20 MW HANZEL HYDROPOWER PROJECT, GILGIT BALTISTAN

ANNEX

1. Terms of Reference (TOR) for water and wastewater sampling/monitoring

This TOR provides the objectives and the scope of work for the environmental monitoring laboratory that will be hired to undertake water and wastewater baseline monitoring in the subject project area. The main objective of water and wastewater baseline monitoring is to evaluate the existing quality of groundwater, surface water and wastewater and the sources of pollution.

1.1. Scope of Work:

The scope of work consists of but not limited to the following activities/requirements:

a) Internationally accepted code of practices will be used for water and wastewater sampling (collection method, precautions/instructions for sampler, sample preservation before delivered to laboratory for analysis etc.).
b) Integrated composite sampling will be carried out for obtaining water and wastewater samples from the following locations:

Location	Sampling Area	Type of Sample	No. of Samples
1	Hanzel, Gilgit Baltistan	Surface Water	04
		Ground Water	01
Total samples			**05**

c) The Bidder/Contractor will undertake the required testing for the following parameters:

Type of Sample	Parameters
Ground Water	Color, pH, Turbidity, Total Hardness, Total Dissolved Solid (TDS), Aluminum (Al), Antimony (Sb), Barium (Ba), Boron (B), Cadmium (Cd),Chloride (Cl^-), Chromium (Cr), Copper (Cu), Cyanide (CN), Fluoride (F), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), Nitrate (NO_3^-), Nitrite (NO_2), Selenium (Se), Residual Chlorine, Odor, Taste, Arsenic (As), Zinc (Zn^{2+}), Pesticides, Phenols (Total Phenolic Compounds), Total Coli forms, Fecal Coli forms (E.Coli).
Surface Water& Wastewater	Temperature, pH, COD, BOD_5, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Chloride Fluoride (F-), Oil & grease, Phenols (Total Phenolic Compounds), Cyanide (CN-), Anionic Detergents as MBAS, Sulfate (SO_4^{-2}), Sulfide (S), Ammonia NH_3, Cadmium (Cd), Chromium (Cr) as Hexavalent & Trivalent, Copper (Cu),

	Lead(Pb), Nickel (Ni), Zinc (Zn), Iron (Fe), Manganese (Mn), Selenium (Se), Silver (Ag), Arsenic (As), Barium (Ba), Boron (B), Mercury (Hg), Chlorine (Cl), Total Toxic Metals, Turbidity, Dissolved Oxygen, Pesticides, Nutrients as Potassium, Nutrients as Nitrogen, Nutrients as Phosphorous

d) Sampling methodology shall be as per National Environmental Quality Standards (NEQS). NESPAK's engineers/scientist shall supervise the sampling process at site.

e) Analytical procedures shall be according to USEPA methods. Results of analysis will be compared with NEQS limits. However, where these standards do not provide limits for certain parameters, other appropriate international standards will be used for comparison.

f) The Contractor will provide comprehensive report on water and wastewater, which will include, but not limited to the following:

I. General
II. Sampling methodology and Locations
III. Analysis of results with remarks / comments
IV. CV's and designations of personnel responsible for sampling, monitoring and report writing.

g) The security arrangements for sampling shall be bidder/contractor's responsibility.

h) The report must be submitted within thirty (30) days after mobilization.

2. Program for Air Quality and Noise Levels Baseline Monitoring

2.1. Introduction

Air Quality and Noise Levels Baseline Monitoring is required to be performed in the same project area. The objective of monitoring would be to analyze the existing ambient air quality and noise levels at each site of the subject project and to analyze the existing emission sources.

2.2. Monitoring Locations

Total Six (06) locations have been identified for baseline air quality and noise monitoring, which are given below:

Sr. No.	Location	Sampling Point	No. of Samples
1	Hanzel, Gilgit Baltistan	Existing Hanzel Road	01
		Hanzel Paine Village (Forebay and Power House Site)	01

Sr. No.	Location	Sampling Point	No. of Samples
		Harpoon Village (Weir Site)	01
		Hanzel Bala Village (Power Channel)	01
		Proposed Road	01
		Proposed Bridge	01
Total sampling points			**06**

The exact locations will be finalized by NESPAK Environment Specialist, who will also supervise the activities of the lab in the field.

2.3. Methodology for Ambient Air Quality and Noise Level Baseline Monitoring

The monitoring methodology for each of the air quality parameter will be in accordance with the requirements of NEQS, Statutory Regulatory Order (SRO) 1062 (I)/2010 for ambient air and 1064(I)/2010 for Noise levels. Sampling methodology will be approved by NESPAK before mobilization to site and monitoring works will be top supervised by NESPAK's representative (s).

2.4. Monitoring Protocol

The details of the testing parameters and averaging period as per NEQS are given below:

Type of Sample	Number of Samples	Testing Parameters
Ambient Air Monitoring	06	SO_2 (Averaging Period:24 hours)
		NO (Averaging Period:24 hours)
		NO_2 (Averaging Period: 24 hours)
		CO (Averaging Period:1hour & 8hours)
		Suspended Particulate Matter (Averaging Period: 24 hours)
		PM_{10} (Averaging Period:24 hours)
		$PM_{2.5}$ (Averaging Period: 1 hour & 24 hours)
		Ozone (Averaging Period:1 hour)
		Volatile Organic Compounds (VOC)
		CO_2
Noise Level Monitoring	06	dB(A)

2.5. Monitoring Report

After completion of monitoring and testing, results will be compared with NEQS and a comprehensive report on baseline air quality and noise levels monitoring will be prepared and submitted by the monitoring laboratory within thirty (30) days after mobilization including field work. Report will cover the introductory part, sampling methodology, monitoring and sampling locations with coordinates, analysis of results/remarks, comparison with applicable national and international standards and pictorial representation.