track for community quite at a distance away from the construction areas. Similarly appropriate crossing points will be provided at the access road during its construction for daily works and having free access to the natural resources of the local population.
- Contractor will remain sensitive towards the local customs and traditions, particularly in the context of privacy of women.
- It is desirable that the night-time working may be avoided at places where settlements are very close to the construction sites.
- If the above is unavoidable, The Contractor will share the plan and schedule of night time working with the Supervision Consultants for approval.
- The Contractor will provide adequate light at the site and display florescent sign boards in English, Urdu and Shina languages at appropriate places for warning to the communities and machine operators.
- Compensation will be provided as per eligibility and entitlement matrix for Project Affected Persons (PAPs) who lose their land. The land will be acquired in accordance with the Land Acquisition Act 1894 (latest amendment) using the current market prices.
- Loss of other infrastructures and trees within the properties to be acquired will be compensated in accordance with the provision of Land Acquisition Act.
- The Contractor will have to select the specific timings for the construction activities particularly near the settlements, so as to cause least disturbance to the local population particularly women considering their peak movement hours.
- Contractor will take due care of the local community and sensitivity towards local customs and traditions will be encouraged.
- During construction activities, if privacy of the nearby households is affected, the Contractor will inform the house owner to make some 'parda' arrangements.
- As referred earlier, no indigenous or vulnerable household group of people was identified in or along the project area, so the WB/ADB Policy will not be triggered.

- Complying with the safety precautions for construction workers as per International Labour Organization (ILO) Convention No. 62, as far as applicable to the project contract.
- Training of workers by Contractor in construction safety procedures, environmental awareness, equipping all construction workers with safety material including safety boots, helmets, and gloves, hearing protection and protective masks, and monitoring their proper and sustained usage.
- The Contractor will ensure the provision of medical services, medicines, first aid kits, vehicle, etc. at the campsite and working place. For this purpose, he will install, staff, equip and operate a clinic on site. It is recommended that this clinic should also be open to the population of the nearby villages, in order of give them some direct benefits from the project.
- Warning to local communities prior to blasting and to enhance blasting safety the contractor will use protective devices, including wire mesh containment, displaying warning signs along the work site, blowing sirens, etc.
- There are no cultural sites located within the study area and no impacts on archaeological sites are envisaged. In case of a chance find during excavation, the contractor will protect the site and notify the Engineer who will inform Department of Archaeology & Museums through WPD-GB and hand over such sites to the department if instructed by Engineer / WPD-GB.

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# TABLES

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**Table – 7.2: Rapid Environmental Assessment (REA) Checklist**

<p><b>Instructions:</b></p> <ul style="list-style-type: none"> <li>• This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department</li> <li>• This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.</li> <li>• This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.</li> <li>• Answer the questions assuming the “without mitigation” case. The purpose is to identify potential impacts. Use the “remarks” section to discuss any anticipated mitigation measures.</li> </ul>
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SCREENING QUESTION	YES	NO	REMARKS
<b>A. Project Planning</b>			
Is the project area adjacent to or within any of the following environmentally sensitive area?			
❖ Protected area		✓	
❖ Wetland		✓	
❖ Mangrove		✓	
❖ Estuarine		✓	
❖ Buffer Zone of protection area		✓	
❖ Special area for protecting biodiversity		✓	
<b>B. Potential Environmental Impacts</b>			
Will the project cause.....			
❖ Loss of precious ecological values (e.g. rules of encroachment into forests / swamplands or historical / cultural buildings / areas, disruption of hydrology of natural waterways, Regional flooding and drainage hazards.		✓	
❖ Loss of archaeological, historical or cultural monuments?		✓	
❖ Dislocation or involuntary resettlement of people?	✓		One residential units will be impacted
❖ Disruption/destruction of tribal groups/indigenous peoples?		✓	
❖ Environmental degradation from increased pressure on land?		✓	
❖ Conflicts on water supply rights, and related social conflicts?		✓	
❖ Proliferation of aquatic weeds in reservoir and downstream impairing dam discharge, irrigation systems, navigation and fisheries, and increasing water loss through transpiration?		✓	
❖ Scour of riverbed below dam?		✓	
❖ depletion of dissolved oxygen by large quantities of Decaying plant material, fish mortality due to reduced dissolved oxygen content in water, algal blooms causing successive and temporary eutrophication, growth and proliferation of aquatic weeds?		✓	
❖ Increased incidence of waterborne or water-related		✓	

SCREENING QUESTION	YES	NO	REMARKS
Diseases?			
❖ Deterioration of water quality in reservoir?		✓	
❖ Decline or change in the fisheries below dams due to reduced peak flows and floods and water quality changes?		✓	
❖ Loss of migratory fish species due to the impediment posed by the dam?		✓	
❖ Formation of sediment deposits at reservoir entrance, creating backwater effect and flooding and water logging upstream?		✓	
❖ Sedimentation of reservoir and loss of storage capacity?		✓	
❖ alteration of water quality due to evaporation in reservoir, lowered temperatures during low flow periods, silt concentration in density currents, low dissolved oxygen, and high levels of iron and manganese?		✓	
❖ Salinization of floodplain lands and saltwater intrusion in estuary and upstream?		✓	
❖ Decrease in floodplain agriculture?		✓	
❖ Environmental problems arising from uncontrolled human migration into the area, made possible by access roads and transmission lines?		✓	
❖ Impediments to movements of people and animals?	✓		During construction diversion will be made.
❖ Potential social conflicts arising from land tenure and land use issue?		✓	
❖ Labor – related social problems especially if workers from different areas are hired?	✓		Problems will be there but those will be mitigated.

**Table - 7.3: WHO Guideline Values for Community Noise in Specific Environments**

Specific Environment	Leq*(dB)	L max,**(dB)
Outdoor living area	55	-
School class rooms and pre-schools (indoors)	35	-
School, playground (outdoors)	55	-
Hospital, ward rooms (indoors)	30	40
Industrial, commercial, shopping and traffic areas (indoors and outdoors)	70	110

\*Level equilibrium

\*\*Maximum level

**Table- 7.4: Relative Sound Levels**

Sound Level dB (A)	Activity
40 – 50	Rural Area
55	Quiet background conversation
60	General office
72	Passenger car @ 60 km/hr at 7 meters distance
85	Heavy diesel lorry @ 40 km/hr at 7 meters distance
90	Hazard to hearing from continuous exposure
95	Pneumatic drill (un-silenced) at 7 meter distance

**Table - 7.5: Detail of Land Acquisition for Naltar V HPP**

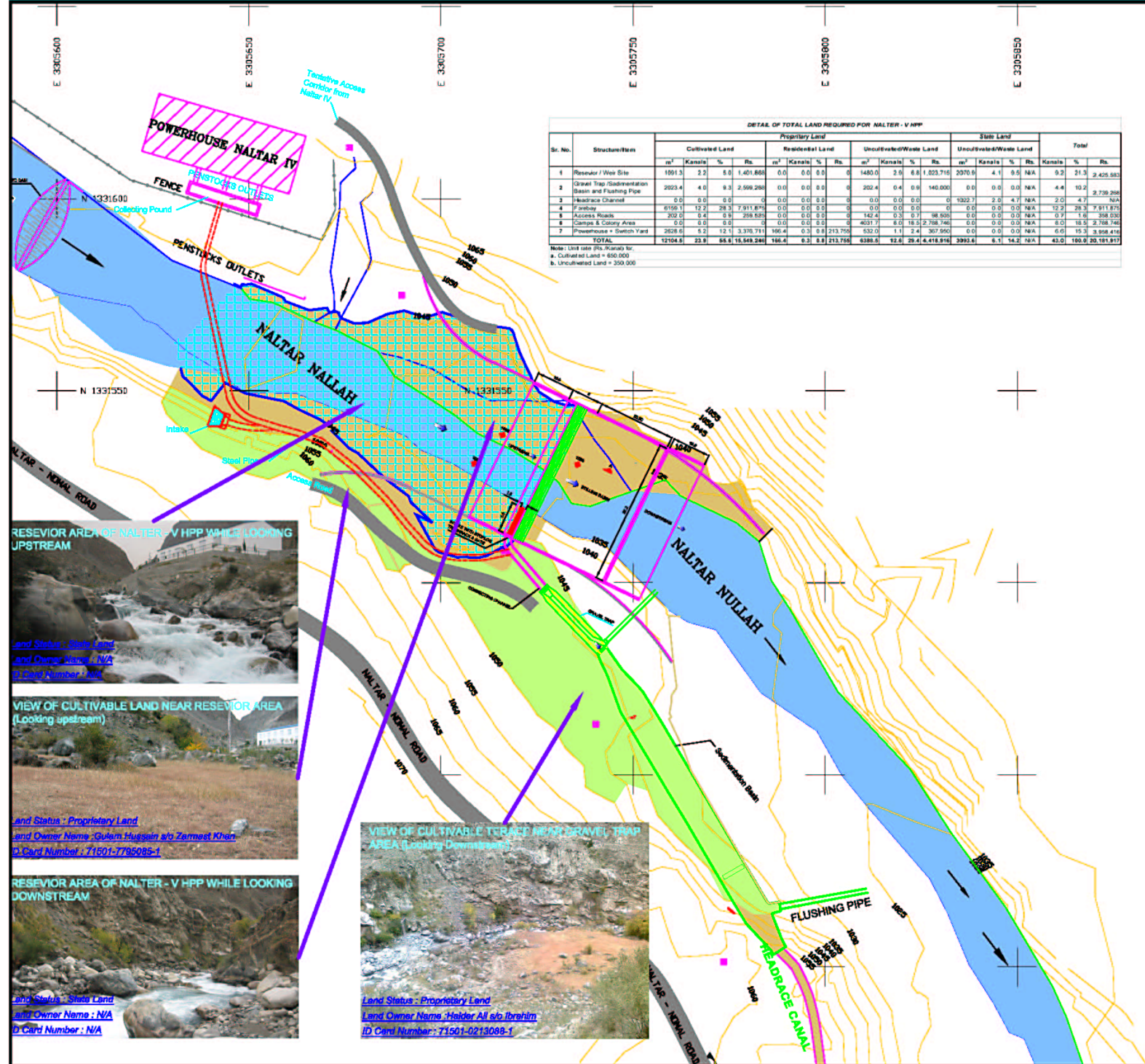
Sr. No.	Structure/Item	Proprietary Land			State Land	Total
		Cultivable	Residential	Cultivable/ Waste Land	Cultivable/ Waste Land	
<b>Permanent Land Acquisition</b>						
1	Weir Site	2.2	0.0	2.0	4.1	8.3
2	Gravel Trap , Sedimentation Basin and Flushing Pipe	4.0	0.0	0.4	0.0	4.4
3	Headrace Canal	0.0	0.0	0.0	2.0	2.0
4	Forebay	12.2	0.0	0.0	0.0	12.2
5	Penstock	0.0	0.0	0.0	120.0	120.0
6	Powerhouse & Switch Yard	5.2	0.3	1.1	0.0	6.6
7	Access Road	0.4	0.0	0.3	0.0	0.7
8	Colony*	0.0	0.0	0.0	0.0	0.0
<b>Total</b>		<b>24.0</b>	<b>0.3</b>	<b>3.8</b>	<b>126.1</b>	<b>154.2</b>
<b>Temporary Land Acquisition</b>						
1	Contractor's Camp	0.0	0.0	8.0	0.0	8.0
2	Spoil Disposal**	0.0	0.0	0.0	0.0	0.0
<b>Total</b>		<b>0.0</b>	<b>0.0</b>	<b>8.0</b>	<b>0.0</b>	<b>8.0</b>
<b>GRAND TOTAL</b>		<b>24.0</b>	<b>0.3</b>	<b>11.8</b>	<b>126.1</b>	<b>162.2</b>
Note: All areas are in Kanal, 1 Kanal = 506 m <sup>2</sup>						
* Existing residential units of Naltar - IV Powerhouse should be used for colony						
**Spoil Disposal Area proposed near Village Nomal at Powerhouse Area						



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# **FIGURES / MAPS**

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**DETAIL OF TOTAL LAND REQUIRED FOR NALTAR - V HPP**

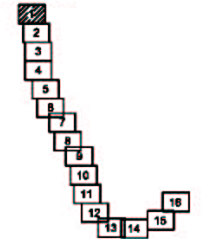
Sr. No.	Structure/Item	Cultivated Land			Proprietary Land			Uncultivated/Waste Land			Site Land			Total								
		m <sup>2</sup>	Kanals	%	m <sup>2</sup>	Kanals	%	m <sup>2</sup>	Kanals	%	m <sup>2</sup>	Kanals	%									
1	Reservoir / Weir Site	1091.3	2.2	5.0	1,401,869	0.0	0.0	0	0.0	0.0	1480.0	3.0	6.8	1,023,710	2070.9	4.1	9.5	N/A	9.2	21.3	2,425,583	
2	Gravel Trap (Sedimentation Basin and Flushing Pipe)	2923.4	4.0	9.3	2,599,280	0.0	0.0	0	0.0	0.0	202.4	0.4	0.9	140,000	0.0	0.0	0.0	N/A	4.4	10.2	2,739,280	
3	Headrace Channel	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0.0	N/A	2.0	4.7	204	
4	Forebay	6156.1	12.2	28.3	7,911,879	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0.0	N/A	12.2	28.3	7,911,879	
5	Access Roads	202.6	0.4	0.9	258,825	0.0	0.0	0	0.0	0.0	142.4	0.3	0.7	98,500	0.0	0.0	0.0	N/A	0.7	1.6	358,325	
6	Camp & Colony Area	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	4031.7	8.0	16.5	2,768,746	0.0	0.0	0.0	N/A	8.0	18.5	2,768,746	
7	Powerhouse + Switch Yard	2628.6	5.2	12.1	3,378,711	166.4	0.3	0.8	213,705	0.3	0.8	307,590	0.0	0.0	0.0	0.0	0.0	N/A	6.0	15.3	3,958,416	
<b>TOTAL</b>		<b>12104.6</b>	<b>23.8</b>	<b>55.6</b>	<b>15,549,244</b>	<b>166.4</b>	<b>0.3</b>	<b>0.8</b>	<b>213,705</b>	<b>0.3</b>	<b>0.8</b>	<b>6388.6</b>	<b>12.6</b>	<b>28.4</b>	<b>4,418,916</b>	<b>2093.6</b>	<b>4.1</b>	<b>14.2</b>	<b>N/A</b>	<b>43.0</b>	<b>100.0</b>	<b>20,181,917</b>

Note: Unit site (Rs. Kanals) for:  
 a. Cultivated Land = 650,000  
 b. Uncultivated Land = 350,000

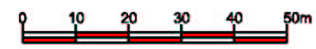
**LEGEND:**

- Reservoir Area
- Full Reservoir Level
- Building
- Cultivated Land
- Un Cultivated Land
- Nallah
- Headrace Channel
- Road
- Katcha Track
- Fence
- Survey Control Point
- Boulder
- Pylon
- Electric Pole
- Telephone
- Index Contour

**KEY PLAN**



NOTE:  
Proposed area for penstock is drawn at Sheet no. 4 to 15 which consumed state land.



RESEVIOR AREA OF NALTAR - V HPP WHILE LOOKING UPSTREAM



VIEW OF CULTIVABLE LAND NEAR RESEVIOR AREA (Looking upstream)



RESEVIOR AREA OF NALTAR - V HPP WHILE LOOKING DOWNSTREAM



VIEW OF CULTIVABLE TERRACE NEAR GRAVEL TRAP AREA (Looking Downstream)



Land Status : State Land  
Land Owner Name : N/A  
D-Card Number : N/A

Land Status : Proprietary Land  
Land Owner Name : Gulam Hussain s/o Zameer Khan  
D-Card Number : 71501-7795083-1

Land Status : Proprietary Land  
Land Owner Name : Halder Ali s/o Ibrahim  
ID Card Number : 71501-0213088-1

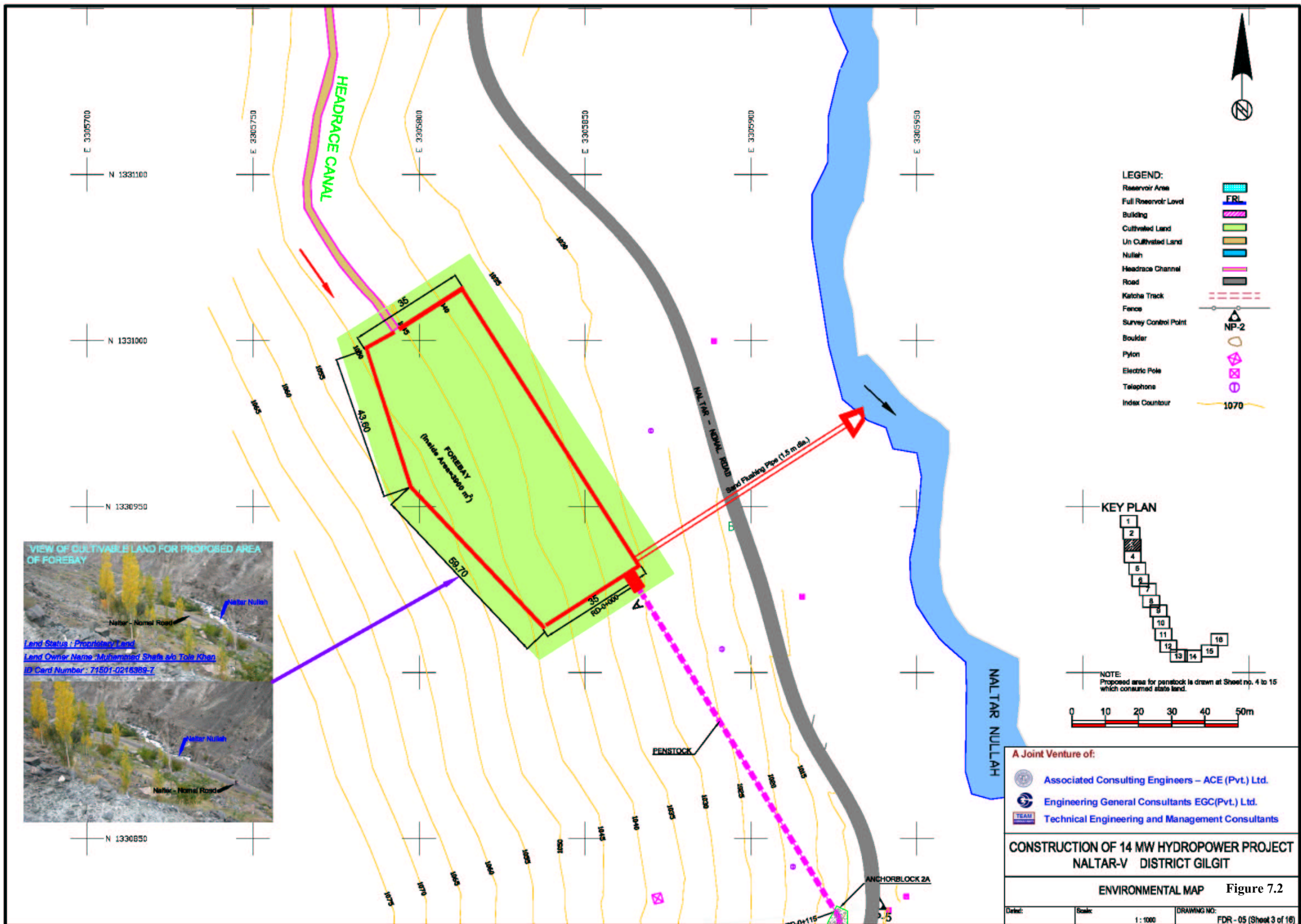
A Joint Venture of:

- Associated Consulting Engineers – ACE (Pvt.) Ltd.
- Engineering General Consultants EGC(Pvt.) Ltd.
- Technical Engineering and Management Consultants

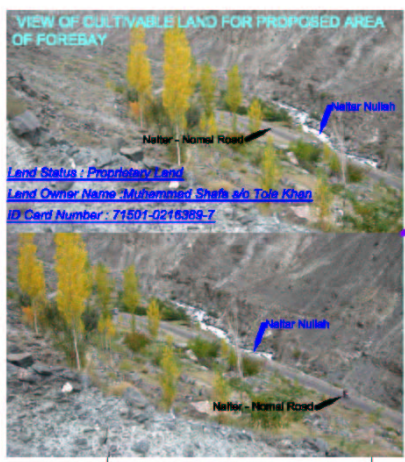
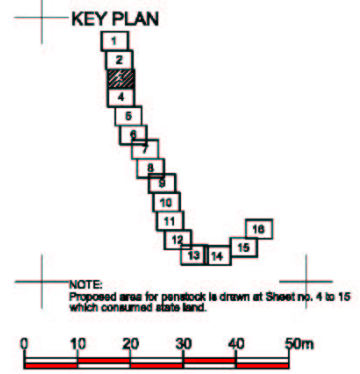
**CONSTRUCTION OF 14 MW HYDROPOWER PROJECT NALTAR-V DISTRICT GILGIT**

**ENVIRONMENTAL MAP Figure 7.1**

Date: \_\_\_\_\_ Scale: 1:1000 DRAWING NO: FDR-05 (Sheet 1 of 16)



- LEGEND:**
- Reservoir Area
  - Full Reservoir: Lovd
  - Building
  - Cultivated Land
  - Un Cultivated Land
  - Nullah
  - Headrace Channel
  - Road
  - Katcha Track
  - Fence
  - Survey Control Point
  - Boulder
  - Pylon
  - Electric Pole
  - Telephones
  - Index Countour



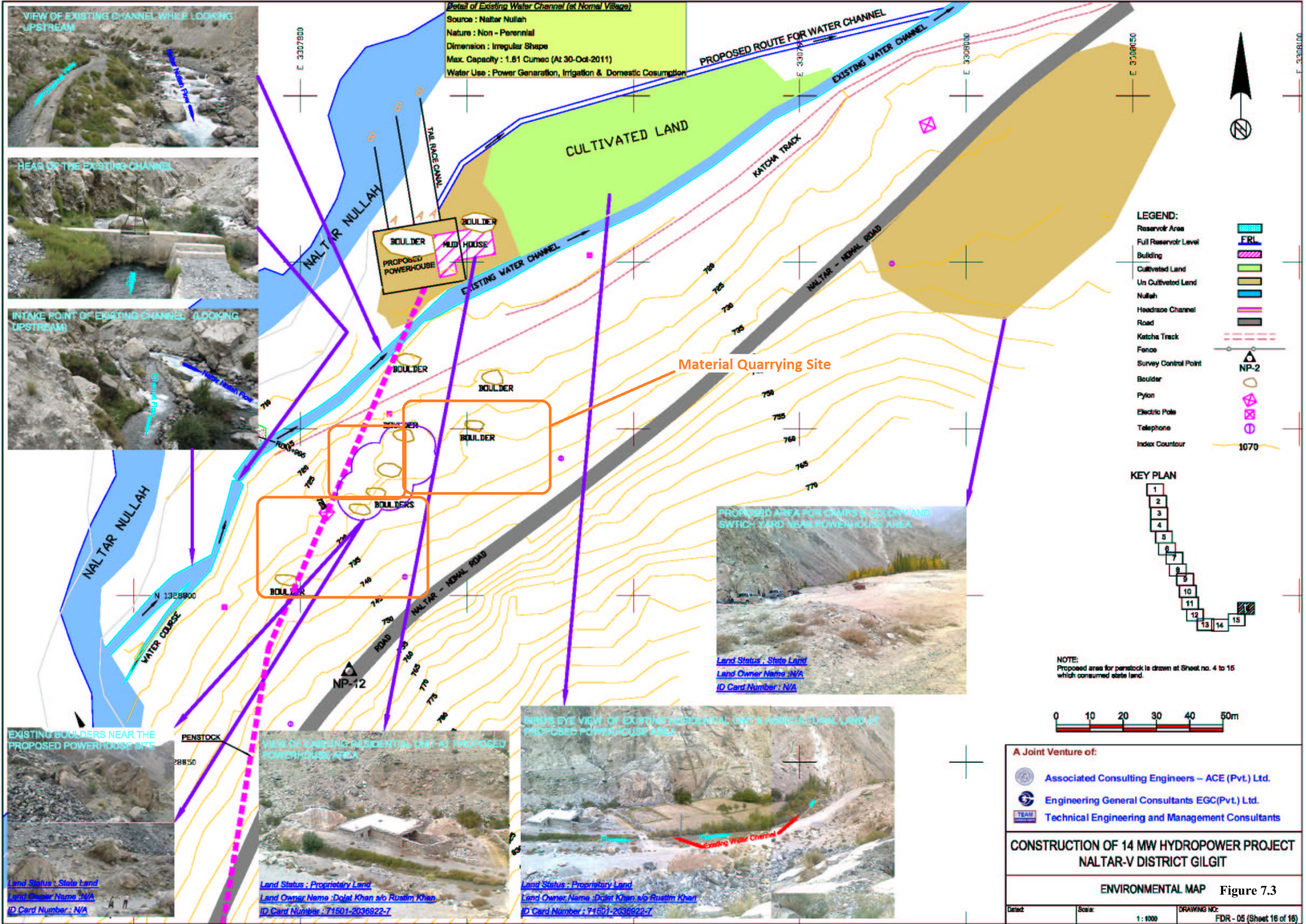
**A Joint Venture of:**

- Associated Consulting Engineers – ACE (Pvt.) Ltd.
- Engineering General Consultants EGC (Pvt.) Ltd.
- Technical Engineering and Management Consultants

**CONSTRUCTION OF 14 MW HYDROPOWER PROJECT  
NALTAR-V DISTRICT GILGIT**

**ENVIRONMENTAL MAP Figure 7.2**

Date: \_\_\_\_\_ Scale: 1:1000 DRAWING NO: FDR - 05 (Sheet 3 of 16)

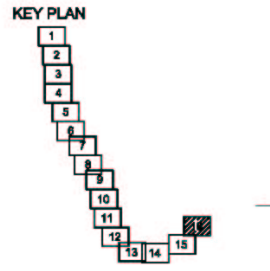


**Detail of Existing Water Channel (at Nomal Village)**  
 Source : Naltar Nullah  
 Nature : Non - Perennial  
 Dimension : Irregular Shape  
 Max. Capacity : 1.81 Cumec (At 30-Oct-2011)  
 Water Use : Power Generation, Irrigation & Domestic Consumption



Material Quarrying Site

- LEGEND:**
- Reservoir Area
  - Full Reservoir Level
  - Building
  - Cultivated Land
  - Un Cultivated Land
  - Nullah
  - Headrace Channel
  - Road
  - Katcha Track
  - Fence
  - Survey Control Point
  - Boulder
  - Pylon
  - Electric Pole
  - Telephone
  - Index Contour



NOTE:  
 Proposed area for penstock is drawn at Sheet no. 4 to 16 which consumed state land.



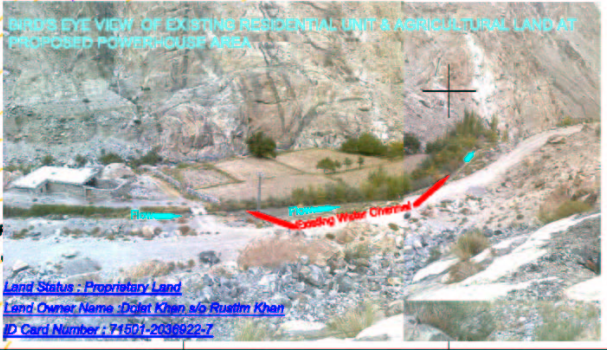
**A Joint Venture of:**

- Associated Consulting Engineers – ACE (Pvt) Ltd.
- Engineering General Consultants EGC(Pvt) Ltd.
- Technical Engineering and Management Consultants

**CONSTRUCTION OF 14 MW HYDROPOWER PROJECT  
 NALTAR-V DISTRICT GILGIT**

**ENVIRONMENTAL MAP Figure 7.3**

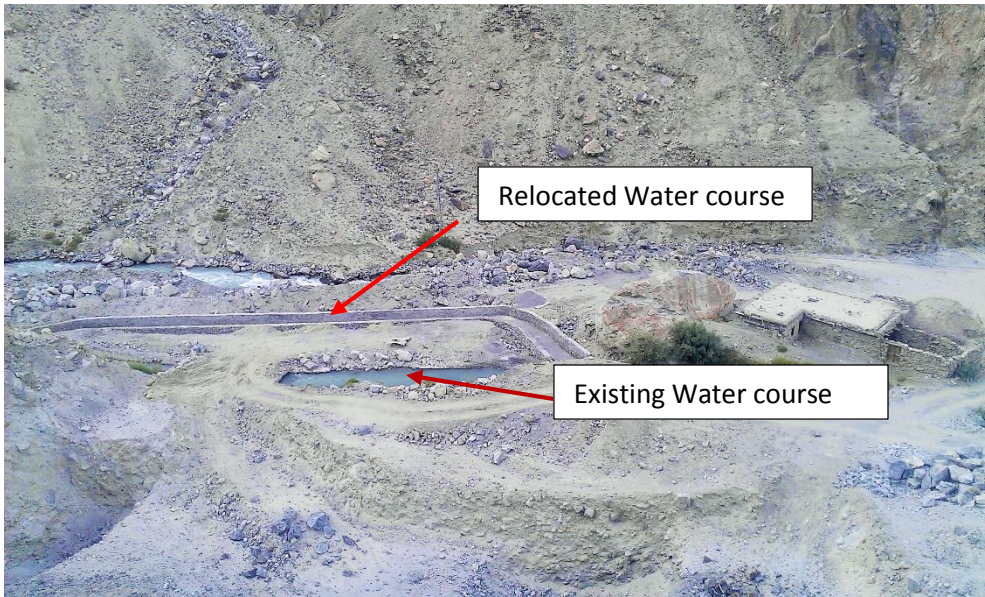
Sheet: \_\_\_\_\_ Scale: 1 : 1000 DRAWING NO: FDR - 05 (Sheet 16 of 16)



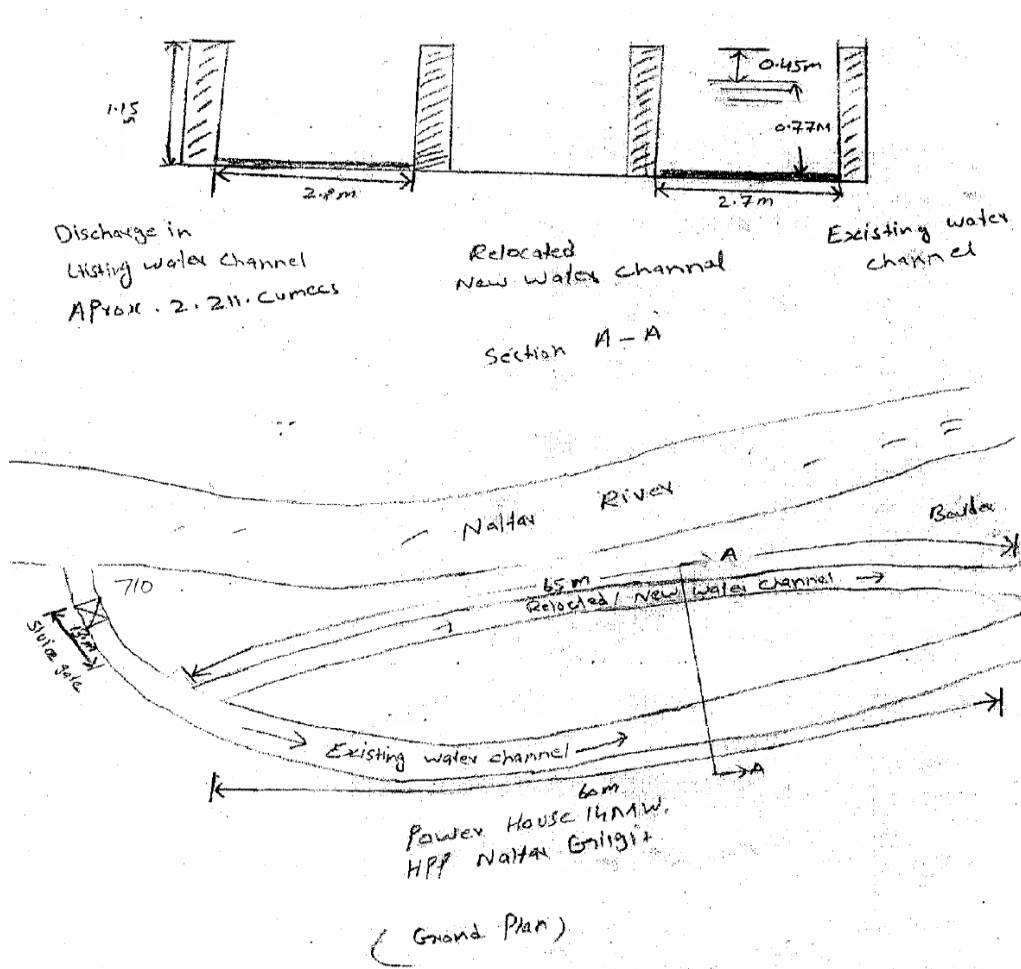
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# PHOTOGRAPHS

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Photograph 7.1: Existing and Relocated Watercourse



Photograph 7.2: X - Section of Relocated Watercourse

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**ENVIRONMENTAL MANAGEMENT AND  
MONITORING PLAN**

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## **8. Environmental Management and Monitoring Plan**

### **8.1 General**

This section provides an overall approach for managing and monitoring environment and social issues and describes the institutional framework and resource allocations required to implement the environmental management and monitoring plan (EMMP) for the project. The environmental management plan and its institutional requirements have been described in tabular form as Table 8.1.

### **8.2 Objectives of EMMP**

The EMMP will help WPD – GB to address the adverse environmental impact of the project, enhance project benefits, and introduce standards of good environmental practice. The primary objectives of the plan are to:

- Define the responsibilities of project proponents, contractors and other role players and effectively communicate environmental issues among them.
- Facilitate the implementation of the mitigation measures identified in Section 7 by providing the instructions on how to handle the issues and providing an implementation schedule.
- Define a monitoring mechanism and identify monitoring parameters to ensure that all mitigation measures are completely and effectively implemented.
- Identify training requirements at various levels and provide a plan for implementation.
- Identify the resources required to implement the EMMP and outline corresponding financing arrangements.

### **8.3 Key Environmental and Social Issues**

The environmental and social issues associated with this project were discussed in detail in the previous Section 7 and include:

- Permanent acquisition of land for project structures, access road and colonies for project operation and residence of maintenance staff.
- Appropriately locating temporary construction camps, site offices, workshops and concrete batching plants.
- Disposal of excavated material, which will be generated quantities (Tyrolean Weir foundation, road).
- Regulating the procurement of borrow material, soil erosion and land sliding during construction as well as at operation stage.
- Enhancing and two years look after of tree plantation in the Project environ particularly on slopes for their stabilization as a compensatory action for loss of vegetation by the Project.
- Ensuring safety of construction crew and local communities during construction and operation.



- Slope stabilization for preventing landslides and erosion, which cause damage to the access road and other project structures.
- Competition for water between the Project and the local population (need for irrigation, micro hydropower and drinking water).

#### 8.4 Institutional Arrangements for Implementation of EMMP

The Project Director (PD), who will function as in-charge of the Project and will be responsible for overall coordination, and internal/external processing of all approvals and he will be assisted by additional field staff deputed to the site to implement the Project. His responsibilities will not only include implementation of physical works, but also ensuring environmental & social safeguards, and timely land acquisition and relocation of various utility services. In respect of the latter activities, the Resident Engineer (RE) will be assisted by a Deputy Director (DD), Environment and Resettlement (E&R).

The DD (E&R) will be strengthened by an Assistant Director (AD) Environment and an AD, Resettlement and a team constituted of an appropriate number of revenue staff and a sociologist.

In addition to the above, WPD – GB will engage a design and supervisory consultant who is supposed to prepare project design in a way as to cause minimum disruption to the physical, biological and social environment of the project area. Department has already engaged Supervisory Consultants, as Management Consultants acting as “The Engineer”. The consultant will employ the necessary staff for supervising environmental and resettlement related tasks and supervise compliance by the contractor the provisions of the EMMP.

#### 8.5 Specific Implementation Responsibilities

**Pre-Construction Phase:** Pre-construction phase activity will mainly be related with land acquisition. The DD Resettlement with assistance of AD, Resettlement will supervise and coordinate a Land Acquisition Collector (LAC) and his staff in matters relating to land acquisition and management. In this context, AD will get assistance of sociologists and WPD-GB revenue staff. However, the overall responsibility of the land acquisition will rest with the Project Director. The WPD-GB resettlement staff will ensure that the following activities are carried out transparently and according to acceptable standards:

- Identifying project-affected persons (PAPs) on the basis of specified documents, if available;
- Carrying out a consultation and information dissemination campaign on compensation procedures, entitlement packages, and proposed resettlement sites, if any;
- Identifying any problems due to restricted access during construction and verifying whether diversions have been provided where required;
- Establishing a grievance redressal committee to ensure fairness and transparency during the resettlement process;
- Preparing a joint on-site inventory and valuation of the affected assets and incomes of individual PAPs;

- Preparing individual entitlement files;
- Preparing and approving compensation budgets;
- Ensuring that an adequate notice period is given to PAPs before shifting, if relocation is required;
- Ensuring and recording compensation payment in case of delays;
- Providing shifting assistance to displaced people, if any, and allowing to salvage their assets
- Identifying major issues of conflict between PAPs and the Contractors during implementation of resettlement activities; and

**Construction Phase:** The DD (E&R) along with Environmental and Social staff will be responsible for the following:

- Liaising between project staff and the Supervision Consultant's staff to monitor environmental compliance during construction.
- Supervising and providing technical support to contractors' staff to help ensure compliance with the EMMP.
- Sustaining a working partnership among WPD-GB, EPAs, provincial agriculture, forest and wildlife departments, NGOs/CBOs and other related public/private sector organizations.
- Oversee that plantation within the reservoir area has been cleared to avoid/minimize the production of greenhouse gasses.

The Project Director with the assistance of the DD (E) will oversee the Project's environmental implementation, training, reporting and monitoring and may commission periodic environmental audits. DD (E) will get assistance from the Supervision Consultant for overseeing and reporting on the implementation of the EMMP and assist in training field staff.

For the afforestation program, a Forest Officer will be assigned to ensure that the Afforestation Contractor (Forest Department, GB) is raising adequate nursery stock of the type, quality, and maturity required to meet the afforestation requirements; preparing plantation schemes for different locations; and stockpiling materials, etc. The Forest Officer will report to the AD Environment.

**Operation Phase:** It is likely that some of the works identified in EMMP could not be accomplished during the construction phase and will continue during operation of the Project. This particularly relates to afforestation and restoration of sites, especially spoils dumping areas and allied works. The DD (E&R) and environment & Social staff will be responsible for the following:

- Coordinating with the operations staff to monitor environmental compliance during operation, particularly release of compensation water downstream of the Tyrolean Weir.
- Advising on and monitoring tree plantation and growth/propagation status.

- Oversee that the contractor has complied with restoration clauses of the agreement with landowners from land temporarily acquired for establishing facilities and dumping spoil.
- Reporting on the progress of environmental compliance to the federal and provincial EPAs.
- Assessing the long-term environmental impact of the project operation.

### **8.5.1 The Contractor**

In order to make contractors fully aware and responsible of the implications of the EMMP and to ensure its compliance, it will be ensured that environmental measures are treated appropriately and separately in the tender documentation and that payment milestones are linked to environmental performance, measured by execution of the prescribed environmental mitigation measures. Such a procedure would help ensure adequate assessments of project impacts are carried out during Project construction and operation phases, where a consistent approach will be expected on behalf of contractors that warrant data and information collected from monitoring programs are compared to baseline conditions.

The contractor would be made accountable through contract documents and/or other agreements of the obligations and importance of the environmental and social components of the Project. They would be prepared to co-operate with the executing agency, project management unit, supervising consultants and local population for the mitigation of adverse impacts. After the EMMP's addition in the contract documents, the contractor will become bound to implement the EMMP and to hire trained environmental management staff for implementation and effectiveness of the mitigation measures.

The contractor(s) would be required to prepare the following plans before mobilization on the basis of IFC/WBG EHS Guidelines and obtain approval from the Supervision Consultants:

- Camp Management Plan
- Traffic Management Plan
- Pollution Prevention Plan (both Air & Noise)
- Drinking Water Management Plan
- Waste Disposal Plan
- Borrow Area and Disposal Area Restoration Plan
- An Emergency Response Plan,
- An Occupational Health, Public Health and Safety Plan.

### **8.5.2 Contingency Plan**

If any of the results of the environmental monitoring/sampling exceed specified trigger levels for the determinant, the appropriate actions will be undertaken to prevent hazard to human life, property and the environment outside the operating site bounding control and minimize any immediate risks of pollution of the environments, ensure the immediate initiation of necessary

investigation and management actions to identify, mitigate and remediate the cause of the accident. Initiate training and periodic testing/checking when necessary.

The probabilities of accident such as oil spills, accidental habitat destruction, water or air pollution and hit with unexpected high flow are very low. However, such accidents can occur and overall environmental emergency response method may be used:

- Obtain an early warning of the emergency conditions so as to avoid adverse impacts on the environment.
- Safeguard personnel to prevent injuries or loss of life.
- Minimize the impact of such event on the environment and facilities by mitigating the potential for escalation and containing of the hazards.
- Site in charge should have permanent mode of contact with the HSE officer.
- Contact name and number of HSE officer should be available in site office and displayed on site office notice board.

It is a responsibility of the contractor to provide at least one First Aider during working hours.

The First Aid provider will perform the following duties.

- Keeping all necessary first aid medicines and bandages in the first aid box at every time.
- Replace the medicines before their expiry dates to avoid any health hazard to the people.
- Provide first aid to the injured at the event of accident.
- Report any accident / incident to the environmental manager immediately for necessary action.
- Call ambulance in case of any serious emergency.

Emergency siren should be installed at the barrage to inform the site worker about any emergency situation. The operation of the siren will be controlled by the HSE officer or his nominated person. The designate assembly area also should be marked and informed to site worker. An outline of a contingency plan for the accidental spill is shown in following table:

**Table: Accidental Spill Contingency Plan**

<b>Step</b>	<b>Diesel spill</b>	<b>Chemical and Oil Spill</b>
<b>Alert / Mobilize (by work supervisor)</b>	Alert emergency coordinator and team	Alert emergency coordinator and team

<p><b>Initial action (by HSE Officer)</b></p>	<p>Start log of event Determine appropriate strategy  Notify PMO in Gilgit Notify relevant authority</p>	<p>Start log of event Determine appropriate strategy  Notify PMO in Gilgit Notify relevant authority</p>
<p><b>On-going actions (Site In charge)</b></p>	<p>If there is a containment breach, use earth moving equipment to construct ditch or berm to contain spill. Use pump / absorbent to recover the product. Handle the recovered product according to the Control of substances hazardous to health (COSHH) sheets.</p>	<p>If there is a containment breach, use earth moving equipment to construct ditch or berm to contain spill. If it contaminates the river use pump / absorbent pad to recover the product. Handle the recovered product according to the COSHH sheets.</p>
<p><b>Stand Down (Site Incharge / The Engineer)</b></p>	<p>Once the incident has ended the emergency team and authorities will stand down and commence as full investigation.</p>	<p>Once the incident has ended the emergency team and authorities will stand down and commence as full investigation.</p>
<p><b>Waste disposal (Contractor)</b></p>	<p>Collect all contaminated soil or absorbing pads and incinerate or treat with bioremediation at a controlled access area. In case of contaminated water the water should be treated and reuse or pump it back in to the river.</p>	<p>Incinerate or treat with bioremediation the collected product at a controlled – access area at the burn pit. Collect all contaminated soil and incinerate it at the burn pit.</p>

### 8.5.3 Supervision Consultant

The Supervision Consultant appointed by WPD - GB for the project will be responsible for:

- Supervising the Project's Contractors and ensuring that all contractual obligations related to construction of works, as well as environmental and social compliance are met.
- Ensuring that day-to-day construction activities are carried out in an environmentally sound and sustainable manner.

- Assisting the project management for coordinating with provincial and local officials, community groups, government departments, etc. on environmental issues and obtaining the necessary clearances from the regulatory authorities.
- Monitoring of the environmental aspects of projects during construction to ensure that the environmental requirements of the contract and the mitigation measures proposed in the EMMP are implemented.
- Prepare daily, monthly, quarterly and annual progress report during construction phase covering environmental issues.
- Supervising contractors and preparing environmental input to the quarterly progress report.
- Developing guidelines and a code of good practice describing low-cost environmental measures that can be implemented in the construction and maintenance programs.
- Developing and conducting environmental training activities for contractors and the supervision consultant staff.
- Ensure that concrete and asphalt batching plants, construction camps and other facilities are properly sited and installed in accordance with the contract.
- Determine the timing and exact locations of both baseline and routine air, noise and vibration, and water quality monitoring in accordance with the contract provisions (if any).
- Undertake critically important routine visual monitoring of construction, waste disposal and overall environmental management practices by the Contractors. Effective environmental management during construction will require frequent site visits and observation skills. Necessary meters to measure noise, air pollution will be required. All meters be calibrated at intervals specified by manufactures and certificate obtained which must be submitted to the employer.
- Devise solutions to environmental issues as they arise. Construction projects inevitably give rise to problems of excessive dust, noise levels and other impacts that are in some instances unavoidable. Good construction supervision requires that every effort be made to minimize these impacts. A team approach is essential. Environmental issues are entwined with those of safety, management and community relations. Circumstances will arise that will require creative solutions based on circumstances as they are encountered.

## 8.6 Training Program

WPD – GB will initiate a training program to ensure that its employees and that of its contractors have the required knowledge and skill to manage the environmental aspects of their respective jobs. The proposed environmental trainings are listed in the Table 8.2.

## 8.7 Progress Reporting

The overall progress reporting of environment, land acquisition and resettlement activities will be the responsibility of the DD, (E&R) who will provide these reports to the Supervision Consultant to be collated and reflected in the overall project implementation progress reports, at

least on a quarterly basis. Weekly and monthly reporting formats are attached as Annexure I at the end of the report.

## **8.8 Environmental Monitoring**

This section provides a monitoring plan that identifies the roles and responsibilities of project staff involved in environmental monitoring, and lists the parameters that will be used in the monitoring process. (Table 8.3)

### **a) Construction Phase**

The main objectives of the construction phase monitoring plans will be to:

- Monitor compliance with the conditions specified in the final EMMP.
- Monitor the actual project impact on physical, biological and socioeconomic indicators. This will indicate the adequacy of the IEE in identifying and mitigating the project adverse effects.
- Recommend mitigation measures for any unforeseen impact or where the impact level exceeds than that anticipated in the IEE.
- Ensure compliance with legal and community obligations including safety on construction sites.
- Monitor the rehabilitation of borrow areas and the restoration of the construction campsite as described in the EMMP.
- Ensure the safe disposal of excess construction materials.

### **b) Operation Phase**

The main objectives of monitoring during the operation phase will be to:

- Appraise the adequacy of the IEE with respect to the project's predicted long-term impacts on the corridor's physical, biological and socioeconomic environment.
- Evaluate the effectiveness of the mitigation measures proposed in the EMMP, and recommend improvements in the EMMP, if required.
- Monitor the survival rate of compensatory plantations carried out for loss of vegetation by the project.

WPD - GB will ensure two types of monitoring during the execution of the project, viz,

- (i) Compliance Monitoring - to ensure that proposed measures in the EMMP are adhered to, and
- (ii) Effects Monitoring - to establish baseline values for environmental parameters such as air quality, water quality and noise levels. Given the circumstances of the project, independent environmental monitoring consultant may be engaged.

### **8.8.1 Environmental Monitoring Parameters**

The following major environmental parameters will be monitored at locations to be identified during the construction phase.

- Ambient air quality (mainly PM<sub>10</sub>)
- Batching plant emissions (smoke, dust, etc.)
- Ambient noise levels
- Water quality
- Compensatory plantation.
- Soil quality.

### **8.9 Social Monitoring**

The DD (E&R) along with AD Resettlement and Sociologist will be responsible for monitoring:

- The progress of resettlement activities based on monthly progress reports which shall be submitted by the PD.
- The status of the project's consultation strategy, based on monthly progress reports shall also be submitted by the PD.
- WPD - GB will review the efficacy of the M&E arrangements quarterly, relating to social, resettlement, and land management issues, and refine the arrangements accordingly.
- In this respect, WPD - GB will also take into consideration the findings/suggestions made by the independent consultants engaged for social monitoring as Third Party Validation in semi-annual Monitoring Reports.

The overall progress reporting of land acquisition and resettlement activities will be the responsibility of the DD (E&R) who will prepare the quarterly progress report which will be submitted to the PD. The Supervision Consultants will help in preparing the progress reports covering the implementation of resettlement activities under the project.

#### **8.9.1 Social Monitoring Parameters:**

Social monitoring will be carried out based on the following indicators under Social Monitoring Plan:

- Total Number of Project Affected Persons (PAPs) to be compensated for the land; and those compensated and those outstanding.
- Inventory and valuation of PAPs' affected assets.
- Assessment of pre- and post-resettlement incomes of PAPs.
- Notice period given to PAPs for their shifting from their original locations to new sites



- Verification of shifting assistance provided to displace people.
- Number and nature of consultations carried out, as well as targeted stakeholders.
- Record of any problems due to restricted access to the natural resources during construction, and whether appropriate access has been provided to the communities near the construction areas.
- Number of grievances recorded and redressed.
- Key issues of conflict between PAPs and the WPD - GB /contractors during implementation of resettlement activities.
- Number of public facilities and utilities to be relocated.
- Number of mosques/shrines/graves relocated (if any) and corresponding contribution of affected communities.
- Compliance with the hiring policy defined in the contracts.

In case a Social Monitoring Consultant is engaged by WPD - GB, the consultancy cost will be met from the sum as mentioned in the Environmental Monitoring cost.

### **8.10 Grievance Redressal System**

The DD (E&R) will maintain a Community Complaints-Management Register (CCMR) to document complaints brought forward by the local community, and to ensure that these are appropriately redressed under the project's M&E system. The DD will report to the PD who will in turn notify to MD - WPD - GB. The information recorded in the register will include the date of the complaint and particulars of the complainant; a description of the grievance; the follow-up action required; the person responsible for implementing the action; and a target date for its completion.

A small grievance redressal committee will be constituted to deal with the resettlement and other issues. The Committee will be comprised 3 members, including DD, a representative of the Supervisory Consultant, and a representative of the community/PAP. The committee will resolve the grievances at local level and the PD will be informed in written by the DD about the grievance and its resolution. However, for grievances, which could not be resolved by the Committee at local level, will be referred to the PD along with the findings of the Committee. A satisfactory mechanism to solve such cases (independent authority not being part in the project) will still have to be established.

Affected communities and their representatives will be identified during the project preparation stage. The PD/DD will visit each community once a month, while his office will maintain a record of these visits (date visited, persons met, issues discussed, and complaints brought forward) using the CCMR. The DD will work towards resolving the grievances recorded in the CCMR in conjunction with the Supervision Consultant within seven days. After this deadline, any unresolved issues will be forwarded to the PD. The PD will, in turn, seek to resolve outstanding issues referred to him within seven days. In all cases, the WPD - GB response will be formally communicated to the complainant in writing.

The CCMR and feedback from the Consultants engaged for social monitoring will be periodically (at least quarterly) reviewed at a high-level meeting at the MD, WPD - GB, and the necessary actions taken to redress outstanding issues as soon as possible, with a formal WPD - GB response communicated to the complainant in writing. Any observations made by Local NGOs and CBOs will also take into consideration in redressal process.

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# TABLE

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**Table – 8.1: Environmental Management and Monitoring Plan of Naltar - V HPP**

Resources	Environmental Impact/ Impact Source	Description	Mitigation Measures	Mitigation Strategy	Responsibilities		Indicator Key Performance	
					Execution	Monitoring		
<b>PRE CONSTRUCTION &amp; CONSTRUCTION CONSIDERATIONS</b>								
<b>1. Land Resources</b>	<b>1.1</b>	<b>Land Acquisition</b>	<p><b>Permanent Land Acquisition for:</b></p> <ul style="list-style-type: none"> <li>The Project is going to affect about 162.2 kanals of private land which includes 24kanal of Cultivated land, 0.3 Kanal of residential land, 3.8 Kanal of cultivable waste land, 126 kanal of state land.</li> </ul> <p><b>Temporary Land Acquisition for:</b></p> <ul style="list-style-type: none"> <li>Construction camps at dam and powerhouse site 8 kanal.</li> </ul>	<ul style="list-style-type: none"> <li>Payment of compensation for acquisition of land areas up to the level of restoration.</li> <li>Prompt payment to affectees before start of construction work.</li> <li>Job opportunities to affectees and locals.</li> <li>Payment of compensation for acquisition of land areas up to the level of restoration</li> <li>Prompt payment to affectees before start of construction work</li> <li>Job opportunities to affectees and locals</li> </ul>	Compensation to the level of restoration in accordance with Asian Development Bank Policy Statement 2009 & 2010/The World Bank Guidelines/Land acquisition Act 1894/RP of Pakistan 2002 Draft	Deputy Director (DD) in charge of the land acquisition and resettlement operations/ Land Revenue Department (LAC)	WPD – GB / Monitoring consultants	Non - Compliance with land acquisition plan.
	<b>1.2</b>	<b>Loss of Structure</b>	<ul style="list-style-type: none"> <li>Only 01 Structure at reservoir area will be affected.</li> </ul>	<ul style="list-style-type: none"> <li>Payment of compensation for acquisition of land areas up to the level of restoration.</li> <li>Prompt payment to affectee before start of construction work.</li> <li>Job opportunities to affectees and locals.</li> </ul>	Compensation to the level of restoration in accordance with Asian Development Bank Policy Statement 2009 & 2010/The World Bank Guidelines/Land acquisition Act 1894/RP of Pakistan 2002 Draft.	Deputy Director (DD) in charge of the land acquisition and resettlement operations/ Land Revenue Department (LAC)	WPD – GB / Monitoring consultants	Non - Compliance with land acquisition plan.
	<b>1.3</b>	<b>Loss of Commercial Assets</b>	<ul style="list-style-type: none"> <li>no commercial Assests will impacted</li> </ul>		N/A	N/A	N/A	N/A

Resources	Environmental Impact/ Impact Source	Description	Mitigation Measures	Mitigation Strategy	Responsibilities		Indicator Key Performance	
					Execution	Monitoring		
	1.4	<b>Loss of community structure</b>	NA	NA	NA	NA	NA	
	1.5	<b>Slope Instability</b>	<ul style="list-style-type: none"> <li>If hillside or valley side slopes are left unprotected these will be subject to a natural weathering and become increasingly prone to land sliding.</li> </ul>	<ul style="list-style-type: none"> <li>Good engineering practices will help in controlling soil erosion.</li> </ul>	Grading, compaction, pitching, retaining structures and terracing.	Contractor	WPD – GB	Non - Compliance with Waste Management Plans.
	1.6	<b>Disposal of excavated material</b>	<ul style="list-style-type: none"> <li>Land pollution will be activated due to haphazard disposal of debris spoil material.</li> </ul>	<ul style="list-style-type: none"> <li>Identification of re-use of excavated material on site, to reduce off site effects.</li> <li>All excavated materials to be disposed of in designated sites.</li> </ul>	Prepare comprehensive Waste Management Plan, Erosion and Sediment Control Plan.	Contractor	WPD – GB	Non - Compliance with Waste Management Plans.
	1.7	<b>Soil Contamination</b>	<ul style="list-style-type: none"> <li>Land may be contaminated by the spillage of chemicals like fuels, solvents, oils, paints and other construction chemicals and concrete.</li> </ul>	<ul style="list-style-type: none"> <li>The contractor will be required to train its workforce in the storage and handling of materials like furnace oil, diesel, petrol and chemicals, etc., that can potentially cause soil contamination.</li> </ul>	Compliance with Fuels and Hazardous Substances Management Plan.	Contractor	Supervision Consultant, WPD – GB	Non - Compliance with Waste Management Plans.
<b>2. Water Resources</b>	2.1	<b>Depletion of the river flow</b>	<ul style="list-style-type: none"> <li>No use river water for irrigation purpose</li> <li>Discharge of 0.25 m<sup>3</sup>/s is recommended ecological flow needed to maintain the downstream ecosystem.</li> </ul>	<ul style="list-style-type: none"> <li>0.25 m<sup>3</sup>/s were the recommended mean monthly ecological or residual flow which also covers river water usage for the community as well. The project has adopted this figure for energy calculation of the project.</li> </ul>	Easy access of good water Quality and Quantity.	Contractor	Supervision Consultant, WPD – GB	Approved Plan.
	2.2	<b>Hazardous Material and Waste in water bodies</b>	<ul style="list-style-type: none"> <li>Water pollution from the storage, handling and disposal of hazardous materials and general Construction waste and accidental spillage.</li> </ul>	<ul style="list-style-type: none"> <li>Follow the waste management plan.</li> <li>Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly</li> </ul>	Compliance with NEQS/ADB/ World Bank Guidelines for on-site waste treatment and disposal facilities.	Contractor	WPD – GB	Non-compliance with waste management plan.

Resources	Environmental Impact/ Impact Source	Description	Mitigation Measures	Mitigation Strategy	Responsibilities		Indicator Key Performance
					Execution	Monitoring	
			petroleum and chemical wastes). These substances must not enter waterways, or underground water tables.				
2.3	<b>Discharge from construction sites in water bodies</b>	<ul style="list-style-type: none"> <li>• During construction both surface and groundwater quality may be deteriorated due to construction activities in the river, sewerages from construction sites and work camps.</li> <li>• The change in hydrological regime leads to increased rate of runoff and in sediment and contaminant loading, increased flooding, groundwater contamination, and effect habitat of fish and other aquatic biology.</li> </ul>	<ul style="list-style-type: none"> <li>• Install temporary drainage works (channels and bunds) in areas required for sediment and erosion control and around storage areas for construction materials.</li> <li>• Divert runoff from undisturbed areas around the construction site.</li> <li>• Stockpile materials away from drainage lines.</li> <li>• Prevent all solid and liquid wastes entering waterways by collecting solid waste, oils, chemicals, bitumen spray waste and wastewaters from brick, concrete and asphalt cutting where possible and transport to approved waste disposal site or recycling depot.</li> <li>• Wash out ready-mix concrete agitators and concrete handling equipment at washing facilities off site or into approved bounded areas on site. Ensure that tires of construction vehicles are cleaned in the washing bay (constructed at the entrance of the construction site) to remove the mud from the wheels. This should be done in every exit of each</li> </ul>	Compliance with NEQS/ADB/ World Bank Guidelines for on-site waste treatment and disposal facilities.	Contractor	WPD – GB	Non-compliance with waste management plan.

Resources	Environmental Impact/ Impact Source	Description	Mitigation Measures	Mitigation Strategy	Responsibilities		Indicator Key Performance
					Execution	Monitoring	
				construction vehicle to ensure the local roads are kept clean.			
	<b>2.4 Construction activities in or near water bodies</b>	<ul style="list-style-type: none"> <li>• Construction works in the water bodies will increase sediment and contaminant loading, and effect habitat of fish and other aquatic biology.</li> </ul>	<ul style="list-style-type: none"> <li>• Dewater sites by pumping water to a sediment basin prior to release off site.</li> <li>• do not pump directly off site.</li> <li>• Protect water bodies from sediment loads by silt screen or bubble curtains or other barriers.</li> <li>• Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly Petroleum and chemical wastes). These substances must not enter waterways or underground water tables.</li> <li>• Use environment friendly and non toxic slurry during construction of piles to discharge into the river.</li> <li>• Do not discharge cement and water curing used for cement concrete directly into water courses and drainage inlets.</li> </ul>	Compliance with NEQS/ADB/ World Bank Guidelines for on-site waste treatment and disposal facilities.	Contractor	WPD – GB	Non-compliance with waste management plan.
	<b>2.5 Use of Local Water Supplies</b>	<ul style="list-style-type: none"> <li>• Local water supplies through the springs may be affected due to implementation of project both in quantity as well as quality.</li> </ul>	<ul style="list-style-type: none"> <li>• As per Local Government Act, the contractor will seek approval from the local government for exploitation of the water resources</li> </ul>	Easy access of good water quality.	Contractor	Local Government/ WPD – GB	Approved Plan.
<b>3 .Ambient Air Quality</b>	<b>3.1 Construction vehicular traffic</b>	<ul style="list-style-type: none"> <li>• Air quality can be adversely affected by</li> </ul>	<ul style="list-style-type: none"> <li>• Fit vehicles with appropriate exhaust systems and</li> </ul>	Contractors traffic management plan.	Contractor	WPD – GB	Non-compliance

Resources	Environmental Impact/ Impact Source	Description	Mitigation Measures	Mitigation Strategy	Responsibilities		Indicator Key Performance
					Execution	Monitoring	
		vehicle exhaust emissions and combustion of fuels.	<p>emission control devices, in compliance with the NEQS. Maintain these devices in good working condition.</p> <ul style="list-style-type: none"> <li>• Operate the vehicles in a fuel efficient manner.</li> <li>• Cover haul vehicles carrying dusty materials moving outside the construction site.</li> <li>• Impose speed limits on all vehicle movement at the worksite to reduce dust emissions.</li> <li>• Control the movement of construction traffic.</li> <li>• Water the construction materials prior to loading and transport.</li> <li>• Service all vehicles regularly to minimize emissions.</li> <li>• Limit the idling time of vehicles not more than 2 minutes.</li> </ul>	Compliance with NEQS.			with waste management plan and NEQS.
3.2	<b>Construction machinery</b>	• Air quality can be adversely affected by emissions from machinery and combustion of fuels.	<ul style="list-style-type: none"> <li>• Fit machinery with appropriate exhaust systems and emission control devices.</li> <li>• Maintain these devices in good working condition.</li> <li>• Focus special attention on containing the emissions from generators.</li> </ul>	Enforcement of air standards as per NEQS.	Contractor	WPD – GB	Non-compliance with NEQS.



Resources	Environmental Impact/ Impact Source	Description	Mitigation Measures	Mitigation Strategy	Responsibilities		Indicator Key Performance
					Execution	Monitoring	
			<ul style="list-style-type: none"> <li>• Machinery causing excess pollution (e.g. visible smoke) will be banned from construction sites.</li> <li>• Service all equipment regularly to minimize emissions.</li> </ul>				
	<b>3.3 Construction activities</b>	• Dust generation from construction sites, material stockpiles and access roads is a nuisance in the environment and can be a health hazard	<ul style="list-style-type: none"> <li>• Water the material stockpiles, access roads and bare soils on an as required basis to minimize the potential for environmental nuisance due to dust.</li> <li>• Increase the watering frequency during periods of high risk (e.g. high winds).</li> <li>• Fugitive dust emissions will be minimized by appropriate methods, such as spraying water on soil, where required and appropriate.</li> <li>• Reschedule earthwork activities or vegetation clearing activities, where practical, if necessary to avoid during periods of high wind and if visible dust is blowing off-site.</li> <li>• Restore disturbed areas as soon as practicable by vegetation/grass turfing.</li> </ul>	Enforcement of air standards as per NEQS.	Contractor	WPD – GB	Non-compliance with NEQS.
<b>4. Noise and Vibration Management</b>	<b>4.1 Construction vehicular traffic</b>	• Noise quality will be deteriorated due to vehicular traffic.	• Maintain all vehicles in order to keep it in good working order in accordance with manufactures maintenance procedures.	<p>Enforcement of Noise standards as per NEQS.</p> <p>Follow Pak-EPA and WHO guideline values for</p>	Contractor	WPD – GB	Lack of any non-compliance reports.

Resources	Environmental Impact/ Impact Source	Description	Mitigation Measures	Mitigation Strategy	Responsibilities		Indicator Key Performance
					Execution	Monitoring	
			<ul style="list-style-type: none"> <li>• Make sure all drivers will comply with the traffic codes concerning maximum speed limit, driving hours, etc.</li> </ul>	community noise in specific environment.			
4.2	<b>Construction machinery</b>	• Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	<ul style="list-style-type: none"> <li>• Generators and vehicles will have exhaust mufflers (silencers) to minimize noise generation.</li> <li>• Modify equipment to reduce noise (for example, noise control kits, lining of truck trays or pipelines).</li> <li>• Maintain all equipment in order to keep it in good working order in accordance with manufactures maintenance procedures.</li> <li>• Install acoustic enclosures around generators to reduce noise levels.</li> <li>• NEQS compliance will be ensured.</li> </ul>	<ul style="list-style-type: none"> <li>• Enforcement of noise standards by contractor.</li> <li>• Follow Pak-EPA and WHO guideline values for community noise in specific environment.</li> </ul>	Contractor	WPD – GB	Lack of any non - compliance reports.
4.3	<b>Blasting and hauling</b>		<ul style="list-style-type: none"> <li>• Controlled blasting and excavation and orderly dumping of excavated material under cover of moisture Ensure blasting during daytime.</li> <li>• Any blasting during night time (2200-0700 hrs) to be prohibited within a distance of 200 m from houses and settlements.</li> </ul>	<p>Enforcement of noise standards by contractor.</p> <p>Follow Pak-EPA and WHO guideline values for community noise in specific environment.</p>	Contractor	WPD – GB	Lack of any noncompliance reports

Resources	Environmental Impact/ Impact Source	Description	Mitigation Measures	Mitigation Strategy	Responsibilities		Indicator Key Performance	
					Execution	Monitoring		
5. Biological Environment	5.1	<b>Destruction of Vegetation</b>	<ul style="list-style-type: none"> <li>About 41 trees have to be cut.</li> </ul>	<ul style="list-style-type: none"> <li>Plantation programme. Planting at least 4 trees for the one removed.</li> </ul>	<ul style="list-style-type: none"> <li>Fair/negotiated compensation to tree owners.</li> <li>Vegetation and reforestation and tree plantation under annual tree plantation campaigns of the provincial governments</li> </ul>	Contractor	WPD – GB	Non – compliance with approved Plan.
	5.2	<b>Vegetation loss; threat to wildlife</b>	<ul style="list-style-type: none"> <li>Local flora are important to provide shelters for the birds, offer fruits and/or timber/fire wood, protect soil erosion and overall keep the environment very friendly to human living. As such damage to flora has wide range of adverse environmental impacts.</li> <li>Clearance of vegetation may impact shelter, feeding and/or breeding and/or physical destruction and severing of habitat areas.</li> </ul>	<ul style="list-style-type: none"> <li>The camp will be established in a natural clearing, outside forested areas.</li> <li>Complete record will be maintained for any tree cutting.</li> <li>Provide adequate knowledge to the workers regarding nature protection and the need of avoid felling trees during construction.</li> <li>The construction crew will be provided with LPG as cooking (and heating, if required) fuel.</li> <li>Use of fuel wood will not be allowed.</li> </ul>	<ul style="list-style-type: none"> <li>Get approval from supervision consultant for clearance of vegetation.</li> <li>Creating awareness and imparting training to construction crew to avoid loss of fauna, birds and animals habitat.</li> </ul>	Contractor	WPD – GB	Non – compliance with approved Plan.
	5.3	<b>Endangered Species</b>	-----	-----	-----	-----	-----	-----
	5.4	<b>Impacts on Fauna near camps &amp; colony area.</b>	<ul style="list-style-type: none"> <li>The location of construction activities can result in the loss of wild life habitat and habitat quality,</li> </ul>	<ul style="list-style-type: none"> <li>Limit the construction works within the designated sites allocated to the contractors.</li> <li>check the site for animals trapped in, or in danger from site works and use a qualified person to relocate the animal</li> </ul>	<ul style="list-style-type: none"> <li>Creating awareness and imparting training to construction crew to avoid loss of fauna, birds and animals habitat.</li> </ul>	Contractor	WPD – GB	Non – compliance with approved Plan.

Resources	Environmental Impact/ Impact Source	Description	Mitigation Measures	Mitigation Strategy	Responsibilities		Indicator Key Performance
					Execution	Monitoring	
		<ul style="list-style-type: none"> <li>• Impact on migratory birds, its habitat and its active nests.</li> </ul>	<ul style="list-style-type: none"> <li>• Not be permitted to destruct active nests or eggs of migratory birds.</li> <li>• Minimize the tree removal during the bird breeding season. If works must be continued during the bird breeding season, a nest survey will be conducted by a qualified biologist prior to commence of works to identify and located active nests.</li> <li>• Minimize the release of oil, oil wastes or any other substances harmful to migratory birds to any waters or any areas frequented by migratory birds.</li> </ul>				
5.5	<b>Construction Camps and Wild Life</b>	<ul style="list-style-type: none"> <li>• Illegal poaching</li> </ul>	<ul style="list-style-type: none"> <li>• Provide adequate knowledge to the workers regarding protection of flora and fauna, and relevant government regulations and punishments for illegal poaching.</li> </ul>	Creating awareness and imparting training to construction crew to avoid loss of fauna, birds and animals habitat.	Contractor	WPD – GB	Non – compliance with approved Plan.
5.6	<b>Aquatic flora and fauna</b>	<ul style="list-style-type: none"> <li>• The main potential impacts to fisheries are hydrocarbon spills and disposal of wastes into the river.</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure that if boats used in the project are well maintained and do not have oil leakage to contaminate river water.</li> <li>• Contain accidental spillage and make an emergency oil spill containment plan to be supported with enough equipments, materials and human resources.</li> </ul>	Creating awareness and imparting training to construction crew to avoid loss of fauna, birds and animals habitat.	Contractor	WPD – GB	Non – compliance with approved Plan.

Resources	Environmental Impact/ Impact Source	Description	Mitigation Measures	Mitigation Strategy	Responsibilities		Indicator Key Performance	
					Execution	Monitoring		
		<ul style="list-style-type: none"> <li>The main potential impacts to aquatic flora and Fauna River are increased suspended solids from earthworks erosion, sanitary discharge from work camps, and hydrocarbon spills.</li> </ul>	<ul style="list-style-type: none"> <li>Do not dump wastes, be it hazardous or non-hazardous into the nearby water bodies or in the river.</li> <li>Strictly follow Water Resources Management and Drainage Management Plan.</li> </ul>					
<b>6. Social Impact</b>	<b>6.1</b>	<b>Standard of living of resettled people</b>	<ul style="list-style-type: none"> <li>Social disruption and decrease in standard of living of resettled people.</li> </ul>	<ul style="list-style-type: none"> <li>Uplift of standard of living by ensuring access to parks, provision of health and social services. Adequate compensation of lost assets.</li> </ul>	Adequate Compensation provided in the resettlement plan. There would be Social uplift programme prepared by the contractor.	Contractor	WPD – GB	Lack of any noncompliance reports; lack of any complaints.
	<b>6.2</b>	<b>Village water supply</b>	<ul style="list-style-type: none"> <li>Reduction or stress on water resource of community needs.</li> </ul>	Construction of water tanks to collect spring water for distribution in the village.	Easy access of good water Quality.	Contractor	Supervision Consultant / WPD – GB	Lack of any noncompliance reports; lack of any complaints.
	<b>6.3</b>	<b>Impacts on Local Communities/ Work force</b>	<ul style="list-style-type: none"> <li>The road along Turkho river is narrow carriage way with many sharp vertical and horizontal curves. This 15 km stretched will have to be upgrade to take traffic load.</li> <li>Effect on general mobility.</li> <li>Accessibility of the local population to the valley access road.</li> </ul>	<ul style="list-style-type: none"> <li>The contractor will ensure that the mobility of the local communities, particularly women and children and their livestock is not hindered by the construction activities.</li> <li>The contractor will provide crossing points at the project structure specially dam site at appropriate places.</li> </ul>	Ease in mobility of local community.	Contractor	Supervision Consultant / WPD – GB	Lack of any noncompliance reports; lack of any complaints.
	<b>6.4</b>	<b>Social disruption</b>	<ul style="list-style-type: none"> <li>The presence of outside construction workers inevitably causes some degree of social disruption.</li> </ul>	<ul style="list-style-type: none"> <li>The Contractor will be required to maintain close liaison with the local communities to ensure that any potential conflicts related to common resource utilization for the project</li> </ul>	Strictly follow the code of conduct of work force.	Contractor	Supervision Consultant / WPD – GB	Lack of any noncompliance reports; lack of any complaints.

Resources	Environmental Impact/ Impact Source	Description	Mitigation Measures	Mitigation Strategy	Responsibilities		Indicator Key Performance
					Execution	Monitoring	
			purposes are resolved quickly.				
6.5	<b>Safety and noise hazards</b>	<ul style="list-style-type: none"> <li>The night time working will be having intrinsic problems relating to safety and noise hazards for the communities.</li> </ul>	<ul style="list-style-type: none"> <li>It is desirable that the night time working may be avoided at places where settlements are very close to the construction sites.</li> <li>The Contractor will share the plan and schedule of night time working with the Supervision Consultants for approval.</li> <li>The contractor will ensure that blasting is not carried out in the near vicinity of the settlements and village tracks that are very frequently used. Here only excavators will be used.</li> <li>Effective construction controls by the Contractor to avoid inconvenience to the locals due to noise, smoke and fugitive dust. The contractor will frequently sprinkle water at the work areas and haul tracks to avoid generation of fugitive dust.</li> <li>The frequency of sprinkling will be determined by the weather condition. During long spell of hot and dry weather the sprinkling will be done at 2 to 3 hours interval.</li> </ul>	Follow Pak-EPA and WHO guideline values for community noise in specific environment.	Contractor	Supervision Consultant / WPD – GB	Lack of any noncompliance reports; lack of any complaints.
6.6	<b>Loss of Income</b>	-----	-----	-----	-----	-----	-----
6.7	<b>Gender Issues</b>	<ul style="list-style-type: none"> <li>The rural women actively participate in outdoor socio-economic activities</li> </ul>	<ul style="list-style-type: none"> <li>The Contractor will have to select specific timings for the construction activities</li> </ul>		Contractor	Supervision Consultant / WPD – GB	

Resources	Environmental Impact/ Impact Source	Description	Mitigation Measures	Mitigation Strategy	Responsibilities		Indicator Key Performance
					Execution	Monitoring	
		<p>such as livestock rearing, bringing of potable water, etc which may also be affected by the project activities.</p> <ul style="list-style-type: none"> <li>The induction of outside labor may create social and gender issues due to the unawareness of local customs and norms.</li> </ul>	<p>particularly near the settlements, so as to cause least disturbance to the local population particularly women.</p> <ul style="list-style-type: none"> <li>Contractor will warn the staff strictly not to involve in any un-ethical activities and to obey the local norms and cultural restrictions particularly with reference to women.</li> </ul>				
<b>6.8</b>	<b>Indigenous and Vulnerable Households</b>	-----	-----	-----	-----	-----	-----
<b>6.9</b>	<b>Safety Hazards</b>	<ul style="list-style-type: none"> <li>Occurrence of accidents/incidents during the construction activities.</li> </ul>	<ul style="list-style-type: none"> <li>Complying with the safety precautions for construction workers as per International Labour Organization (ILO) Convention No. 62, as far as applicable to the project contract.</li> <li>Protective fencing to be installed around the Camp to avoid any accidents.</li> <li>The camp staff will be provided fire fighting training and firefighting equipment will be made available at the camps.</li> <li>All safety precautions will be taken to transport, handle and store hazardous substances, such as fuel.</li> </ul>	An HSE management plan will be prepared.	Contractor	Supervision Consultant / WPD – GB	Non compliance with approved plan
<b>6.10</b>	<b>Religious, Cultural and Historical Sites</b>	<ul style="list-style-type: none"> <li>No historical or archeological site has been observed along the Project corridor.</li> </ul>	N/A	N/A	N/A	N/A	N/A

Resources	Environmental Impact/ Impact Source	Description	Mitigation Measures	Mitigation Strategy	Responsibilities		Indicator Key Performance
					Execution	Monitoring	
		<ul style="list-style-type: none"> <li>• Disturbance from construction works to the cultural and religious sites, and contractors lack of knowledge on cultural issues cause social disturbances.</li> </ul>	<ul style="list-style-type: none"> <li>• Do not block access to cultural and religious sites, wherever possible.</li> <li>• Stop construction works that produce noise (particularly during prayer time) should there be any mosque/religious/educational institutions close to the construction sites and users make objections.</li> <li>• Take special care and use appropriate equipment when working next to a cultural/religious institution.</li> <li>• Stop work immediately and notify the site manager if, during construction, an archaeological or burial site is discovered. It is an offence to recommence work in the vicinity of the site until approval to continue is given by the relevant authority (i.e.PMU).</li> <li>• Provide separate prayer facilities to the construction workers.</li> <li>• Show appropriate behavior with all construction workers especially women and elderly people.</li> <li>• Allow the workers to participate in praying during construction time.</li> </ul>	Ease in mobility of local community.	Contractor	Supervision Consultant / WPD – GB	Lack of any noncompliance reports; lack of any complaints.



Resources	Environmental Impact/ Impact Source	Description	Mitigation Measures	Mitigation Strategy	Responsibilities		Indicator Key Performance
					Execution	Monitoring	
			<ul style="list-style-type: none"> <li>• Resolve cultural issues in consultation with local leaders and supervision consultants.</li> <li>• Establish a mechanism that allows local people to raise grievances arising from the construction process.</li> </ul>				
<b>For Operation/Maintenance Phase</b>							
<b>1. Land Resources</b>	<b>1.1 Land acquisition</b>	• Reduction in cultivated land.	• Increase of productivity through improved management of land (agricultural, range, forestry improvements) to offset effects of land taken for project implementation.	Minimum land taken for the project implementation.	WPD – GB	EPA	Non – compliance with approved Plan.
	<b>1.2 Sedimentation</b>	• Sedimentation of reservoir and loss of storage capacity.	<ul style="list-style-type: none"> <li>• Control of land use in watershed (especially prevention of conversion of forests to agriculture).</li> <li>• Reforestation and/or soil conservation activities in watersheds.</li> <li>• Hydraulic removal of sediments (flushing, sluicing, release of density currents).</li> </ul>	<p>Watershed management to control deforestation.</p> <p>Watershed management to promote reforestation and soil conservation activities.</p> <p>Under sluicing provided.</p>	WPD – GB	Forest Deptt.	Non – compliance with approved Plan.
	<b>1.3 Waste</b>	Waste from powerhouse area and colony area.	• Adherence to the Waste Management Plan and measures put in place.	Compliance with waste management plan.	WPD – GB	EPA	Non – compliance with approved Plan.
<b>2. Water resources</b>	<b>2.1 Proliferation of aquatic weeds</b>	•Proliferation of aquatic weeds in reservoir and downstream impairing dam discharge and fisheries which might cause	•Clearance of woody vegetation from inundation zone prior to flooding Provide weed control measures Harvest of weeds for compost	Development of fishery in the reservoir creating opportunities of income for local population.	WPD – GB	EPA	Non – compliance with approved Plan.

Resources	Environmental Impact/ Impact Source	Description	Mitigation Measures	Mitigation Strategy	Responsibilities		Indicator Key Performance
					Execution	Monitoring	
		Eutrophication.	<p>or fodder.</p> <ul style="list-style-type: none"> <li>Regulation of water discharge and manipulation of water levels to discourage weed growth.</li> <li>In the absence of nutrients and high oxygen contents, no Eutrophication is foreseen.</li> </ul>				
	<b>2.2 Water quality</b>	<ul style="list-style-type: none"> <li>Deterioration of water quality in reservoir.</li> <li>Poor land use practices in catchments areas above reservoir resulting in increased siltation and changes in water quality.</li> </ul>	<ul style="list-style-type: none"> <li>Clearance of woody vegetation from inundation zone prior to flooding.</li> <li>Control of land uses, wastewater discharges, and agricultural chemical use in watershed.</li> <li>Limit retention time of water in Reservoir.</li> <li>Provision for multi-level releases to avoid discharge of anoxic water.</li> <li>Afforestation programmes to be urged/ promoted by WPD – GB.</li> </ul>	<p>Cutting of necessary trees/shrubs/ grasses etc. in inundation zone.</p> <p>Watershed monitoring and management for water pollution control.</p> <p>Reservoir operation to be coordinated with management of river discharges/ outflows for energy generation Under sluicing Provided.</p> <p>Forest Deptt, has regular working plans to preserve the area and to control silt loss by tree plantation.</p>	WPD – GB / Forest Deptt.	EPA	Non – compliance with approved Plan.
<b>3. Biological Resources</b>	<b>3.1 Riverine fisheries</b>	-----	-----	-----	WPD – GB	Fishery Deptt	Non – compliance with approved Plan.
<b>4. Human Resources</b>	<b>4.1 Water Use</b>	<ul style="list-style-type: none"> <li>Conflicting demands for water use.</li> </ul>	<ul style="list-style-type: none"> <li>As per Local Government Act, the WPD – GB O will seek approval from the local government for exploitation of the water resources</li> </ul>	Easy access of good water Quality and Quantity.	WPD – GB	Monitoring Consultant/ EPA	Irrigation releases to remain consistent during operation.

Resources	Environmental Impact/ Impact Source	Description	Mitigation Measures	Mitigation Strategy	Responsibilities		Indicator Key Performance
					Execution	Monitoring	
4.2	<b>Water-related diseases</b>	<ul style="list-style-type: none"> <li>Increase of water-related diseases</li> </ul>	<ul style="list-style-type: none"> <li>Vector control</li> </ul>	Vector control and treatment discussed for a public health protection plan.	WPD – GB	Health Deptt.	Non – compliance with approved Plan.
4.3	<b>Community Protection</b>	<ul style="list-style-type: none"> <li>Reservoir bank stability.</li> <li>Noise and Vibration to Occupational Workers</li> </ul>	<ul style="list-style-type: none"> <li>Plantation of trees along the banks and construction of spurs where Required.</li> <li>Compliance with Occupational Health &amp; Safety standards.</li> </ul>	To enhance the reservoir Life.	Contractor	WPD – GB	Monitoring of compliance with Health & Safety standards (including monthly reporting of accidents).
4.4	<b>Fishing</b>	<ul style="list-style-type: none"> <li>Snagging of fishing nets in submerged vegetation in reservoir.</li> </ul>	<ul style="list-style-type: none"> <li>Construction of water tanks to collect spring water for distribution in the village.</li> </ul>	At present no fishing activity exists.	WPD – GB	-	Non – compliance with Plan.

**Table – 8.2: Proposed Environmental Training**

Sr. No.	Type of Training	Personnel to be Trained	Training Description
1	Occupational Health and Safety	EHS Manager Plant managers and supervisors	Awareness to conform to safety codes. Mandatory use of PPE by the senior administration during all plant visits
2	Occupational Health and Safety	Workers Staff	Health, safety and hygiene Proper usage of personnel protective gear Precautions to be taken for working in confined areas.
3	Health, Safety and Environmental Auditing	Staff responsible for inspection/audits	Procedures to carry out Health, Safety and Environmental Audit Reporting requirements
4	Waste Disposal and Handling	Relevant Workers Relevant Staff	Segregation, identification of hazardous waste, use of PPEs, waste handling
5	Social & Environmental laws & regulations, norms, procedures and guidelines of Government	EHS staff Plant managers and supervisors	Environmental standards and their compliance
6	Implementation of environmental management and monitoring plant	EHS staff Responsible supervisory staff Management	Concepts of environmental management and monitoring plan
7	Defensive driving	All drivers and their supervisors	Safe driving and handling of equipment

**Table - 8.3: Environmental Monitoring Plan**

Sr. No.	FEATURE / ISSUE	PARAMETER/S MONITORED	Frequency	LOCATION	Responsibilities	
					Implementation	Supervision
<b>Construction Phase</b>						
1.	<b>Acquisition of Land/Houses/Commercial Assets/Tress</b>	• Payments to Affectees, complaints	Monthly till finalization	Project sites.	Contractor	Monitoring Consultant /EPA
2.	<b>Landslides</b>	• Catchments stability.	Once after Rainy seasons	Weir and powerhouse catchments.	Contractor	Monitoring Consultant /EPA
3.	<b>Muck Disposal</b>	• Reuse of spoil/muck within Project areas where possible.	Daily	Project sites	Contractor	Monitoring Consultant /EPA
		• Correct disposal of surplus spoil/muck in designated areas.	Daily	Disposal areas		
4.	<b>Erosion and Sediment</b>	• Extent of erosion and sedimentation.	Daily	Project sites	Contractor	Monitoring Consultant /EPA
		• Topsoil stripped and covered or seeded if stockpiled for longer than one month or during the monsoon.	Weekly	Project sites		
			Weekly	Project sites		
5.	<b>Hydrology</b>	• Batter stability.	Daily	Naltar River at Weir & Powerhouse site.	Contractor	Monitoring Consultant /EPA
		• River flow volumes.				
6.	<b>Water Quality</b>	• Wastewater treated prior to river discharge.	Quarterly	Construction sites and camps.	Contractor	Monitoring Consultant /EPA
		• As per NEQS of PAK- EPA.	Quarterly	Upstream and downstream of weir and powerhouse.		
7.	<b>Waste Management</b>	• Waste materials reused or recycled on-site where possible.	Monthly	Project sites	Contractor	Monitoring Consultant /EPA

Sr. No.	FEATURE / ISSUE	PARAMETER/S MONITORED	Frequency	LOCATION	Responsibilities	
					Implementation	Supervision
		<ul style="list-style-type: none"> <li>• Non-recyclable wastes disposed of appropriately</li> </ul>	Monthly	Project sites		
8.	<b>Hazards/Risk</b>	<ul style="list-style-type: none"> <li>• Workers provided with appropriate safety equipment and regular safety training.</li> <li>• Storage of hazardous goods in bounded areas or in secure sheds.</li> <li>• Explosives stored in guarded bunkers.</li> <li>• Use of hazardous goods according to manufacturers' specifications.</li> </ul>	Weekly  Weekly  Weekly  Weekly At time of use	Project sites	Contractor	Monitoring Consultant /EPA
9.	<b>Workers Health and Safety</b>	<ul style="list-style-type: none"> <li>• Enforcement of workforce rules and Regulations.</li> <li>• Provision of alternative fuels for cooking, heating and light.</li> <li>• Provision of adequate and well maintained services and facilities.</li> </ul>	Weekly  Weekly  Weekly	Project sites  Workforce camps  Project sites	Contractor	Monitoring Consultant /EPA
10.	<b>Noise and Vibration</b>	<ul style="list-style-type: none"> <li>• Maintenance of equipment in accordance with manufactures' specifications.</li> <li>• Controlled blasting</li> </ul>	Weekly  Daily	Project sites  Construction sites	Contractor	Monitoring Consultant /EPA
11.	<b>Air Quality</b>	<ul style="list-style-type: none"> <li>• Air quality in confined areas.</li> <li>• Water sprayed regularly to minimize dust generation.</li> <li>• Exhaust emissions from machinery – visual inspection.</li> </ul>	Weekly  Weekly  Weekly	Power station.  Project sites  Project sites	Contractor	Monitoring Consultant /EPA

Sr. No.	FEATURE / ISSUE	PARAMETER/S MONITORED	Frequency	LOCATION	Responsibilities	
					Implementation	Supervision
12.	<b>Traffic/Access</b>	<ul style="list-style-type: none"> <li>• Enforcement of speed limits on Project roads.</li> <li>• Noise.</li> <li>• Traffic Signs.</li> </ul>	Weekly	Access and approaches roads.	Contractor	Monitoring Consultant /EPA
13.	<b>Complaints</b>	<ul style="list-style-type: none"> <li>• All complaints.</li> </ul>	Weekly	Project sites	Contractor	Monitoring Consultant /EPA
<b>For Operation/Maintenance Phase</b>						
1.	<b>Hydrology</b>	<ul style="list-style-type: none"> <li>• River flow volume</li> </ul>	Daily	Downstream of weir and tailrace outlet	WPD – GB	EPA.
2.	<b>Head pond Stability</b>	<ul style="list-style-type: none"> <li>• Banks stability</li> </ul>	Quarterly	Head pond	WPD – GB	EPA.
3.	<b>Water Quality</b>	<ul style="list-style-type: none"> <li>• As per NEQS of PAK - EPA</li> </ul>	Quarterly	Head pond and downstream of river	WPD – GB	EPA.
4.	<b>Aquatic Ecology</b>	<ul style="list-style-type: none"> <li>• Habitat availability and seasonal fish species and populations.</li> </ul>	Quarterly	Upstream and downstream of weir.	WPD – GB	EPA.
5.	<b>Hazards</b>	<ul style="list-style-type: none"> <li>• Monitor landslides.</li> <li>• Structural soundness</li> </ul>	Annually Biannually	Catchments of project site and project structures.	WPD – GB	EPA.
6.	<b>Noise</b>	<ul style="list-style-type: none"> <li>• Noise levels</li> </ul>	Quarterly	Powerhouse site	WPD – GB	EPA.
7.	<b>Solid Waste Disposal</b>	<ul style="list-style-type: none"> <li>• Visit disposal sites</li> </ul>	Quarterly	Project staff colonies	WPD – GB	EPA.
8.	<b>Waste Water Discharge</b>	<ul style="list-style-type: none"> <li>• Waste water Quality in accordance with NEQS.</li> </ul>	Quarterly	Project staff colonies	WPD – GB	EPA.
9.	<b>Workers Health and Safety</b>	<ul style="list-style-type: none"> <li>• Safety codes for powerhouse.</li> </ul>	Quarterly	Powerhouse site	WPD – GB	EPA.

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**ESTIMATED ENVIRONMENTAL COST**

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## **9. Estimated Environmental Cost**

### **9.1 General**

Environmental costs are based on the environmental setting, social aspect and ecology of the surrounding area required to neutralize the impacts, arising from the construction of the project. The estimated environmental cost is Rs. 30.469 million.

### **9.2 Resettlement Cost Estimates**

The resettlement cost of land is based on current market prices and latest rates assessed by DC. Office GB. The market value was assessed on the basis of recent transactions and consultations with the affected persons and other community members as in most cases transactions are verbal and not documented. The permanent land acquisition (162.6 kanal) and compensation cost is estimated at 30.2 million rupees.

### **9.3 Compensation for Trees plus Afforestation Cost**

The main components covered in afforestation cost are compensation for loss of trees and re-plantation of trees.

A total of 41 tree will have to be removed (26 shade trees and 15 fruit trees) with a total compensation cost of 35,800 rupees. Compensation planting of 164 trees (at a ratio of 4 trees for each tree lost) is estimated at 8,200 rupees. Total Afforestation Cost for trees is estimated at .044 million rupees.

### **9.4 Environmental Monitoring Cost**

The monitoring cost mainly consists of the equipment required for checking and testing of water quality, air quality and noise levels during construction of the project and associated manpower costs. The monitoring cost, after completion of the project during the first year of operations is provided in the table. Environmental monitoring cost is estimated at Rs. 0.2million rupees.

Detail of all these costs with unit rates are given in the Table 9.1.

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# TABLES

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**Table – 9.1: Estimated Environmental Cost**

Item No.	Item	Category	Unit	Quantity	Average rate (Rs./unit)*	Estimated Amount (Rs.)
<b>A. Estimated Cost of Resettlement</b>						
1	Permanent Land Acquisition	Cultivated Land	Kanal	24	650,000	15,600,000
		Residential Land		0.3	650,000	195,000
		Uncultivable Land		3.8	350,000	1,330,000
		Waste Land		126	100,000	12,600,000
2	Temporary Land Acquisition	Waste Land		8	50,000	400,000
<b>Sub Total - A</b>						<b>30,125,000</b>
<b>B- Afforestation Cost</b>						
4	Trees	Loss of shade trees	No.	26	800	20,800
		Loss of fruit trees	No.	15	1,000	15,000
		Compensation plantation	No.	164	350	57,400
<b>Sub Total - B</b>						<b>93,200</b>
<b>C. Environmental Monitoring Cost during Construction Phase (36 months)</b>						
5	Water	Once every in three months from two points		24	Pak - NEQS 5,000	120,000
6	Air	Bi - annually		12	Pak - NEQS 5,000	60,000
7	Noise	Bi - annually		12	Equivalent Noise level 500	6,000
8	Soil	Once every in four months		9	Oil and Grease 5,000	45,000
<b>Sub Total - C</b>						<b>231,000</b>
<b>GRAND TOTAL (A+B+C)</b>						<b>30,449,200</b>

\*These are indicative prices, Land Acquisition Collector (LAC) will determine current and fair market price of the land and other infrastructures

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**CONCLUSION AND RECOMMENDATIONS**

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## **10. Conclusions and Recommendations**

### **10.1 Conclusions**

This report presents the results of an Initial Environmental Examination of the proposed Naltar – V Hydropower Project (14 MW).

Naltar – V HPP falls in the IEE category according to the provision of Pak-EPA regulation (SRO 339 (I)/2000) which states that an IEE is required for Hydroelectric project less than 50 MW.

In spite of the fact, most of the project activities have adverse effects of low to medium level in certain environmental areas. The overall environmental impact rating is low adverse. The benefits of the project operation and the compensation package proposed herein outweigh the adverse effects of the project.

Construction of Naltar- V HPP will bring following impacts in the area;

#### **Beneficial Impacts:**

- Hydropower is a clean and renewable source of energy and avoids contributions to pollution loads, hence it is environment friendly.
- Creation of an impoundment of relatively shallow depth will be helpful for development of fish.
- The construction of the project will open job opportunities for the local people. This will help in raising their living standard.
- The provision of electricity in the area will bring prosperity and improve the living standards of the local people.
- The creation of small reservoir will open the area to tourism which will again be economically beneficial for the local communities.
- People are in favor of the Project provided they are compensated for their loss.

#### **Adverse Impacts:**

- During construction phase, the breeding ground of the aquatic life, if any, falling in the nullah reach between the u/s and d/s coffer dams, will be lost
- Fragmentation of fish population if any is expected.
- The reduced or no flow in the downstream reaches between Tyrolean Weir and powerhouse during operation phase of the project may affect the aquatic life.
- Water quality will not be deteriorated with reduced flows.
- The impact on vegetation is not high. About 41 trees (26 shade trees and 15 fruit trees) will have to be cut.
- Hindrance in the traffic on Gilgit-Naltar road is expected for short period. However, this may be avoided if the existing roads are improved to allow more intensive traffic with traffic

management.

- Disposal of excavated material is required according to a disposal plan under strict supervision.
- The Project is going to affect about 162.2 kanals of land which includes 24 Kanal of cultivated land, 3.8 kanal uncultivated waste land, 0.3 kanal residential and 126 Kanal of state land.
- In addition about 8 kanal of land are required for Contractor facility on rental basis or temporary acquisition.
- The Project will affect only one house (dera being used only during cropping season) falling in the power house area .The total population of the affected house is 10, the total covered area of this house is about 0.3 kanal.
- Minor effects on the scenic beauty of the area are expected due to transmission line but at the same time add a feeling of development of the area.
- Power transmission line will mostly pass through barren land but will affect trees and crops under the towers while passing through the cultivated areas which will be compensated.
- EPC Contractor will look after the environment friendly route alignment and compensation for affected trees and crops will be paid by Water and Power GB .through DC office.
- The construction activities will affect air quality and cause noise-related impacts, which may disturb wild life of the project area. However human settlements are not close to the project activities site and are located at more than 300m.
- Waste water from operator's village needs to be treated.
- Downstream siltation and erosion pattern will have to be attended.
- The aesthetic look of the river after diversion of water will present a Tyrolean Weird look. This will last for months except when the reservoir spillover during high flow conditions. There is no mitigation possible for this condition and will have to be tolerated.

## 10.2 Recommendations

- Maintenance of flow in the water channel is recommended because the depletion of stream flows when the water will be diverted through diversion channel will affect the water use of population of Nomal village by affecting the water channel, located in stream stretch between the Tyrolean Weir and the powerhouse and is currently used for running two micro-hydels, irrigation ,and domestic use
- The existing watercourse is intersecting the proposed tailrace channel route. A water diversion structure shall be required to supply required flows to this water course from the powerhouse tailrace. The EPC Contractor would assess long term water requirements based on monthly / daily use in the light of his survey and Environmental Management Plan. The EPC Contractor shall design and implement a proper diversion arrangement at the tail race, for continuous water supply for downstream users of Nomal.

- For saving fish of larger size from getting killed in the turbines, and to avoid damage to the turbine blades from floating debris like floating logs etc, it is recommended that the project may install trash racks of suitable grid opening at the forebay.
- For the protection of the fish and other aquatic life 10 % of average yearly flow is required (D.L.Tennat, (1976) “In-stream flow regimes for fish, wild life, recreation and related environmental resources”). Based on the available data the minimum flow to be ensured through the Tyrolean Weir is 0.25 m<sup>3</sup>/s as compensation flow, in addition to the flow in the water channel will also be maintained, as the hydrological records are enhanced, the figure of minimum requirement for maintenance of aquatic ecosystem has to be revised likewise.
- 41 trees are likely to be removed under the project. Compensation for the trees will be paid to the owners by GB W&PD, and replaced by planting new trees at suitable locations at the ratio of 1:4 (i.e. at least 164 trees).
- During construction, setting up speed limits, in close consultation with the local stakeholders, is recommended. The movement of vehicles carrying construction material will be restricted to daytime work to reduce traffic inconvenience to the local people.
- Maintenance of heavy machinery and vehicles by contractor will be in good order and engines well-tuned to avoid smoke emissions, oil leakages and other chemicals which may result in contamination of land and water.
- The proprietary land will be compensated in cash by GB W&PD in accordance with the market rates currently prevailing in the market or according to Land Acquisition Act 1894 plus 15% Compulsory Acquisition. The average market rates for agricultural land are Rs 650,000. - -per Kanal for uncultivated land 350,000.
- There will be proper disposal of residual muck material by contractor.
- The existing utilities will be rehabilitated by contractor before construction, to avoid any inconvenience to the resident of the project area and provide them with alternative arrangement during the construction period.
- The project area will be rehabilitated by contractor after the completion of project
- The health and hygiene practices are primitive. Awareness of project will be conducted by GB W&PD.
- GB W&PD will be responsible for proper supervision or monitoring for the environmental management and monitoring plan.
- Rs19.432 million as environmental cost is strongly recommended;
- In view of the fact that most of the impacts are mitigable and the project will produce very useful hydropower with benefits to Gilgit Baltistan province in particular and Pakistan in general, the Project is recommended for construction. The project area people will benefit with the project.

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# **ANNEXURES**

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**ANNEXURE**

**I**

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**WEEKLY AND MONTHLY  
ENVIRONMENTAL MONITORING REPORT  
FORMAT**

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**ENVIRONMENTAL MONITORING REPORT.**

**A. WEEKLY REPORT FORMAT**

**Book No:** \_\_\_\_\_

**Monitoring Report No:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Time:** \_\_\_\_\_

**Contract:** \_\_\_\_\_

**Work Site:** \_\_\_\_\_

**A. WEEKLY ENVIRONMENTAL CHECKLIST**

	Yes	No	Credit: Yes= +5, No= -5
1. Correct Disposal of Solid waste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
2. Correct Disposal of Liquid waste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
3. Vehicle with no Smoke and Noise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
4. Vehicle within speed Limit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
5. No pollution From Batching Plant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
6. No Oil Diesel Spills on land or Water	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
7. No Social Issue Created	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
8. No threat cause to Trout fish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
9. Water Sprinkled on Approach Road	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
10. No Soil Erosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
11. Health Precaution taken for workers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
12. Dispensary working, Doctor present	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
13. Ambulance functional	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
14. No loss of Flora and Fauna	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
15. Water Flow in Irrigation canal as required	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
16. Traffic Control good, sinology function	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
17. Labor camp Location & Management in order	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
18. Drinking water facilities for labor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
19. No burning of wood in camp	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>
20. Proper PPEs used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>

**Total Credits: -----%**

**B. EXPLANATION** (if any of above point)

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**C. NON COMPLIANCE**

Noncompliance	Period	Description	Class
<hr/>			Minor under one month
<hr/>			Moderate over one month
<hr/>			Major about two months
<hr/>			Critical Over three months

**D. CIRCULATION**

- |               |                      |
|---------------|----------------------|
| 1. White (RE) | 2. Pink (Contractor) |
| 3. Blue (ES)  | 4. Green Counterfoil |

<b>B. MONTHLY REPORT FORMAT</b>
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**1. PROJECT IMPLEMENTATION PROGRESS OVERVIEW**

<b>Reporting period (Date):</b>	<b>Work program/Project Activities</b>
<u>Project status:</u> <b>a.</b> On-going activities/site works: Provide details of specific activities such as earthworks, vegetation clearing, borrow pit operation, establishment of construction camp, etc. including locations, schedule, etc. <b>b.</b> Construction activities during the previous month. <b>c.</b> Construction activities for the next month.	
Previous report date:	
Persons met and dates:	
Report prepared by:	

**2. ENVIRONMENTAL MONITORING****a. Summary of Compliance with Environmental Mitigation Measures through Inspection:**

Sr. No	Mitigation Measures	Compliance Attained (Yes, No, Partial)	Comment on Reasons for Non-Compliance	Issues for Further Action
1.				
2.				
3.				
4.				
5.				
6.				

**b. Issues for Further Action**

Sr. No	Issue	Cause	Required Action	Responsibility	Timing	Resolution
1.						
2.						
3.						
<b>New Issues from this Report</b>						
1.						
2.						
3.						
Report prepared by:						

**3. ENVIRONMENTAL EFFECTS MONITORING****a. Environmental Monitoring Results through Instruments**

Sr. No	Monitoring Parameter	Comparison to Relevant Standard / Criteria	Comment on Incidences of Exceedance	Issues for Further Action
1.				
2.				
3.				

**b. Problems/Issues for Further Action**

Sr. No	Issue	Cause	Required Action	Responsibility	Timing	Resolution
<b>Old Problems/Issues from Previous Reports (if any)</b>						
1.						
2.						
3.						

New Problems/Issues from this Report						
1.						
2.						
3.						
Report prepared by:						

#### 4. COMPLIANCE WITH EMP

a. Determine if the required mitigation measures are sufficient or still appropriate considering current site conditions and on-going site works.

b. Describe any difficulties related to the implementation of the proposed mitigation measures. Indicate any changes proposed by the contractor to improve environmental protection.

**5. PERMITS:**

**a.** Indicate any environmental permit/license/consent obtained during the previous period or to be obtained for the coming month in order to continue the project construction activities.

**b.** Provide details of any environmental permit that the contractor failed to secure prior to conducting any specific activities.

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**6. COMPLAINT(S)**

**a.** Provide details of any complaints that have been raised by the local population and other stakeholders (who, what, where, when).

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**b.** Document how the complaints were addressed or will be addressed, who are the responsible project staff, specific actions and dates.

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**7. ENVIRONMENTAL TRAINING/ORIENTATION**

Provide details of environmental training or orientation carried out during the previous month and the coming month (if any).

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**8. SUMMARY OF PROBLEMS/ISSUES ENCOUNTERED AND RECOMMENDATIONS**

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**9. APPENDICES**

**a.** Correspondence

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**b.** Monitoring Results, laboratory analysis

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**c.** etc.

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