

Environmental and Social Monitoring Report

Project Number: 44914-014
Quarterly Report (April-June 2018)
June 2018

Pakistan: Patrind Hydropower Project

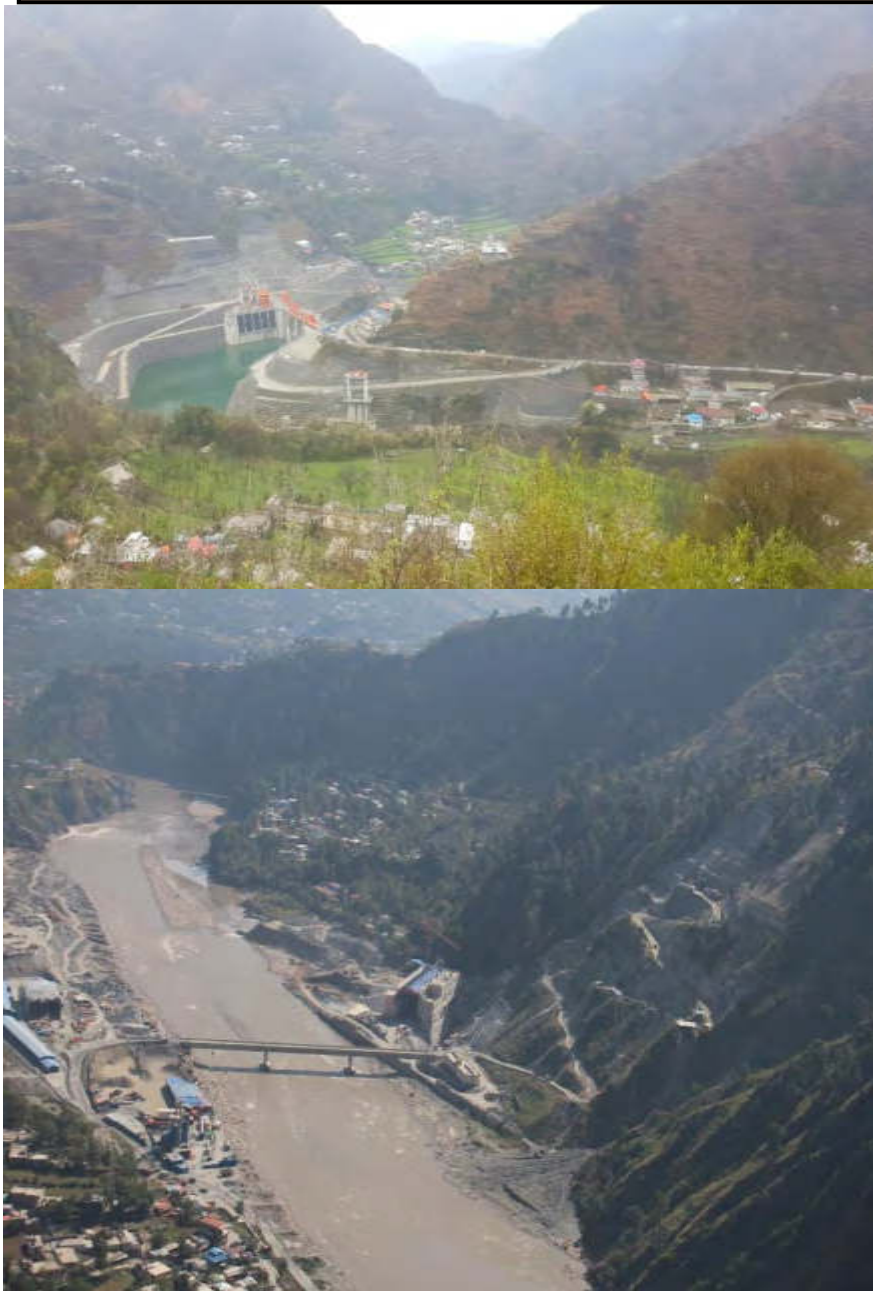
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147 MW PATRIND HYDRO POWER PROJECT

Environmental & Social Monitoring Report (April-June 2018)



**STAR HYDROPOWER
LIMITED**

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INTRODUCTION

Background

Patrind Hydropower Project (the “Project”) is a run-of-river project located on the boundary of Khyber-Pakhtunkhwa and Azad Jammu & Kashmir. The Project is financed by multilaterals like IFC, ADB, IDB and KEXIM with total capacity of 147 MW. The construction of Project was completed in first quarter of 2017 and was officially commissioned on November 08, 2017.

Objectives:

The purpose of this Quarterly Environmental & Social Monitoring Report is to describe O&M Contractor’s compliance with the environmental and social requirements of IFC/ADB (including implementation of the Environmental and Social Management Plan) and to assess any corrective actions implemented/proposed. This includes:

- A description of all significant health, safety, environmental and social activities and events that occurred during the reporting period.
- Provision of additional information about activities (i.e., status of permits or other approvals, ongoing public consultation etc.).
- Quantitative performance monitoring data summaries in comparison to appropriate ADB’s Safeguard Policy Statement (SPS) and IFC’s Performance Standards (PS), IFC’s EHS General Guidelines and national requirements.
- An explanation of any cases of non-compliance with lender’s guidelines or applicable regulatory limits that have occurred, identifying the cause and the corresponding corrective measures planned or underway to prevent future occurrences.
- Resettlement Action Plan activities and progress on the implementation of project within the Sustainable Development Strategy Framework

RELEVANT ENVIRONMENTAL PERMITS OR C OMPLIANCE CERTIFICATES

i. Summary of permit conditions and media covered:

Following conditions were imposed by EPA-AJK during the operations phase of the Project. The status of compliance with the conditions is presented in below table:

Condition	Status of compliance
Proponent shall ensure strict compliance to National Environmental Quality Standards (NEQSS).	Compliance with NEQs is being monitored through third-party. Water quality (Biannually) and noise/vibration (quarterly) are being monitored
During lean period, the proponent shall ensure 2 cumecs water, as E-flow, downstream during the operational phase of the project.	2.2 cumecs environmental flow is being released from weir. The data is attached as Annex-1 . The minimum requirement for E-Flow of the project is 2 cumecs, however, the project is releasing 2.2 cumecs downstream of the weir.
The proponent shall in-place proper metering arrangement to ensure and verify the release of approved E-flow downstream.	Upstream (coffer dam and start of reservoir) and downstream gauges (Gotha bridge about 3.5 Km downstream of weir) have been installed for monitoring of E-flows.
Mitigation measures, as suggested in Environmental Management Plan (EMP) for operational phase, shall be strictly adhered to.	Mitigation measures are being implemented strictly.
The proponent shall in place Environmental Management & Monitoring unit headed by an Environmental Monitoring Expert.	HSE team has been formulated which consists of HSE Manager having more than 17 years of experience, Environmentalist having more than 5 years of experience, HSE Officer having more than 5 years of experience and Community Liaison Officers worked with EPCC during the construction phase in the O&M team apart from Senior Manager- E&S who is monitoring the compliance from SHPL side.
The proponent shall be responsible to carry out Fish Study on annual basis through certified Fish Expert/Firm throughout the operational period of the project and undertake mitigation measures to minimize the adverse effect on fish species, if any, in consultation of Fisheries Department, Govt. of AJ&K, under intimation to EPAAJK.	The fish and vegetation studies are being conducted from start of the construction period and are also being conducted quarterly during the operational phase. The fishery department of KP has been contacted and their visit to the project site is awaited for further discussion.
The proponent shall carry out the Environmental Audit through 3rd party consultant after every 05 years during the Operational Phase of the Project.	The said Audit shall be conducted in 2022 as recommended.

Condition	Status of compliance
The proponent shall undertake a plantation (of indigenous species) activity, in consultation with Forest Department, Govt. of AJ&K, both at the Weir & Powerhouse sites as a measures to enhance the watershed in immediate vicinities, increasing carbon sink and for the purpose of aesthetic beauty of the area.	Company and its EPC Contractor participated in annual tree plantation campaigns and planted several species within the project area. This will be continued during the operational phase as well in consultation with relevant forest department. During 2018 no plantation activity has been conducted. A detailed implementation and monitoring plan shall also be developed keeping in view the recommendations of vegetation studies conducted during the construction phase and in consultation with relevant department.
Monitoring shall cover the entire life of the project and monitoring reports in this regard shall be submitted to AJK-EPA on quarterly basis.	Quarterly monitoring reports have been shared with EPA-AJK during the construction period. The same is also being shared during the operational phase of the project.
Proponent shall ensure the adequate arrangements for addressing public grievances, if any.	GRM procedure has been developed and is being implemented. GRM procedure is attached as Annex-2
In case an independent Environment Specialist Companies are to be hired, as an arrangement, to undertake measurements of different parameters critically important in determining water & air quality and assessing noise emission level during the operational phase of the proposed project, the findings of monitoring shall be shared with AJK- EPA as a part of quarterly monitoring reports.	Third party monitoring was done during the construction period and the results were shared with all the stakeholders including EPAs. The same is also being done during the operational phase of the project. The monitoring results are included in the relevant reports attached as annexures to this report.
The proponent shall finalize the plan and ensure the arrangements in-place for the execution of CSR within a month of issuance of this approval.	The CSR procedure has been developed and shared with EPA AJK. CSR procedure is attached as Annex-3 .
The proponent shall ensure that strict and efficient Occupation Health & Safety Plan in-place and the same shall be shared with AJK-EPA accordingly.	Occupation health and safety plan has been developed and is being implemented. The plan is attached as Annex-4 .
As far as possible, the local people shall be given preference for all unskilled jobs. Preference may also be given to them for all semiskilled and skilled jobs as well.	Being complied. Please note that during the operational phase, very few vacancies are available. Hiring is being done keeping the locals on priority.
The mechanized plants and machinery and other equipment must be fitted with noise abatement devices and should have the conformity to NEQS standards.	Noise abatement devices have been installed where required and noise levels are within the NEQS levels. Reports will be shared in next quarterly report.
The proponent shall be liable for the correctness and validity of the information provided in EMP.	Agreed.
Proponent shall be responsible to facilitate EPA team for any visit for inspection/monitoring, etc.	Agreed. The Company has always facilitated all the stakeholders for site visits.

Condition	Status of compliance
This approval shall stand null and void if the conditions, mentioned herein before, are not fully complied with.	Agreed.
This approval does not absolve the proponent of the duty to obtain any other approval or clearance that may be required under any law in force or by any competent forum/court of law.	Agreed.
This approval can be withdrawn at any time with any prior notice if deemed necessary in the public interest.	Agreed.

EPA KP approval did not include any conditions as it was a temporary approval till commissioning period. They will issue the permanent NOC later after visiting the project site. Till the reporting period, EPA KP did not visited the site.

ii. Relevant Government Agencies

As the Project is located on the boundary of Khyber Pakhtunkhwa and Azad Jammu & Kashmir, Star Hydro Power Limited (the “Company”) had to seek approval of Environmental Impact Assessment (EIA) from following two Environmental Protection Agencies (EPAs).

EPA Azad Jammu and Kashmir

EPA Khyber Pakhtunkhwa

iii. Issuance dates and duration of validity

Issuing Authority	Issuance Date	Duration of Validity
EPA-AJK	10-08-2010	Project construction phase
EPA-KPK	14-04-2011	Project construction phase
EPA-AJK	08-08-2017	Project operational phase
EPA-KPK	29-09-2017	Project Commissioning phase

INCIDENTS OF VIOLATIONS OR NON-COMPLIANCE

HSE compliance monitoring is being undertaken regularly by O&M operator’s HSE department. The compliance is measured based on the approved plans/procedures, ESMP and IFC’s EHS guidelines and ADB’s safeguard policy for different parameters. HSE Plan has been finalized and approved and is under implementation. To ensure implementation of recommended procedures, regular liaison was maintained by the O&M operator with the Company. To prevent incident and mitigate risks, during the quarter, close supervision was carried out by O&M’s HSE team.

Waste collection is being done on daily basis on powerhouse site. Waste collectors collect the trash (waste) from the site and O&M accommodation buildings and dispose in the trash bins. O&M

contractor has hired the services of government approved waste contractor for collection, segregation, recycling and disposal of the wastes. Waste is collected by the waste contractor from powerhouse site. Certificates from the waste contractor are attached as **Annex-5**. No environmental incident and non-compliance has been reported during the quarter.



HSE monitoring during maintenance

Gantry crane access ladder, Handrails, lifting gears, Load indicator & Limiting switch for runway corner was inspected by HSE for safe operations.



Warning Letters for Non-compliances

No warning letters were issued during the reporting quarter. As per policy, warning letters will be issued by admin department on recommendation of relevant supervisor depending on nature and severity of violation. Verbal warning for the first time on minor violations and if any employee fails to abide by HSE policies after verbal warning a written warning letter will be issued. The employee will be terminated on 3rd written warning.

INCIDENTS OF ENVIRONMENTAL AND SAFETY ACCIDENTS

Environmental Accidents and Mitigation

No environmental incident occurred during the reporting quarter on both the sites (weir and powerhouse).

Health and Safety Accidents and Mitigation

Accidents can be minimized by providing necessary health and safety information, instruction, and supervision to employees. Employees are encouraged to take reasonable care for their own health and safety.

Summary of health and safety incidents during quarter is in the table given below.

Incident	Frequency	Description	Media or Community Reaction
Fatality	None	None	None
Medical Treatment Case	0+0+0	None	None
Near Miss	0+0+0	None	None
First Aid	0+0+0	None	None
Fire Incident	0+0+0	None	None
Property damage/environmental incident	0+0+0	None	None
Medical Checkup / Examination / Treatment	0+0+0	None	None

EXTERNAL MONITORING /INSPECTION

Sites HSE internal inspection has remained an ongoing activity. ADB's team lead Mr. Shinya Kondo visited the project site on April 24~25, 2018. During the reporting quarter ADB team leader visited on both sites i.e. weir site and powerhouse site. There is no specific schedule of EPAs visit.



INTERNAL INSPECTIONS CONDUCTED DURING REPORTING PERIOD

Site internal HSE inspection by O&M HSE team has remained an ongoing activity. To mitigate safety incidents, machinery, equipment and electrical appliances are being inspected by HSE staff to ensure fitness. Occupational Health & Safety Plan is developed for the project. During the reporting period, O&M HSE department has formulated a PPE policy for the operational phase.

According to the nature of work, inspections have been carried out by the HSE team during the reporting period to reduce the risk of accidents and impacts on environment and for proper maintenance of machineries and other equipment regularly.

Following inspections were undertaken during second quarter 2018;

- Site Overall Inspection
- Fire Extinguisher Inspection
- Health and Hygiene Inspection
- Hand & Power tools Inspections



Fire Extinguishers inspection during 2nd quarter, 2018



Flash Back Arrestor inspection during 2nd quarter, 2018

MITIGATION MEASURES

To ensure health and safety of both staff and labor, following were some of the prominent activities undertaken during the quarter:

1. PPEs policy has been made and signed by the GM plant. Selection/Procurement is in progress.
Approved PPEs policy is attached as **Annex-6**
2. Regular trainings/education sessions for all employees in accordance with the ESMP based on needs assessment.
3. Newly employed staff, labor and daily wagers were given HSE inductions so that they are aware of potential risks associated with the sites emergency procedures.
4. Installation of Sign boards on both sites
5. Posting of emergency contact numbers on visible locations
6. Installation of emergency lifebuoys on both sites
7. Installation of sign boards on downstream at Weir site



Installation of Lifebuoys on both sites



Installation of sign boards on both sites



Sign boards at Weir downstream

LABOR RELATIONS AND CONDITIONS

The O&M is being managed by O&M operator, there are no other subcontractors working on site on behalf of O&M operator. Currently, the number of employees are 113 including security personnel.

I. NATURE OF DISPUTE OR GRIEVANCE

No dispute or conflict with workers or local community was observed or reported during the reporting quarter. Complaints boxes are placed on each site on detectable location for the ease in submitting complaints.



Complaint Boxes placed on both sites

II. AUTHORITIES IN CHARGE OF INVESTIGATION/RECORDING

In case of any incident, relevant team manager and HSE staff is responsible to record, investigate and address it appropriately.

To address any dispute or work related complaint received from staff /workers. Internal Grievance Redress Committee (GRC) comprising of Admin Manager and HSE Manager are mandated to investigate the matter in an unbiased manner and resolve it amicably so that the

concerned party or individual may be satisfied and a friendly / peaceful environment is reinstated.

III. CORRECTIVE ACTIONS, DEADLINES, IDENTIFICATION OF RESPONSIBLE PARTIES.

O&M HSE department indicates corrective actions as and when required for further compliance by entire team of O&M operator.

IV. LABOR RELATIONS AND LIVING CONDITIONS FOR EMPLOYEES

Safety measures such as fire extinguishers and emergency contact numbers are placed on main locations. Following standards are implemented for adherence of local Labor standards:

- Government of Pakistan Labor Policy 2010.
- Standards for labor health and safety are executed according to O&M Contract.
- O&M has made all necessary arrangements for payment, housing & feeding.
- The living conditions are up to merit with all necessities.
- Preference to hire unskilled /skilled staff from AJ&K or KP.

V. MEDICAL FACILITIES PROVIDED DURING QUARTER:

Availability of first aid boxes has been ensured at both sites.

PROJECT PROCEDURES FOR: (A) HIRING; AND (B) ACQUISITION OF GOODS AND SERVICES:

Procedures for hiring have been adopted as per O&M policy and also in compliance with O&M Contract. While, procurement of goods and services by O&M contractor is being carried out under Quality Assurance and Quality Control plan.

I. LOCAL EMPLOYMENT STATUS:

As per the O&M contract, O&M will give priority to the locals in the employment specially for unskilled workers/lower staff and for skilled jobs preference has to be given to the qualified locals.

The summary of employment status is presented below.

Organization	Job Type	AJK						KP				Others Areas	Total
		Alda	Patrind	Lower Chatter	Shoran	Other AJK	Sub-Total (AJK)	Sarati	Dalola	Other KP	Sub-Total (KP)		
1. K-water													
	i. Technical Staff	0	2	3	0	25	30			8	8	11	49
	ii. Non-Technical Staff	3	2	6		2	13	1	1	2	4		17
	iii. Community Liaison Officers	1					1	1			1		2
2. Third-party Staff (Private Security)						9	9	5			5		14
3. Police Personnel						18	18	13			13		31
4. Daily Labour		1		6		3	10	1			1		11

Compliance with legal requirement for employment

Project Legal Agreement/Contract	Conditions/Requirements	Compliance Status
As per condition Environmental approval issued by AJK EPA	<p>“As far as possible, the local people shall be given preference for all unskilled jobs.</p> <p>Preference may also be given to them for all semiskilled and skilled jobs as well;”</p>	Employment opportunities are being disclosed to the local communities through different avenues such as newspapers advertisement, public notice on prominent locations and through community coordinators and local project staff. Preference is being given to the locals subject to availability of skilled and unskilled human resources.

ENVIRONMENTAL AND SOCIAL CAPACITY

I. STAFF CAPACITIES IN ENVIRONMENTAL AND SOCIAL MANAGEMENT

The Project is being managed with a balanced team of HSE staff in O&M team comprising of HSE Manager, Environmentalist, HSE Officer along with two CLOs and being supervised by the Senior Manager Civil-E&S of the Company.

An orientation to environmental management, health and safety during operations work is part of induction for all the staff and workers hired. Furthermore, daily HSE monitoring, toolbox meeting programs and other related activities raise the awareness level among all staff and workers. The organizational Chart is attached as **Annex-7**.

II. HSE WEEKLY MEETINGS:

Weekly internal meetings are conducted regularly and compliance with HSE standards have always been main agenda items during the meetings.

III. ENVIRONMENTAL LAWS AND REGULATIONS

EIA study of the project was completed in light of following laws and regulations. EMP as part of EIA is in implementation under the same laws and regulations;

- Pakistan Environmental Protection Act 1997
- National Environmental Quality Standards (NEQS)
- AJK Environmental Protection Act 2000
- Land Acquisition Act 1894
- Draft National Resettlement Policy 2002
- ADB Safeguard Policy Statement 2009
- IFC Handbook (Resettlement Action Plan)

IV. SAFETY TRAINING AND CAMPAIGN

Capacity building activities coupled with effective supervision is always result oriented. HSE trainings were conducted for O&M employees on different subjects. These trainings were conducted in the light of standards guidelines and procedures developed by O&M with site specific modifications.

During the quarter Emergency evacuation drill was conducted by HSE department to ensure the safety, health and wellbeing of employees during emergency.



Emergency evacuation drill during 2nd quarter, 2018



Defensive driving training for K-water drivers

V. INDUCTION TRAINING

As part of ESMP, all staff and workers before starting their respective jobs have been given induction training.

VI. TOOL BOX MEETINGS

Daily safety message is conveyed to all staff before start of every shift.



VII. NEEDS ASSESSMENT OF ENVIRONMENTAL AND SOCIAL MANAGEMENT CAPACITY

As ongoing activity, continuous capacity building initiatives including more specific trainings on environment and social management are required for staff. Furthermore, daily HSE monitoring, toolbox meeting programs and other related activities have raised the awareness level among all employees.

During the quarter World Environment Day was celebrated on 5th June, 2018 at Patrind HPP as well as in local communities with the theme of “Beat Plastic Pollution”. Manager HSE and CSR talked on the importance of World Environment Day (WED) and informed about the theme of World Environment Day, 2018.



STAKEHOLDER CONSULTATION/CSR ACTIVITIES

To initiate and sustain constructive external relationships with Project stakeholders particularly with adjacent /local communities, consultation is an important tool to enhance the social performance of the Project.

DETAILS OF COMMUNITY PROGRAMS INVOLVING CIVIL SOCIETY/NGOS IN IMPLEMENTATION:

Some professional services on quarterly basis were hired by O&M from locally based individuals and organizations during the quarter. Following organizations have been engaged to undertake activities under ESMP and CSR activities.

HSE sign board preparation and printing activity requirements of the Project is being undertaken by local vender (Chaudhary Steels), resident of Muzaffarabad.

Flora and Fauna Study by local Fisheries and wildlife expert Mr. Yousaf Qureshi who is also retired Director Fisheries Government of AJK.

During the reporting quarter CLOs conducted consultations sessions with the local affected communities.

	
<p>Community consultation at Alda village</p>	<p>Community consultation at Sarati village</p>

COMPLIANCE AND IMPLEMENTATION ESMP



Compliance monitoring of ESMP has been an on-going activity undertaken by O&M's HSE staff and SHPL on both sites. Non compliances with recommended standards and regulations will be recorded and reported. ESMP compliance status is attached as **Annex-8**.

A. ENVIRONMENTAL MONITORING UNDER EMP:

Internal Environmental and Inspection checklist was developed and filled on daily basis. Besides this following activities have been undertaken as part of environmental monitoring.

i. Flora Study Monitoring:

Quarterly Study/monitoring was undertaken at both (Power house & weir) sites in June, 2018. Detailed report is annexed as **Annex-9**.

	
<p>Vegetation Monitoring for the 2nd Quarter, 2018</p>	

ii. Fish fauna Study Monitoring:

Quarterly Study/monitoring was undertaken in Kunhar River (Up & down stream of Project site) during the month of June, 2018. Sampling was done on six study points. Detailed report is annexed as **Annex-10**.



Fish Monitoring Study during 2nd Quarter

Table: Compliance with NEQ's

Envrn. component	Standards (NEQS)	Compliance/Mitigation measure	Remarks
Air Quality	EPA ambient air quality (EPAs standards for each Parameter)	NEQS: To ensure dust suppression due to transportation activity, unpaved roads are being sprinkled with water at least twice a day. The EPC is taking all necessary measures to limit pollution from dust and any wind-blown materials during construction.	Since major construction works were already completed, dust control has improved significantly during the quarter. Air quality monitoring was conducted recently through third-party Green Crescent and report is awaited. Report will be shared in next quarterly report.
Water quality	WHO Guidelines (EPAs standards for each Parameter)	Waste water from tunnel is treated through sedimentation tanks. Waste water discharged from HRT is being measured	Biannual quality monitoring of waste and drinking water was undertaken in the first quarter and report was shared Next monitoring is due in this quarter.
Noise levels /Vibration	EPA ambient noise standards and worldwide vibration standards.	Noise: Noise prone activities were avoided during night time. No open blasting was done during quiet hours. Excavators and all heavy machines were lubricated in a routine matter to minimize the noise and to increase the life of equipment Vibration: Factors of human comfort and structural damage was given and always tried to comply with allowable vibration standards. Blasting checklist was used by HSE staff.	Noise level and vibration record is being maintained.
Soil quality	EPA quality standard (Different standards for each Parameter)	No environmental incident observed	Construction works completed in first quarter
Flora	Visual observations by relevant Forest professional during EIA study.	Study /monitoring during last quarter undertaken	Study undertaken in June-18 (Annex-9)
Fish Fauna	Observation by relevant wildlife & Fisheries professional during EIA study.	Study /monitoring for last quarter undertaken	Study undertaken in June-18 (Annex-10)

B. OCCUPATIONAL HEALTH AND SAFETY

Health and safety of staff/workers has been a prime consideration during the operation of the Project. In accordance with the safety standards, all the relevant staff are provided with the Personal Protective Equipment (PPE) comprising of hard hats, safety shoes, and jacket and dust masks depending upon the job specification to prevent injuries.

1. Waste management training sessions were held for supervisors and relevant personnel.

Furthermore, waste segregation methods were practically taught to site workers and staff to adopt appropriate mechanism.

2. During quarter, coordination meetings, monitoring and inspections were undertaken by O&M's HSE staff with regard to site HSE status.
3. Waste segregation, collection, transportation and disposal mechanism has been implemented and full time waste collectors were placed on both sites. Waste management training sessions were held for supervisors and relevant personnel.

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

To manage the environmental and social issue appropriately, following detailed plans developed by O&M operator have been in implementation to fulfill the environmental and social compliance requirements of the project;

- a) Plan for Waste Management
- b) Plan for Traffic Management
- c) Plan for Reservoir Management

A. PLAN FOR WASTE MANAGEMENT

O&M contractor have hired waste collectors on both sites to maintain housekeeping and timely segregation /collection of waste. All the waste generated at sites is being managed in accordance with ESMP & Waste Management Plan. O&M made contract with private company to collect the waste on weekly basis. The quantity of waste is being recorded on the waste consignment note.

Daily environmental Performa regarding potential environmental impacts has been prepared and monitoring at site is being done regularly by direct observation and inspection. Waste management plan is attached as **Annex-11**.

B. PLAN FOR TRAFFIC MANAGEMENT:

Safety precautions, warning sign boards have been placed at different locations to protect staff/workers and the general public. All the vehicles are equipped with directional control signage and are being inspected by HSE team prior to use. Traffic Management Plan is attached as **Annex-12**.

RESETTLEMENT PLAN IMPLEMENTATION

I. SCOPE OF LAND ACQUISITION AND RESETTLEMENT IMPACTS

The land identified by the EPC Contractor on the basis of basic design of the Project measuring 872.65 Kanal (601.4 Kanal on AJK and 188.7 Kanal on KP side) was acquired by the Company in 2012 through Land Acquisition Act (LAA) 1894 applicable in both AJ&K and KPK. The land acquired in 2012 was owned by 94 land owners which was detailed in the approved resettlement plan.

In 2014, during the construction on the weir site, it was noticed that the land area of 3.7 Kanal “Additional Land” is further required on AJ&K side which is to be submerged due to the head pond of the Project. The land is owned by three (03) land owners.

Due to the change in the design and location of weir downstream in late 2014, it was confirmed through survey that the land area of 10.3 Kanal is further required on AJ&K side the slope stabilization in the stilling basin area downstream of the weir. The land is owned by six (06) land owners. The process of acquisition on AJK side completed in December 2015.

Furthermore, in 2015 on the complaint of the local Mr. Khalid who also raised the same issue during the Lenders’ E&S mission in November 2015, on the head pond area a survey was conducted to confirm whether his land is affected or otherwise. EPCC conducted the survey on November 13, 2015 and it was confirmed that his land measuring 5.45 Kanal was being affected due to submergence in the head pond. The process of acquisition started by contacting the relevant revenue department. Section-4 was issued on April 01, 2016. Initial assessed value of the land by the revenue department was deposited by the Company in November 2016. The detail of compensation is given in subsequent section.

During the reporting period, it was brought in to notice of the revenue department/district administration by one of the locals (Mr. Fareed) in Shoran village AJK that his land and house is right on the bank of river Kunhar and the area was prone to sliding in the past as well and asked the revenue department/district administration to acquire his land. The revenue started the procedure of acquisition of land in February 2017 and the land award was issued on October 31, 2017 for the land measuring 4.66 Kanal.

In addition to above, when reservoir impounding was being done, the local community of Deedal and Dalola villages (KP area) asked the district administration/revenue department to conduct a survey through revenue staff to confirm whether their land was being submerged. After the detailed survey by the revenue staff it was communicated to the Company that additional land will be submerged.

The Company along with the revenue staff again visited the site to confirm the additional land acquisition matter. It was found that land measuring 65.45 Kanal was already destroyed by the landslide well before the project started. According to revenue staff, its status in revenue record is not updated as slide area which means Company has to acquire the same. In addition to this about 17.7 Kanal land in Dalola was also being affected.

The Company approached the district administration/revenue department and apprised the situation. The revenue department started the process and issued section-4 for the areas (65.45 & 17.7 Kanal) on July 25, 2017. After the issuance of section-4, the Company was asked by the revenue department to execute an Agreement U/S-41 of LAA 1894 with GoKP. The draft agreement was shared with the office of Commissioner Hazara Division but till date there is no further development on the issue. The acquisition process will formally start after the execution of Agreement U/S-41.

SUMMARY OF THE LAND ACQUIRED/TO BE ACQUIRED FOR THE PROJECT

PERMANENT LAND						
Sr.	Project Component	Affected Land (Kanal)				
		State owned Land/ Riverbed	Farmland	Wasteland	House land	Total
1	Reservoir Impounding	87.3	282.05	231.9	9.1	610.35
2	Weir Structures	0	1.5	48.7	0	50.2
3	Powerhouse	13.6	30.1	32.85	5.25	81.8
4	Surge Tank	-	-	47.75	-	47.75
5	Additional Land-Patrind	0.3	3.75	15.4		19.45
6	Additional Land-Shoran	-	-	3.52	1.14	4.66
7	Additional Land-Deedal		1.95	63.5		65.45
8	Additional Land-Dalola			1.4		1.4
9	Additional Land-Naroka		1.65	14.65		16.3
Total Permanent Land Acquisition		101.2	321	459.67	15.49	897.36
TEMPORARY LAND						
	Colony of Expatriate construction staff, Switchyard, labor camp,	54.75	0	27.8	0	82.55
Total Temporary Land Acquisition (Kanal)		54.75	0	27.8	0	82.55
Total Land Acquisition (Kanal)		155.95	321	487.47	15.49	979.91

II. STATUS OF LAND ACQUISITION, PROGRESS ON COMPENSATION PAYMENTS AND ASSISTANCE DELIVERY

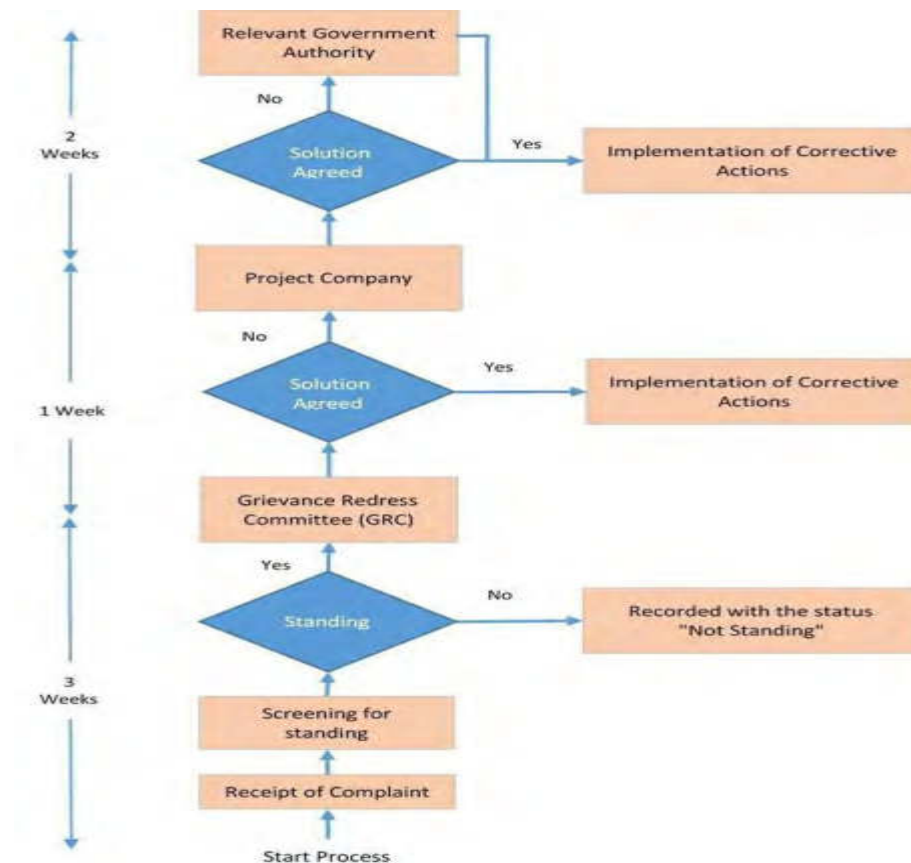
Payment for land acquisition on both sides of the project is in process. The Company has deposited the assessed cost (100%) even for additional land whose cost has been finalized by the revenue department into Government treasuries for subsequent payment to APs. For the additional land acquired for the head pond about 97% payment has been made which is reflected in the below table. However, there is delay in the payment of compensation due to (i) unavailability of entitled land owners who are working or based in other cities or (ii) an existing shareholding dispute among the families. Status of the land acquisition is as follows;

Summary of Land Acquisition Progress and compensation payments including additional land

Village	Area (Kanal)	Award Amount (PKR)	Disbursed (PKR)	%age	No. of Persons	Persons received payment
1. AJ&K						
A. Land/Property						
Powerhouse (Alda Village AJ&K)	81.80	92,479,824	89,068,314	96.31%	196	561
Headpond (Shoran Village AJ&K)	130.75	75,181,250	74,159,019	98.64%	611	200
Weir + Headpond (Patrind Village AJ&K)	341.10	204,037,798	203,670,449	99.82%		353
Forest land for Surge Tank (Alda village)	47.75					
B. Additional Land/Property						
Weir + Headpond (Patrind Village AJ&K)	3.70	2,127,500	1,955,000	91.89%	3	19
Weir + Headpond (Patrind Village AJ&K)	10.30	6,076,540	5,562,233	91.54%	3	19
Headpond (Shoran Village AJ&K)	4.66	6,054,188	6,054,181	100.00%	3	3
C. Trees						
Alda		1,815,089	1,804,468	99.41%		19
Alda		75,546	75,546	100.00%		
Shoran		757,391	685,073	90.45%		58
Shoran		106,053	106,053	100.00%	1	1
Patrind		837,882	829,515	99.00%		32
Sub-Total	620.06	389,549,061	383,969,851	97.01%	817	1,265
2. KPK						
Land/Property/Trees						
Weir + Headpond (Sarati Village KPK)	188.70	128,557,081	114,613,320	89.15%	196	Detail Yet to receive
Headpond (Deedal Village KPK)	5.45	3,133,750	Under Acquisition Process		1	Under Acquisition Process
Headpond (Deedal Village KPK)	65.45	37,633,750			16	
Head pond (Dalola Village KPK)	1.40	805,000			1	
Head pond (Naroka Village KPK)	16.30	9,372,500			7	
Sub-Total	277.30	179,502,081	114,613,320	89.15%	221	0

GRIEVANCE PROCEDURES

GRC would be a forum for raising objections and holding discussions to resolve conflicts. Moreover, consultation with the local community and concerned public representatives and officials of the relevant line departments is an ongoing process. Relevant information to the stakeholders has always been provided in a timely manner and in a form and language that are understandable and accessible to them. A grievance mechanism has been proposed in the Environmental & Social Management Plan (ESMP) for operational phase of the project.



Complaint boxes are placed at prominent locations on both sides of the project. Furthermore, the CLOs are also engaged for community consultation and coordination and have key role in the grievance redress mechanism. The community/ APs complaints are being addressed very diligently and carefully at all levels.

Issues related to land acquisition and compensation requires involvement of District administration/Revenue department. For land related grievances, the land owners contact the relevant revenue department/district administration or the courts. The Company has to respond to relevant government departments since the land was acquired through LAA by the Govts.

ANNEXURES

ANNEX-1 ENVIRONMENTAL FLOW DATA

Environmental Flow Data- 2nd Quarter-2018					
April, 2018		May,2018		June,2018	
Day / Sensor	Water Flow (m3/s)	Day / Sensor	Water Flow (m3/s)	Day / Sensor	Water Flow (m3/s)
1 Day	2.33	1 Day	2.56	1 Day	39.61
2 Day	2.34	2 Day	2.54	2 Day	41.02
3 Day	2.36	3 Day	2.49	3 Day	127.84
4 Day	2.28	4 Day	2.41	4 Day	87.89
5 Day	2.33	5 Day	2.43	5 Day	127.55
6 Day	2.24	6 Day	2.54	6 Day	103.36
7 Day	2.32	7 Day	2.51	7 Day	114.79
8 Day	2.35	8 Day	2.65	8 Day	140.29
9 Day	2.25	9 Day	2.5	9 Day	119.95
10 Day	2.29	10 Day	2.51	10 Day	85.3
11 Day	2.32	11 Day	2.63	11 Day	102.56
12 Day	2.32	12 Day	2.54	12 Day	103.73
13 Day	2.26	13 Day	2.45	13 Day	103.13
14 Day	2.28	14 Day	2.38	14 Day	129.02
15 Day	2.31	15 Day	11.65	15 Day	115.13
16 Day	2.37	16 Day	42.24	16 Day	48.87
17 Day	2.35	17 Day	2.28	17 Day	48.9
18 Day	2.28	18 Day	2.21	18 Day	29.65
19 Day	2.24	19 Day	2.26	19 Day	31.76
20 Day	2.54	20 Day	2.24	20 Day	28.36
21 Day	2.42	21 Day	2.26	21 Day	47.6
22 Day	2.31	22 Day	2.22	22 Day	30.25
23 Day	2.28	23 Day	2.19	23 Day	14.65
24 Day	2.44	24 Day	2.28	24 Day	31.96
25 Day	2.53	25 Day	2.23	25 Day	2.78
26 Day	2.69	26 Day	2.19	26 Day	2.51
27 Day	2.64	27 Day	2.2	27 Day	2.38
28 Day	2.6	28 Day	2.24	28 Day	2.44
29 Day	2.64	29 Day	12.82	29 Day	2.53
30 Day	4.25	30 Day	2.18	30 Day	2.53
		31 Day	25.89		

*Please note that the readings lesser than 2.2 cumecs shown in the table are due to some error in flow sensor. The actual flow released downstream of weir is always 2.2 cumecs which will never be reduced.

ANNEX-2 PROCEDURE FOR GRIEVANCE REDRESSAL

HSE PROCEDURE

Grievance Redressal System

Prepared By	Approved By
Name : Syed Qamar Ali Shah	Name : Young Ho Kim
Designation: Manager HSE & CSR	Designation: Plant General Manager
Signature:	Signature:

1. Purpose:

- Resolve environmental and social grievances due to operations of Patrind Hydropower Plant (HPP) in an effective manner.
- Address grievance raised by staff/workers/labors.
- Build up a relationship of trust with affected parties.
- Ensure transparency in dealings amongst stakeholders including affected parties through a proper communication system.

2. Scope:

- This grievance redressal system will be applicable to address the grievances raised by external parties like local communities etc. and grievances raised by company staff/workers/labors.

3. Responsibilities:

- General Manager (GM) Patrind HPP will be responsible for the implementation of this procedure. (Referred as GM Plant in this procedure.)
- Manager HSE and CSR will support GM in implementation of this procedure relevant to local communities and local stakeholders. (Referred as O&M Manager HSE & CSR in this procedure.)
- Head Support Services will support GM Plant in implementation of this procedure relevant to staff/workers/labors. (Referred as O&M Head Support Services in this procedure.)

4. Procedure for External Grievance Redressal:

4.1 Points of Receipts of Complaints:

- Three complaint boxes will be placed at power-house (bridge entrance, main-gate entrance and Alra village entrance); and one complaint register will be placed at outside the main entry gate of power-house.
- Two complaint boxes will be placed at weir-site (main entrance and pedestrian access to Patrind village) and one complaint register will be placed at outside the main entry gate of weir site.
- Points of placements of boxes and registers will be properly marked with instructions in Urdu.

4.2 Grievance Redressal Committee (GRC):

- GRC will consist of the following members:
 - GM Plant (O&M)- Chairman
 - Affected Community Representatives, as Members
 - O&M Manager HSE & CSR, as Member
 - Star Hydro Power Limited (SHPL) E&S Manager, as Member
- O&M Manager HSE & CSR will be supported by his HSE team.

- Where required, representatives from support services team, operations team and maintenance team will be included as members.
- Please refer to the Table 01 for the graphical representation of GRC.

4.3 Grievance Redressal Mechanism (GRM):

- Community Liaison officers (CLOs) will collect the complaints from complaint boxes and registers daily.
- CLOs may also take complaints from the affected Parties directly via phone, email or in written.
- CLOs will share complaints with Manager HSE & CSR or his representative daily.
- Manager HSE & CSR or his representative will log the complaints.
- Manager HSE & CSR will discuss the complaints with GRC chairman for initial screening to decide whether the complaints need to be investigated or declared “not standing” (not required to be investigated)
- GRC investigation team will complete the investigation and submit report to GRC chairman within 07 to 14 working days.
- During investigation, if required, GRC may conduct site visit and interview complainants.
- Solutions will need to be agreed both by K-water and complainants.
- If required, SHPL or relevant government authorities may be involved in agreeing solutions with complainants.
- Manager HSE & CSR or his representative will log agreed solutions/corrective actions.
- Investigation cycle, for each complaint from receipt to completion of investigation will be completed within three weeks.
- Investigation outcomes of each complaints/grievance will be recorded in grievance management form (GMF). Please refer to Table 03 for GMF.

4.4 Complaint Investigation Report Disclosure:

- Manager HSE & CSR will hand over investigation reports to CLOs for further dissemination.
- CLOs will share the information with relevant complainants.

4.5 GRC Review Meetings:

- GRC review meetings will be held monthly. If required, review meetings can be held several times in a month.

4.6 Community Awareness:

- CLOs will hold periodic awareness sessions with local communities and other relevant stakeholders on this procedure.

4.7 Jurisdiction of External Grievance Redressal:

- The scope of this procedure will be limited the grievances related to Patrind HPP operations.
- Grievances related to land acquisition, resettlement and land issues will be out of the scope of this procedure. These will be forwarded to SHPL for redressal.
- Manager HSE and CSR will make up follow-ups with SHPL on redressal of these grievances.

5. Procedure for Internal Grievance Redressal:

- GRC for internal grievance redressal will consist of:
 - GM Plant (O&M)- Chairman
 - O&M Head Support Services, as Member
 - O&M Assistant Manager HR/Administration
 - O&M Manager HSE & CSR, as Member
- Complaint/Suggestion box will be placed at office entrance in power-house and weir-site.
- Staff/workers/labors may also register their grievances directly to O&M Assistant Manager HR/Administration verbally or via email or in written.
- O&M Assistant Manager HR/Administration will check Complaint/Suggestion boxes weekly.
- O&M Assistant Manager HR/Administration will log the complaints and share with O&M Head Support Services.
- O&M Head Support Services will discuss the complaints with GRC chairman for initial screening.
- O&M Head Support Services will ensure that investigation process for each complaint/grievance will be completed within 15 working days.
- O&M Head Support Services will get approved investigation report for each complaint/grievance from the GM plant.
- O&M Head Support Services will hand over investigation reports to O&M Assistant Manager HR/Administration for logging corrective actions and for further sharing with the complainants.
- O&M Head Support Services will ensure that all the corrective actions are being implemented.
- GRC chairman and O&M Head Support Services will review the log sheet and status of complaints & corrective actions monthly.

- O&M Assistant Manager HR/Administration will hold periodic awareness sessions with staff/workers/labors for this procedure.

Table 01: Graphical Representation of GRC

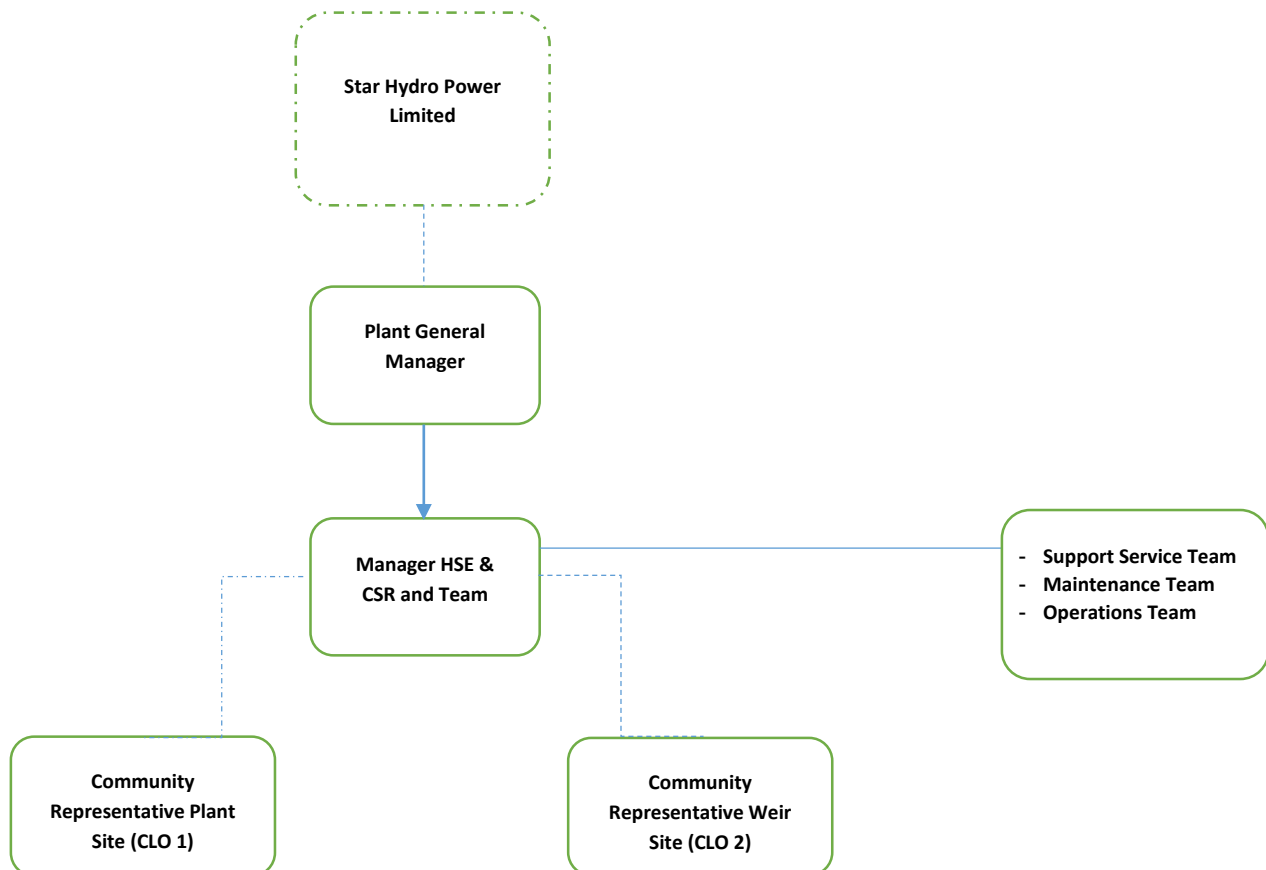


Table 02: Graphical Representation of Grievance Redress Mechanism

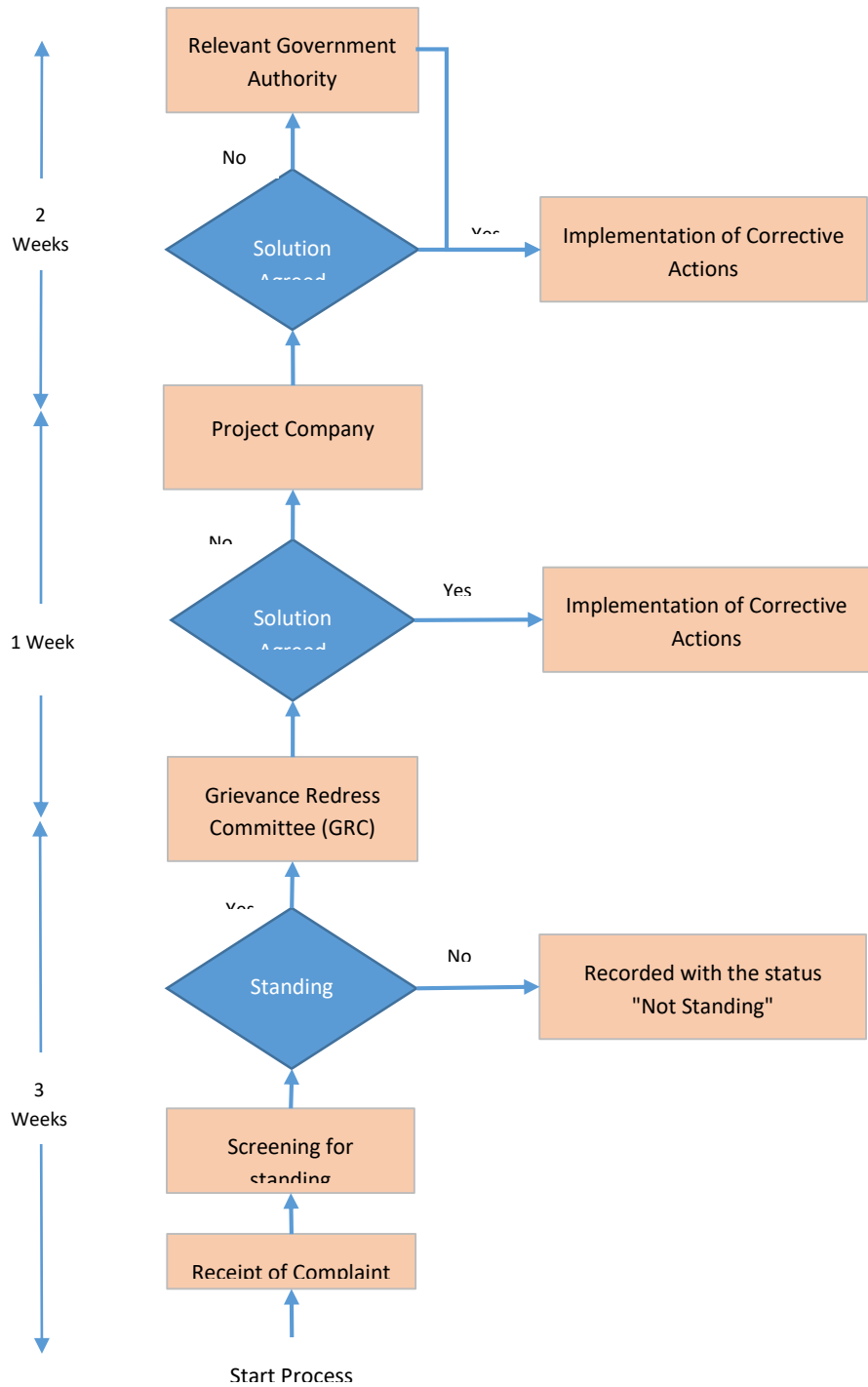


Table 03: Grievance Management Form

Date: _____ Time: _____ Location: _____

Name and address of the complainant: _____

Contact Details: _____

Complaint Received By: _____ (Name). Designation: _____

Details of the complaint: _____

Suggested Actions to resolve the complaint:

Corrective actions undertaken:

Corrective actions approved by:

Name and Signature of the Head of the Grievance committee: _____

Designation: _____ Date: _____

Corrective actions communicated to the complainant?	YES	NO
---	-----	----

Is the complainant satisfied from the corrective actions?	YES	NO
---	-----	----

Further actions: _____

Approved by:

GM Patrind HPP

ANNEX-3

PROCEDURE FOR CORPORATE SOCIAL RESPONSIBILITY

HSE PROCEDURE

Corporate Social Responsibility and Stakeholder Engagement

Prepared By	Approved By
<p>Name : Syed Qamar Ali Shah</p> <p>Designation: Manager HSE & CSR</p> <p>Signature:</p>	<p>Name : Young Ho Kim</p> <p>Designation: GM Patrind HPP</p> <p>Signature:</p>

1. Purpose:

- Perform company corporate social responsibility (CSR) in a responsible manner.
- Conduct social / public welfare schemes in planned and effective manner in consultation with local communities and other relevant stakeholders.
- Build up strong relationship with local stakeholders (local communities etc.).
- Enhance social welfare of local communities and company image.
- Stakeholder engagement in an effective and planned manner

2. Scope:

- This procedure will be applicable to company CSR activities relevant to local stakeholder (local communities etc.) and stakeholder engagement.

3. Responsibilities:

- General Manager (GM) Patrind hydro power plant (HPP) will be responsible for the implementation of this procedure.
- Manager HSE & CSR will support GM in implementation of this procedure.

4. Procedure for CSR:

4.1 General Areas for CSR Schemes / Projects:

Main focus will be on the poor members of the local communities in the villages. Following will be the general areas of CSR schemes/projects but not limited to these:

- **Water:** Installation of hand pumps/deep wells/water taps; distribution of water pipes; construction of water tanks; and distribution of portable water tanks etc.
- **Education / Schools:** Scholarships programs; renovations work in schools; electric works (installation of fans & lights etc.) donations of desks, chairs, table furniture etc.; distribution of portable drinking water bottles, books, geometry boxes etc.; installations of water coolers; and installation of play-items etc.
- **Health:** Free medical camps; provision of ambulance support; health & hygiene trainings; and installations of waste-bins etc.
- **Gender:** Distribution of household items like sewing machines, washing machines etc.; training arrangements for women on sewing, cooking etc.
- **Sports / Youth:** Conducting sports tournaments; distribution of sports items etc.
- **Mosques / Masjids:** Provision of carpets, fans; and renovations works etc.
- **Public Awareness Campaigns:** campaigns in media; installations of sign boards, awareness sessions, disaster management trainings; and plantation campaigns etc.
- **General:** Construction/renovations of village (community) hall etc.

Company staff/workers may also donate voluntary for CSR activities/initiatives or may conduct CSR activities/initiatives voluntary on their own.

4.2 Formation of CSR Committees:

- Internal CSR committee will be formed which will consist of Manager HSE & CSR, community liaison officers (CLOs) and representatives of maintenance, operations, support services and Star Hydro Power Limited (SHPL).
- Manager HSE & CSR with the support of community liaison officers (CLOs) will form CSR village committees in Patrind, Alda and Chatter villages.
- Village CSR committee will be the focal points for company.

4.3 Development and Implementation of Annual CSR Plan:

- Manager HSE & CSR will develop annual CSR plan in consultation with villages CSR committees.
- Company CLOs will help Manager HSE & CSR in development and implementation of annual CSR plan.
- Annual CSR plan will be developed as per the format given in **Table 01**.
- Annual CSR plan will also be shared with SHPL for review.
- GM Patrind HPP will get approval for the annual budget required for the annual CSR plan.
- Company annual CSR plan will be finalized and approved in first quarter of each New Year.
- Copy of approved annual CSR plan will also be shared with SHPL for information.
- Approved annual CSR plan will be implemented with the support of village CSR committees.
- Village CSR committees will develop mechanism for undertaking the CSR schemes/projects. This mechanism will be approved by Manager HSE & CSR.
- Manager HSE & CSR and CLOs will monitor the village CSR committees while undertaking the CRS schemes/projects.
- Payments/financial aspects for the CRS schemes /projects will be managed by company.
- Manager HSE & CSR will update GM Patrind HPP monthly on status of annual CSR plan. Updates will be shared with SHPL for information.
- Manager HSE & CSR will develop scheme/project completion report, biannual CSR & annual CRS reports.
- Company will involve SHPL, local government departments, consultants and private organizations/institutes etc., where required.
- Company will conduct annual CSR function with village CSR committees and local communities.

Note: for current year 06-months CSR plan will be developed and finalized till July, 2018.

5. Procedure for Stakeholder Engagement:

- Company will identify all its relevant stakeholders, their requirements, focal persons and how these stakeholders will be engaged.
- This information will be represented in stakeholder management plan. Please refer to the **Table 02** for the stakeholder engagement plan.
- Manager HSE & CSR will be responsible to develop this plan with the support of all internal departments.
- Plan will be shared with SHPL for review before approval from the GM Patrind HPP.
- Copy of the approved plan will also be shared with SHPL for information.
- GM Patrind HPP will be responsible to implement this plan.
- Manager HSE & CSR and Heads of Support Services, Operations and Maintenance will be responsible to comply with requirements and implement engagement processes relevant to their departments.
- Stakeholder engagement plan will be reviewed and updated annually by all the relevant company departments.
- This engagement plan will not include local communities as they have already been covered in above sections of CSR.
- Key stakeholders include but not limited to:
 - Environment Protection Agencies (EPAs) of Azad Jammu & Kashmir (AJK) and Khyber Pakhtunkhwa (KPP)
 - Wild and Fisheries Departments of AJK and KPP
 - District Administration
 - Department of Industries and Labors, AJK
 - Department of Civil Defense
 - State Disaster Management Authority (SDMA)
 - National Electric Power Regulatory Authority (NEPRA)
 - National Transmission and Dispatch Company (NTDC)
 - National Power Control Centre (NPCC)
 - Central Power Purchasing Agent (CPPAG)
- Key engagement processes include but not limited to:

- Information centre and information boards
- Correspondence by letters/fax/phone/email/text/Instant messaging
- Print media and notice board announcements
- One-on-one interviews
- Formal meetings
- Public meetings
- Workshops
- Focus group meetings
- Surveys
- Submission of reports/documents/plans

Table 01: Annual CSR Plan

S.N	Area	Scheme/Project	Location	Tentative Cost (USD)	Beneficiaries
Total Tentative Cost (USD)					

Prepared By:	Manager HSE & CSR
Approved By:	GM Patrind HPP
Date:	

Table 02: Stakeholder Engagement Plan

S.N	Stakeholders	Requirements	Focal Person Details	Engagement Processes	Schedule/Timings	Responsibility

Prepared By:	 Manager HSE & CSR
Approved By:	 GM Patrind HPP
Date:	

ANNEX-4 OCCUPATIONAL HEALTH & SAFETY PLAN

HSE Plan

Occupational Health and Safety

Prepared By	Approved By
Name : Syed Qamar Ali Shah	Name : Young Ho Kim
Designation: Manager HSE & CSR	Designation: GM Patind HPP
Signature: 	Signature: 

REV. #	DATE	PAGE #	SECTION	NATURE OF AMENDMENT

* All changes made in the document are notified in the Document History.

Abbreviations

- **K-water:** Korea water resources corporation
- **NTDC:** National Transmission and Dispatch Company
- **PPA:** Power Purchase Agreement
- **IPP:** Independent Power Producer
- **BOOT:** Build Own Operate and Transfer
- **GOAK:** Government of Azad Jammu & Kashmir
- **ESS:** Environmental Social Supervisor
- **PPE:** Personal Protective Equipment
- **WHMIS:** Work Hazardous Material Information System
- **OH&S:** Oriental Health & Safety
- **EWP:** Elevating Work Platform
- **PTS:** Permanent Threshold Shift
- **HPDs:** Hearing Protection Devices
- **MSDS:** Material Safety Data Sheets
- **GFCI:** Ground Fault Circuit Interceptor

Introduction

Purpose and Objective

Efficient health and safety at workplace not only ensures that employees are happy and productive, but can also help to reduce both the human and business costs of injuries and unnecessary lawsuits. Additionally, improved health and safety standards help companies become more effective and improve their business profile. This manual provides the delivery mechanism to address the health and safety issues of the project during its operation, to enhance project benefits, and to introduce standards of good practice to be adopted for all operational activities of Patrind Hydro Power Plant.

The primary objectives of the occupational health and safety plan are to:

- Identify and consolidate the obligations on project regarding health and safety management during Operational phase
- Develop the plan for implementation including resources and procedures
- Define a monitoring mechanism and identify monitoring parameters in order to provide a mechanism for taking timely action in the face of unanticipated situations
- Identify training requirements at various levels

At K-Water Health, Safety and Environmental "HSE" responsibilities are integral to the way the company operates. In carrying out all its activities K-water ensures welfare of communities it operates in, protection of ecosystems and safety of its workforce. K-Water believes in good safety performance that can contribute to business success. K-Water believes that responsibility for Health, Safety and Environment cannot be delegated, it is a shared responsibility across the company.

As K-Water continues its business activities basing its growth on sound foundation of technical and financial prudence, it supports Health, Safety and Environmental initiatives by:

- Promoting a positive culture based on improving HSE performance
- Complying with all legal and regulatory requirements
- Complying with HSE requirements of lenders
- Monitoring and continually improving HSE performance
- Eliminating hazards, practices and behaviors that may cause accidents, injuries and illness.
- Providing training and resources for workforce to maintain safe system of work;
- Integrating HSE management into all aspects of organization;
- Employing contractors who aspire to the same HSE standards; and
- Reporting publicly and annually on HSE performances, measured against objectives and targets.

K-Water strives to be good corporate citizen in every community in which it operates. Through observance and encouragement of this policy, the company aims to assist in protecting the environment and overall wellbeing of its stakeholders, specifically its employees, shareholders, subcontractors and communities.



Young Ho Kim
General Manager
Patrind Hydro Power Plant

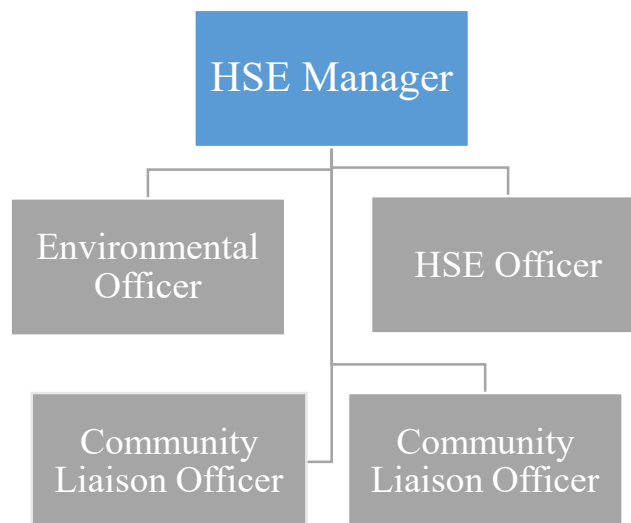
Corporate Health and Safety Policy Statement

HSE Management system

HSE management must follow **PDCA Cycle (plan, do, check and act)** for planning and implementation, measuring performance and reviewing performance.

1. Establishing that all equipment used are suitable for the task and are kept in good working condition; this include, the regular maintenance and servicing of equipment and potentially dangerous substances should be locked away when not in use.
2. Providing adequate training, information, instruction and supervision to ensure that work is conducted safely.
3. Taking immediate and appropriate steps to investigate and rectify any risks to safety and health arising from the work activities.
4. Ensuring that all accidents and “near misses” are properly recorded and reported and that an investigation is carried out to determine the root causes
5. Ensuring safe work practices at all times.

Organization HSE Structure



HSE Manager

The O&M Contractor's HSE Manager shall;

- Have the knowledge and understanding of Policy and obligations about health and safety and allocate the responsibility to each level of staff, including staff of the Sub Contractors, within the Plant site, for ensuring compliance and coordination of all the Health & Safety responsibilities and activities between the Contractor and Sub-Contractors.

- Provide support to line management for HSE implementation
- Provide necessary support to HSE Officer in carrying out his responsibilities.
- Ensure facilities for welfare and sanitation, provision of adequate lighting, arrangements for basic fire protection/fighting & trainings are in place and ensure safe access at the workplace at all times.
- Keep contact with official and professional bodies relating to occupational health and safety in Pakistan.
- Keep up to date with recommended codes of practices and new safety literature, circulate information applicable to each level of employees.
- Monitor that all equipment's and substances used are suitable for the task and are kept in good working condition; and monitor that regular maintenance and servicing of equipment's is in place.
- Ensure that all accidents and "near misses" are properly recorded and reported and that an investigation is carried out to determine the root causes.

HSE Officer

HSE Officer shall;

- Carry out hazard identification and risk assessment, in association with the HSE Manager and representatives of Operation and Maintenance Department to decide on the safe methods of working and that all regulations are being observed.
- Supervise the recording and analysis of information on injuries, damage and loss, analyze accident trends and review overall safety performances.
- Provide training input for all employees on health and safety issues.
- Promote awareness of injury prevention and damage control to all levels of employees
- Conduct the health and safety programs such as trainings, toolbox talks, machinery inspection etc.
- Conduct HSE inspections / audits, accident investigations, HSE trainings, drills etc; and maintain HSE data base
- Prepare HSE procedures and reports etc.
- Monitoring implementation of permit-to-work system
- Support HSE Manager

Responsibilities

- It will be the responsibility of all staff (GM, all departmental heads, engineers, supervisors, technicians and other company & contractor staff) to implement the requirements of this plan.
- HSE department will provided all necessary support in the implementation of this plan.

Risk Assessment

For all safety critical activities (Work- at height, lifting operation, confine space etc.) risk assessment will be conducted by HSE and relevant departments jointly.

Purpose of the risk assessment will be to identify major risks and required measures to address the risks.

This risk assessment will involve following five steps:

- 1: Identify Hazards
- 2: Decide who might be harmed and How
- 3: Evaluate the risk and decide on precautions
- 4: Make the record of your findings and implement them
- 5: Review your assessment and update if necessary.

Please refer to Annexure A for the risk assessment sheet and risk matrix.

No work will be initiated unless risk assessment is conducted and suitable measures are identified and implemented.

HSE will provide trainings on how to conduct risk assessments and on findings of the risk assessments to the relevant staff.

Relevant departmental heads will be responsible to ensure that all measures identified in risk assessment are implemented.

Permit to Work System (PTW) and Safety Instructions

PTW is a formal written document which specifies work to be done and precaution to be taken. PTW system will be in place for non-routine activities at Patrind Hydro Power Plant while routine operations will be managed through operational procedures or HSE procedures / Instructions.

There will be six (06) types of permits:

- Electrical maintenance permit
- Mechanical maintenance permit
- Cutting, welding / hot work permit
- Lifting work permit
- Confined space permit
- Work at height

Please refer to **Annexure B** for **PTW**. Only authorized signatories will be eligible to sign the permits. Each permit issued will be valid for 12 hours. All the above mentioned activities will be commenced only if the relevant permits are issued and all the safety measures are in place.

HSE will provide trainings on PTW to all relevant staff.

Relevant departmental heads / Supervisors will be responsible to ensure that all measures mentioned in the permits are implemented. They will ensure that all the persons carrying a specific job are competent, trained and have all the required certifications.

Relevant departmental heads / job supervisor will close the permits with all relevant departments once the work has been completed.

HSE will monitor the implementation of PTW system.

Confined Spaces

General Hazards

Entry into and work in a confined space poses health and safety problems which may include:

- Presence or possible buildup of a hazardous atmosphere
- Unexpected movement of equipment or materials
- Engulfment
- Explosive, toxic or oxygen deficient atmosphere

Work within a confined space shall be carefully defined and planned ahead of the entry in order to identify all possible hazards and take appropriate preventive action.

Responsibilities

Where confined space work is to be performed, it is the responsibility of relevant departmental head / supervisor to ensure work to be performed has been adequately identified, planned and that all safety requirements have been implemented prior to work commencing.

The responsibility for safety, both at the time of entry and during the entire operation rests with the immediate supervisor. This includes action to continue with the implementation and administration of a safe work plan, ensuring the plan is adhered to and taking all necessary actions to eliminate or control the actual or potential hazards present.

HSE Officer

HSE Officer shall, before work begins:

- Identify confined space locations and work areas and identify confined space work procedures required.
- Provide confined spaces training for direct-hire employees
- Conduct or arrange for gas testing and monitoring of the confined space atmosphere.

Supervisors

The supervisor shall, before work begins:

- Obtain “Safe Work Permit” if required and follow the confined space work procedures appropriate for the worksite
- Provide necessary ventilation, breathing apparatus, safety staff and rescue equipment.

Workers

All workers shall:

- Test respiratory and rescue equipment before use.

Employee Training / Instruction

In addition to the supervisor training in HSE program, all supervisors or workers regularly involved in confined space entry shall receive competency training in confined spaces.

Pre – Job Instruction

The work to be performed shall be under the direction of a competent person thoroughly familiar with the hazards that may be encountered and has received all necessary training.

All workers connected with the performance of the work in the confined space shall before entering, be present at a job meeting to be trained on the hazards they may encounter, how the job will proceed , the precautions required and rescue methods needed in an emergency.

Personal Protective Equipment (PPE)

Appropriate PPE e.g. clothing, gloves, boots, eye, face and respiratory apparatus shall be worn to meet the requirements of the job.

Confined Space Entry Procedure

The following steps shall be used each and every time a confined space is entered by a worker. Where a client has specific confined space procedures for specific operations they will be followed so long as they offer equal or better protection.

Safety Planning / Hazard Assessment

If a worker enters a confined space following measures shall be taken;

- Carry out a job hazard analysis (if one has not been completed) of the physical and chemical hazards to which the worker is likely to be exposed both upon entry and during work activities.
- Specify the necessary tests to determine whether the worker would likely be exposed to any identified hazards

Job Safety Analysis

To prepare a safe work plan for the work to be performed, outline all actual and/or potential hazards and the controls used to reduce/eliminate them. Use the job hazard analysis requirements.

Hazards to consider include:

Oxygen enrichment or deficiency	Inflammable gas, dust, vapor
Combustible dust	Other hazardous atmospheres
Harmful substances	Hazardous energy, equipment
Engulfment, and/or entrapment	Other hazardous conditions

The procedure shall also take the following controls into consideration:

Isolation, lockout, tagging of hazards	Controls of ignition sources
Movement of material	Ventilation and purging
Lighting	Alarms and communication methods
Means of access and egress	Personal protective equipment
Atmospheric testing requirements/frequency	Emergency equipment
Emergency response procedures	Warning signs/barricades
Training requirements	Additional safety procedures

Energy and Equipment Lockout

The supervisor should arrange for the confined space to be checked to ensure that all blinding, blanking or other effective methods are used to prevent contaminants from entering the confined space.

Where purging is necessary to prevent the development of a hazardous atmosphere in the confined space, water and fresh clean air can be used. When this is completed then a further test shall be done to verify the atmospheric content prior to entry.

Before entry all power driven internal equipment and power sources shall be de-energized and locked out to ensure they cannot be operated.

Ensure adequate lighting and that power sources are intrinsically safe.

Ventilation

Where possible, clean-out doors or any other openings shall be positively locked open and the confined space thoroughly ventilated by a positive method of mechanical ventilation to introduce large quantities of fresh air.

Ensure the air introduced into the confined space is not accidentally contaminated with harmful substances before it enters the confined space.

Continuous ventilation with mechanical ventilation equipment shall be done where necessary to provide secondary protection in the event the work in progress produces contamination, heat or toxic fumes.

Appoint Safety Guard (attendant) / Set up Communications.

Ensure that a person for the guard duties is aware of their responsibilities.

The guard is positioned at the confined space entrance and is equipped with the confined space procedure, permit, communications equipment and emergency equipment.

The guard should be capable of rescuing if required (without actual entry) and should be able to communicate constantly with the workers inside either visually or by radio.

The guard should not leave the post unless relieved by a qualified person. The supervisor shall be notified by the guard of any dangerous situations that they become aware of. The guard will have basic first aid and training, or be able to immediately contact someone in the vicinity who does.

Sign In / Sign Out

It is the guard's responsibility to maintain a log system in the immediate area of the confined space. Workers entering the confined space should sign in and out and record the time of entry.

Communications

The supervisor should ensure that an adequate communications system is in place and/or visual contact can be maintained between the guard and the workers in the confined space.

Confined Space Permits

The supervisor will be responsible to ensure that all notifications and permits at the work site have been completed prior to entry.

Ensure a written confined space work permit is completed and signed by a competent person and include as a minimum all of the following information:

1. The length of time for which the permit is valid (12 hour maximum)
2. The identity of each worker entering the confined space
3. The activity to be performed by the workers
4. The location of the confined space
5. The results of the atmospheric testing of the confined space both at the time the permit was issued and more often as required
6. The applicable precautions to protect the workers outlined in the plan

Atmospheric Testing

Prior to any entry being made, portable instrumentation for sampling of oxygen concentrations, explosive concentrations and potential airborne contaminants in the confined space shall be used by a competent person to determine atmospheric conditions.

When a job is stopped for any reason and workers have to re-enter after a prolonged work break, then testing shall be done again before entry if work permits are still in place.

Safe Work Practices for Confined Space Entry

Where work is to be carried out in a confined space the following will be considered when completing the Job Safety Analysis / Procedure:

Types of Confined Spaces

- A. Type 1 – safe atmosphere provided (no immediate atmospheric hazard)
- B. Type 2 – hazardous atmosphere which can be made safe to enter
- C. Type 3 – potentially explosive atmosphere
- D. Type 4 – hazardous / unknown atmosphere on a continuous basis

Job Completion

At the end of the job, a thorough check shall be made by the supervisor to ensure that no tools, equipment or possibly workers have been left behind. Double check and ensure that all personnel are accounted for before leaving the confined space.

Return the work permit to the responsible supervisor for finalization and to ensure that any locks etc. belonging to the crew are removed.

Electrical Safety

Accidental contact with electrical components can have deadly consequences. Always refer to the manufacturer's recommended operating practices prior to using new electrical appliances, tools and equipment. Following guidelines shall be used to reduce the risk of personal injury.

1. No electrical work should be done without prior risk assessments and issuance of PTW.
2. While working on electrical systems, all required PPEs should be used.
3. All electrical tools and appliances shall be double insulated or have a three prong plug-in.
4. Only qualified and authorized electricians should be allowed to service and repair electrical appliances, tools and equipment.
5. Prior to operating electrical powered tools and equipment, it shall be ensured that work is carried out on a dry surface.
6. Tools with damaged cords, grounds and housing units shall be tagged "Out of Service" and sent for repair
7. Missing or damaged ground plugs of any appliance, tool or piece of equipment shall be repaired prior to use.
8. Damaged extension cords shall be tagged "Out of Service", repaired or replaced as warranted.
9. Always stand to the side of a service box when resetting a breaker.
10. Disconnect power tools from power source before making adjustments. Defective equipment needs to be tagged "Out of Service" and removed.
11. Tools with electrical arcing brushes should be removed when you feel any tingling during use.

Mechanical Safety

Basic safety Precautions for welding

1. Always wear a proper face shield
2. Wear close-toed shoes
3. Wear a long-sleeved, non-flammable shirt
4. Wear proper welding gloves
5. Wear ear protection (earplugs or muffs) to prevent sparks from entering your ear canal. An eardrum punctured by a spark will instantly cauterize and never heal
6. NEVER weld on or near anything that's been cleaned with a chlorinated hydrocarbon like brake-cleaner. When combined with UV light, chlorinated hydrocarbons can create phosgene gas, which can cause serious injury or death. Ventilation will not prevent poisoning

7. Before turning on a welding machine, make sure there are no puddles of water on the floor around the weld bench or the machine. Make sure the weld machine is dry.

Oxyacetylene welding, cutting and brazing

1. Store the cylinders in a well-ventilated area, preferably in the open air
2. The storage area should be well away from sources of heat, sparks and fire risk
3. Cylinders should be stored upright and well secured
4. The store area should be designated 'No Smoking'
5. Always use goggles when welding or cutting
6. Use aprons and gloves
7. Do not point the flame towards the regulators and another person
8. When finished welding shut off the main valves, bleed the lines and loosen the regulator adjusting screws
9. Never use oil near oxygen equipment
10. Gas hoses must be in good condition
11. Suitable fire extinguisher must be provided
12. Threads used for acetylene are left-handed
13. Threads used for oxygen are right-handed

Safety Precautions while Working on Lathe Machine

1. Operator should always be sure that all guards are in place before running the lathe machine
2. Always keep the lathe machine clear of tools
3. Machine should be stopped before making measurements or adjustments on the work piece
4. Wear an apron or a properly fitted shop coat. Goggles should also be used to avoid chip particles contact with human body
5. Wear appropriate safety glasses. It may be necessary for others in the area to wear safety glasses too as objects will fly off the work
6. Ensure entanglement hazards are removed (e.g. loose clothing, jewelry, etc.
7. Keep the floor free from obstructions, or slip hazards
8. Ensure that lathe has a start/stop button within easy reach of the operator
9. Inspect chucks for wear or damage. Flying pieces can be very dangerous

10. Remove chuck wrench immediately after adjusting chuck
11. Use a barrier guard when operating the lathe in semi-automatic or automatic mode
12. Keep all lathe cutting tools sharp
13. Shut off the power supply to the motor before mounting or removing accessories
14. Use a vacuum, brush or rake to remove cuttings only after the lathe has stopped moving

Safety precautions while working on milling machine

1. The cutter and arbor must be secured. The Work shall be clamped securely before the Machine is started
2. Adjust transparent shield over the cutter to Prevent accidental contact with the cutter. This will also serve as a chip guard
3. Hands shall be kept away from work when machine is running
4. Remove metal chips with a brush or other suitable tool, never by hand or with compressed air
5. Areas around milling machine should be kept clear of obstructions and in a non-Slippery condition
6. Only qualified personnel are permitted to operate the milling machine

Safe Work Procedures for shaping machine

DO NOT use the machine unless you have been instructed in its safe use and operation and have been given permission

1. Wear proper eye and ear protection
2. Always use the shaper insert
3. Wear a dust mask or connect a dust collection system to the dust chute. Keep the dust chute mounted to the shaper insert even if you do not have a dust collection system. The chute guards the cutter below the table. You can collect dust and chips in a trash receptacle positioned beneath the table
4. Tuck long hair under a hat or tie it up. Do not wear ties, gloves, jewelry or loose clothing. Roll sleeves up above your elbows. Wear nonslip footwear.
5. When mounting cutters and collars, make certain that the tongue washer is correctly installed and directly under the hex nut and that the nut is tight. Also that the arbor setscrew is tightened against the flat of the spindle.
6. Be sure the cutter(s) is positioned with the cutting edge facing to the left. Listen for chatter or signs of looseness at start-up. If you hear, see or suspect problems, turn off the power and unplug the machine. Correct any problem before proceeding.

Safety precautions for using power hacksaw

Never attempt to use a power hacksaw until you have prepared yourself adequately for the task. Make sure that long or loose hair is tied back or covered securely. All kinds of jewelry should be removed to help eliminate the risk of snagging. Protective clothing such as overalls or aprons should be worn to prevent loose clothing from being caught in the blade. Protect your ears with adequate hearing protection such as plugs or mufflers. Also, protect your eyesight with safety glasses. Because metals can be heavy, always wear steel-toe capped boots. Be aware of where the emergency stop buttons are located; most machines should have a foot switch and you should always be ready to use it. Always be ready to turn the machine off by making a mental plan of action before starting. When in use, stay well away from the blade and any other moving parts. Never attempt to remove cuttings or adjust the material while the blade is in action. If there is an obvious problem, turn off the machine and wait until it has stopped before attempting to adjust it.

Safety precautions for using pedestal drilling machine

1. Ensure the drill bit is in the chuck correctly
2. Ensure the chuck key is removed prior to operating the machine
3. Adjust all guards correctly prior to use
4. When drilling make certain that the material is held tight. (use clamp or vice)
5. Keep work area clean at all times
6. Machines must be isolated from power sources when being cleaned, adjusted, maintained or repaired
7. Do not wear loose clothing or jewelry and restrain long hair
8. Hearing protection must be worn
9. Wear safety shoes
10. Ensure enough space / work area clear of tripping hazards
11. Eye protection must be worn
12. Wear gloves when working with sharp edges

Safety precautions while working with pedestal grinder

1. Pedestal Grinders should be securely attached to the floor and Bench Grinders should be securely fastened to a bench in order to handle grinding operations.
2. Always check that a Grinding Wheel R.P.M Rating is consistent with speed of the Grinding Machine.
3. Always wear eye protection (safety glasses or face shield)
4. Never remove guards from a Bench/Pedestal Grinder. They offer protection in case of wheel failure and protects hands and fingers from injury.

5. Before commencing grinding, allow the grinding wheel to run at operating speed for at one minute. Do not stand directly in front of a Grinding Wheel when it is first started. Do not use a wheel that vibrates.
6. Ensure that the hole in the grinding wheel fits closely on the spindle.

Fire and Fire Extinguishers

Good housekeeping is essential in the prevention of fires. Fires can start anywhere and at any time. This is why it is important to know the type of fire extinguisher to use and how to use it

Always keep fire extinguishers visible with easy access. Fire extinguishers shall be properly maintained. Where temperature is a factor, that care is taken in selecting the right extinguisher. Workers shall receive training before using fire extinguishing equipment.

Classification of Fires

Fires are classified according to the fuel type involved

Class “A” fires are those fueled by combustible solids, such as wood, paper, excelsior, rags and rubbish.

Class “B” fires occur in the vapor-air mixture over the surface of flammable liquids, such as gasoline, oil, grease, paints and thinners.

Class “C” fires is concerned with flammable gases like butane and methane etc.

Class “D” fires occur with pyrophoric (combustible) metals such as magnesium, titanium, lithium, sodium, potassium, etc.

Class “E” (Electrical) fires involve energized electrical equipment’s like computers, generators etc.

Class “F” fires involve cooking oils or fats, such as those found in a deep fryer.

Fire extinguishers are classified according to their ability to handle specific classes of fires.

Type Extinguisher	CLASS A	CLASS B	CLASS C	CLASS D	Electrical	CLASS F	Comments
	Combustible materials (e.g. paper & wood)	Flammable liquids (e.g. paint & petrol)	Flammable gases (e.g. butane and methane)	Flammable metals (e.g. lithium & potassium)	Electrical equipment (e.g. computers & generators)	Deep fat fryers (e.g. chip pans)	
Water	✓	✗	✗	✗	✗	✗	Do not use on liquid or electric fires
Foam	✓	✓	✗	✗	✗	✗	Not suited to domestic use
Dry Powder	✓	✓	✓	✓	✓	✗	Can be used safely up to 1000 volts
CO2	✗	✓	✗	✗	✓	✗	Safe on both high and low voltage
Wet Chemical	✓	✗	✗	✗	✗	✓	Use on extremely high temperatures

Fire Protection

Hazardous accumulations of combustible materials are controlled so that a fast developing fire, rapid spread of toxic smoke, or an explosion will not occur. All employees should be aware of the hazardous properties of materials in their workplaces, and the degree of the hazard each poses. Accumulations of materials that can cause large fires or generate dense smoke that are easily ignited or may start from spontaneous combustion are the types of materials that are the greatest concern.

Matches/lighters, welder's sparks, cigarettes, and similar low-level energy ignition sources may easily ignite such combustible materials. Housekeeping inspections will be conducted on regular basis, designed to discover and eliminate such hazards.

Various types of the fire extinguisher will be place at various locations.

Fire detection system, fire water net-work, and firefighting system are in place in the plant.

House Keeping

1. Good housekeeping shall be practiced at all times. Tripping hazards and slippery conditions shall be eliminated. Aisles and access ways shall be kept clear of any obstruction, and be well-lit and properly ventilated.
2. Scraps shall be removed to disposal bin or designated disposal area.
3. Nails or sharp objects protruding from lumber or boards shall be removed.
4. Daily job site cleanup is required and individual cleanup duties shall be assigned to all workers.
5. All materials shall be segregated as to size, kind and length and placed in neat, safe and orderly piles. This will ensure clear passageways in storerooms, warehouses and on job/project sites creating a safe workplace for all employees.

6. Materials shall be properly stored, stacked or piled away from power lines and to prevent tipping/spilling.
7. Bagged or sacked material should be stacked or piled no more than ten high and should be cross piled on skids so that in all cases, no one can be injured because the material falls, rolls, overturns or breaks.
8. Barrels shall be stacked upright with platforms/planks between layers and should not be stacked any higher than the mechanical equipment can safely reach.
9. Skids of brick blocks or other such material should be stockpiled in such a manner as to prevent tipping or collapsing.
10. Employees are not allowed to climb up, on or about around any such stacked equipment, machinery, supplies, parts, products, etc.
11. Stockpiles should be blocked and interlocked ensuring that they are not too high or obstruct any fire access, extinguishing or fire safety equipment (e.g. fire doors).
12. Proper tools, such as cutters or snips, shall be used to break metal bands and extreme caution should be taken when removing such objects.
13. Protruding nails in boards, planks, etc., should have the nails removed or bent over, and the boards placed in an orderly fashion. When handling such material, the workers should wear heavy gloves and safety footwear as prescribed.
14. Signs shall be posted to warn workers of hazardous areas.

Power Tools & color coding

1. Read the manual carefully to learn power tool's applications, limitations and any potential hazards and color coding of tools should be done on regular basis.
2. Ground tool unless it is double insulated.
3. Power tool shall not be used in rain, damp or wet locations or in the presence of explosive atmospheres (gaseous fumes, dust or inflammable materials).
4. The materials or debris shall be removed that may be ignited by sparks.
5. Work area should be kept clean and well lit.
6. Loose clothing or jewelry should not be used.
7. A protective hair covering shall be worn to contain long hair, which may be caught in moving parts.
8. Rubber gloves and insulated non-skid footwear outdoors shall be used.
9. Hands and gloves should be kept away from moving parts.
10. Safety goggles or glasses shall be used with side shields that comply with current safety standards.

11. Hearing protection is a must during extended use of a power tool.
12. Dust mask shall be used for dusty operations.
13. Other personal protective equipment shall be used as required.
14. A fire extinguisher should be kept nearby.
15. All bystanders should be kept at a safe distance from the work area to protect themselves and the operator.
16. Provide barriers or shields as necessary to protect others in the work area from sparks and debris.
17. Secure work with a clamp, vise or other practical means of holding work secure. Use both hands to control tool.
18. Do not use a tool or attachment to do a job for which it is not recommended. Do not alter a tool.
19. Non-recommended accessories may be hazardous and shall not be used. Install and maintain accessories as per tool instructions.
20. Do not defeat a guard or other safety device when installing an accessory or attachment.
21. Inspect guards and other parts before use. Check for misalignment, binding of moving parts, improper mounting, broken parts and any other condition that may affect operation.
22. If abnormal noise or vibration occurs the tool should be turned off immediately and the problem corrected before further use of the tool.
23. Check that all adjusting keys and wrenches are removed from the tool before the power is turned on.
24. Prevent body contact with grounded surfaces, such as pipes, radiators, ranges and refrigerators.
25. When making blind or plunge cuts, always check the work area for hidden wires or pipes.
26. Hold tool by insulated non-metal grasping surfaces.
27. Use a Ground Fault Circuit Interrupter (GFCI) to reduce shock hazards.
28. Do not force a tool to perform at a rate other than for what it was designed. Excessive force causes operator fatigue, increased wear and reduced control.
29. Keep hands away from all cutting edges and moving parts.
30. Never carry tool by its cord or unplug it by yanking cord from the outlet. Pull plug rather than cord to reduce the risk of damage.
31. Keep the cord away from heat, oil, sharp objects, cutting edges and moving parts.
32. Do not overreach. Maintain proper footing and balance at all times. Use extra care when using tool on ladders, roofs, scaffolds, etc.

33. Do not use a tool when tired, distracted or under the influence of drugs, alcohol or any medication which decreases control.
34. Unplug tool when it is not in use, before changing accessories or performing recommended maintenance.
35. Maintain tools. Keep handles dry, clean and free from oil and grease. Keep cutting edges sharp and clean. Follow instructions for lubricating and changing accessories.
36. Periodically inspect tool cords and extension cords for damage.
37. When power tools are not in use, store them in the proper storage cases. If equipment does not have a proper storage case, store in an on-site job box with lock, or return to storage crib at the shop.
38. Report any damaged tools immediately so a replacement or repair can take place. Tag the damaged tools with "DO NOT USE".
39. Maintain labels and nameplates.

Safety precautions while using boat in reservoir

1. Beware of weather condition and boat operator must be trained & it is not allowed to use boat in reservoir alone must there always be at least two people, but not more than four in power boat
2. Before using boat check the fuel and air regularly and there should be no leakage as well
3. Ignition safety switch (use to shut-off boat engine) must be installed in boat which can be used by operator in case of emergency
4. PFD (personal floating devices) e.g. life jackets must be provided and worn before riding on boat
5. Must confirm that there is no immersion of net in the reservoir for fishing purpose before using power boat.
6. Dock line must be provided.
7. Ring guard must be installed around propeller as a physical barrier.
8. Do not smoke inside the boat.
9. Every person must be known that how to swim?
10. Whistle or horn and Walkie Talkies should be provided.
11. Do not boat under the influence (BUI) e.g. avoid alcohol or any other drugs

Lockout Tagout (LOTO)

Lockout/ Tag out" refers to specific practices and procedures to safeguard employees from the unexpected startup of machinery and equipment, or the release of hazardous energy during service or maintenance activities.

This requires that a designated individual turns off and disconnects the machinery or equipment from its energy source(s) before performing service or maintenance and that the authorized employee(s) either lock or tag the energy-isolating device(s) to prevent the release of hazardous energy and take steps to verify that the energy has been isolated effectively.

Responsibilities:

Authorized Employee - one who locks out machines or equipment in order to perform the servicing or maintenance on that machine or equipment.

Affected Employee - one whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

Energy Isolating Device - A mechanical device that physically prevents the transmission or release of energy.

Tagging System – identification tag provided in the valve together with the lock to identify the users of tag, the purpose, duration of activities, contact number or location, etc...



Types of lockout devices

1. Plug locks
2. Ball valve lockout
3. Gate valve lockout
4. Group lockout hasp



Lockout procedures

- Inform the operator (s) that power is being disconnected.
- Preparation for Shutdown
- Equipment Shutdown
- Equipment Isolation
- Application of Lockout Devices
- Control of Stored Energy
- Equipment Isolation-Verification
- Periodic Inspection of LOTO

Removal of lockout

- Ensure equipment is safe to operate
- Safeguard all employees
- Remove lockout/tag out devices. Except in emergencies, each device must be removed by the person who put it on.

Necessary safety precautions before starting unit

1. Firstly check that SP Tag (Self-Protection Tag) or Trouble report must be closed regarding maintenance work before starting unit, if open, do not operate any unit until the trouble report is closed
2. Before starting unit Operator must do general visit of unit and its surrounding (especially generator pit) to confirm that nobody is working there.
3. For starting units Shift control engineer has to make announcement on public addressing system five minutes early to alert everybody in power house.

Equipment Safe Work Practice

Elevating Work Platforms

1. Worker who operates an elevating work platform shall be given an oral and written instruction initially on the operation of the elevating device. An elevating work platform shall only be operated by a worker who has been instructed in:
 - operating the machine;
 - the daily inspections and maintenance required;
 - the types of working surface on which the machine is designed to be used;
 - the maximum rated working load;

- special conditions or limitations of the machine;
 - the significance of alarms; and
 - the location of emergency controls
2. An elevating work platform which is not working properly or which has sustained damage to critical components will not be used until repaired by a qualified mechanic.
 3. In the raised position, an elevating work platform shall only be used on surfaces specified.
 4. An elevating work platform shall not be driven in a raised position close to holes, depressions, trenches or similar hazards.
 5. An elevating work platform shall not bear more than its rated working load and, where possible, the loads shall be distributed over the platform.
 6. When elevating work platforms are used to lift materials, care will be taken to ensure that the materials are firmly secured to the platform.
 7. Makeshift platforms, such as boxes, or proper access equipment, such as ladders and scaffolds, should not be placed on an elevating work platform to gain access to areas above.
 8. Overhanging loads shall not be lifted on an elevating work platform.
 9. An elevating work platform or any other part of an EWP device should not be moved closer than 3 meters (10 feet) to overhead power lines, unless the device is equipped for live electrical line work and the workers on the platform are qualified for such work.
 10. An elevating work platform shall not be used for pulling, pushing or dragging materials.
 11. The platform of an elevating work platform shall not be extended by using cantilevered planks or similar platform materials.
 12. Planks or similar platform materials shall not be used to bridge a gap between an elevating work platform and other work areas.
 13. Workers shall always maintain 3-point contact (one hand and two feet or two hands and one foot) when getting on or off the platform of an elevating work platform.
 14. For all types of off-slab devices, the terrain on which the device is placed or over which it will travel should be firm enough to support the device and its rated working load.
 15. An elevating work platform shall not be used under high wind conditions. This is especially important for smaller scissor lifts and boom-type devices.
 16. When the elevating work platform is not being used, power system will be turned off to prevent exhaust fumes from accumulating in an enclosed work area.
 17. Elevating work platforms used on ramps or on sloping or uneven surfaces shall be designed for such use and properly secured against horizontal and vertical movement.

Forklifts

Following rules shall be applied for Safety purpose.

1. Operate only if trained.
2. Know the manufacturer's manual. Never exceed manufacturer's load rating.
3. Inspect all components prior to use.
4. Keep forks and speed low at all times
5. When parked, always place forks flat on the ground.
6. Drive in reverse when moving bulky items to avoid blind spots.
7. Ensure forks are fully seated and square when lifting pallets.
8. Damaged or improperly loaded pallets should not be moved.
9. Do not carry passengers.
10. Never leave a machine unattended with an elevated load.
11. Use seat belt (mandatory)

Inspection and Maintenance

Defective ladders will be taken out of service, either tagged for repair or scrapped. Personnel that are competent in this type of work should repair ladders.

1. Inspect ladders for structural rigidity.
2. Inspect non-skid feet for wear, imbedded material and proper pivot action on swivel feet.
3. Replace frayed or worn ropes on extension ladders with type and size equal to manufacturer's original rope.
4. Aluminum ladders shall be checked for dents and bends in side rails, steps and rungs. Metal pipe should not be used to replace a rung.
5. Wooden ladders shall be checked for cracks, splits and rot.
6. All ladders will be checked for grease, oil, caulking, imbedded stone and metal or other materials that could make them unsafe.

Lifting Practices (Hoisting)

Evaluating the Load

The weight of the object or load will be determined prior to a lift to ensure the lifting equipment operates within its capabilities.

Balance Loads

Estimate the center of gravity or point of balance. The lifting device should be positioned immediately above the determined center of gravity.

Landing the Load

A place should be prepared for landing the load. Load will be lowered gently and it will be made sure it is stable before slackening the sling or chain.

1. Only appropriate slings shall be selected for the task so that the working load limits are not exceeded.
2. The hoist or crane should be directly over the load.
3. Use slings of proper reach. Line should not be shortened by twisting or knotting.
4. With chain slings, bolts or nuts should not be used.
5. Everyone should be strongly prohibited to ride the lifting hook or the load.
6. All personnel shall stand clear from the load being lifted.
7. Never work under a suspended load, unless the load is properly supported.
8. Never leave a load suspended when the hoist or crane is unattended.
9. All slings shall be inspected thoroughly at specified intervals and should be maintained in good condition.
10. Inspect each chain or sling for cuts, nicks, bent links, bent hooks, etc., before each use. If in doubt, don't use it.
11. Ensure that safety latches on hooks are in good working condition.
12. Ensure that the signaler is properly identified and understands techniques of proper signaling.
13. Make sure a tagline is used to control load.

Fall Equipment Safe Work Practice

Fall Protection Training

The O&M Regulation requires that:

1. Employers shall ensure that workers using a fall protection system are trained in its use and given adequate oral and written instructions.
2. Training and instruction records are kept, including training and instruction dates and workers' names.
3. Employers shall make training and instruction records available to inspectors on request.
4. Supervisors will verify that appropriate fall protection systems are in place on a project

All site personnel shall receive proper fall protection training. All personnel should bring their fall arrest equipment to the training. Training will include a short video and a questionnaire.

At the end of training session all personnel will be expected to have the knowledge to:

- know how to use the fall arrest equipment properly,
- Recognize hazards, and determine if other controls can be put in place to limit the need for fall arrest (e.g. guardrails).

Fall Protection Measures

Working from Scaffolds

1. Scaffold platforms shall be fully planked.
2. Guardrails consisting of a top rail, mid-rail and toe board shall be used whenever the working platform is 2.4 meters (8 feet) or more above floor level.
3. Wheels and casters shall be locked when personnel are working on the scaffold.
4. If the scaffold is more than 2.4 meters (8 feet) high, it should not be moved with personnel on it unless:
 - a. they wear full body harness with lanyard and shock absorber tied off to an independent fixed support, and
 - b. The floor is firm and level.

Working from Ladders

1. A worker should wear a full body harness with lanyard and shock absorber tied off to either an independent fixed support or a lifeline whenever the worker is:
 - a. 3 meters (10 feet) or more above the floor, or
 - b. Above operating machinery, or
 - c. Above hazardous substances or objects.

Fall Protection Equipment

Safety Harnesses and Lanyards

The following is the minimum requirement when working over 3 m (10') where no other means of fall protection is available.

1. Harnesses are to fit snugly to all parts of the body.
2. The D-ring on the harness is to be located in the center of the back between the shoulder blades.
3. Lanyards shall be 16 mm (5/8") diameter nylon or equivalent.
4. All lanyards should have a shock absorber.

5. Lanyards should have a maximum length of 1.5 m (5').
6. Lanyards should be connected to a rigid support or lifeline higher than waist level.
7. The shock absorber side of the lanyard should be connected to the D-ring.

Fall Arrest Protection – Definition

Consists of a lanyard or lifeline/lanyard set-up where the wearer is allowed some movement at an exposed edge to perform his/her work and if he tripped or lost his/her balance he could possible fall over the edge.

This fall protection system will be adjusted so as to limit the wearer's fall to within 1.5 meters from where he stands or sits and only full body safety harnesses should be allowed for his/her protection.

Equipment Standards and Set-Up

1. Safety harnesses and belts shall be snug-fitting and worn with all hardware and straps intact and properly fastened.
2. Lanyards will be 5/8" diameter nylon or equivalent.
3. The D-rings on the safety belts should be centered on the person's back.
4. The lanyard or lifeline and lanyard combination shall be secured to a rigid support capable of resisting the peak arrest forces of 1800 lbs minimum for fall arrest protection purposes and its length should be adjusted so that the wearer will be prevented from falling no greater than 1.5 meters from where he stands
5. When the lifeline consists of wire rope, or the connecting lanyard consists of nylon webbing, a shock-absorbing lanyard shall be used.

Lifelines

Safety lifelines should be:

1. 16 mm (5/8") in diameter propylene or equivalent.
2. Used by only one worker at a time.
3. Free from any danger or chafing, (welding slag, rubbing on mortar concrete, etc.).
4. Free of cuts, knots, abrasions or any other defects.
5. long enough to reach the ground or be terminated to prevent the hitch from running off

Access and Egress

- a. Areas of access and egress shall be adequately lit.
- b. If material may fall on a worker, overhead protection shall be provided.

- c. Access to and egress from a work area located above or below ground level shall be by stairs, runway, ramp or ladder.
- d. Areas of access and egress shall be kept clear of obstructions.
- e. Areas of access and egress shall be kept clear of snow, ice, or other slippery material.
- f. Areas of access and egress shall be treated with sand or similar material when necessary to ensure a firm footing.
- g. Every shaft shall have a means of access and egress by stairway, ladder, or ladder way for its full depth during construction and when it is completed.
- h. A cage or car on a hoist used for transporting workers in a shaft,
 - Shall be at least 1.8 meters high;
 - Shall be solidly enclosed, except for openings for access and egress;
 - Shall have a maximum of two openings for access and egress;
 - Shall have a gate at each opening for access and egress; and
 - Shall have a protective cover suitable to protect passengers from falling object.

Hierarchy of Control



Personal Protective Equipment

Please refer to the **Annexure C** for PPE policy.

S/No	Classification	Hazards	Types of PPE
1	Head protection	Impact from falling or flying objects, risk of head bumping, hair entanglement	Helmets, Hardhats
2	Eye & face protection	Chemical or metal splash, dust, projectiles, gas & vapors, radiations	Safety spectacles, goggles, face shields
3	Body protection	Temperature extreme, adverse weather, chemical or metal splash, spray from pressure leaks, impact or penetration, contaminated dust, entanglement because of loose clothing	Coveralls, aprons, special protective high visibility clothing
4	Feet & leg protection	Wet, electrostatic build-up, slipping, cuts and punctures, impact, chemicals, electric shock, skin infection, disease or contamination	Safety shoes with protective toe caps and penetration-resistant mid sole, gaiters, leggings, spats
5	Hands & arms protection	Abrasions, temperature extreme, cuts and punctures, impact, chemicals, electric shock, skin infection, disease or contamination	Gloves, gauntlets, mitts, armlets, wrist-cuffs
6	Breathing protection	Dust, vapor, gas, oxygen-deficient atmospheres	Disposable filtering face piece or respirators, half or full face respirators, air-fed helmets, breathing apparatus
7	Hearing protection	High noise from working equipment's, machinery and tools	Ear muffs, ear plugs
8	Fall protection equipment	Falls from height	Full body harness, lanyards, fall arrestor
9	Personal floating devices	Immersion and drowning when working at water	Buoyancy aid , life jackets, breathing apparatus, air-fed helmets

Accident/Incident Investigation & reporting

Effectively conducted accident investigations allow us to learn from the loss experience in order to strengthen our proactive efforts and prevent similar future loss situations.

K-water requires that all accidents and incidents that result in injury or property damage and all near misses with the potential for serious injury or property damage must be reported and investigated through HSE department.

Definitions:

An accident is defined as an unplanned event that causes harm to people or damage to property.

An Incident is an unplanned, unwanted event which lead to accident.

Investigation is a reactive process that should result in proactive improvements to accidents/incidents prevention measures.

Accidents are categorized as one of the following:

- **Lost Time Injury (LTI)** refers to any injury that prevents a worker from coming to work on the day following the day of the injury.
- **Medical Aid** refers to any injury not severe enough to warrant more than the day of injury off, but where medical treatment by a doctor is given.
- **First Aid** refers only to injuries that can be treated on the job without any days lost.
- A **Near Miss** is a situation in which no injury or damage occurred but might have if conditions had been slightly different.
- **Occupational Illness** is defined as a condition resulting from a worker's exposure to chemical, biological or physical agents in the workplace to the extent that the health of the worker is impaired.
- **Critical Injury** is defined as an injury of a serious nature that:
 - a) Places life in jeopardy;
 - b) Produces unconsciousness;
 - c) Results in substantial loss of blood;
 - d) Involves the fracture of a leg, arm or any part of body
 - e) Involves the amputation of a leg, arm, hand, foot or any part of body
 - f) Consists of burns to a major portion of the body
 - g) Causes the loss of sight to an eye

“Accident report form attached as an Annex D”

Investigation team (Comprising of team lead and representative from relevant departments) will be formed by GM and HSE manager to investigate all accidents and incidents that involve workers. This includes completing the Accident Investigation Report, taking statements from witnesses and collecting any other pertinent information and ensuring the injured worker has received the necessary medical

assistance. The initial incident/accident report must be forward to Star Hydro Power Limited (SHPL) within 24 hours. Each incident will be analyzed to determine causes and contributing factors and the analysis will be used to reduce or eliminate the risk of further incidents/accidents in future.

Hazard Reporting

The purpose of hazard reporting is to try to stop accidents before they occur. Employees shall be aware of their surroundings to prevent injury if possible.

It will be made sure that the employees are able to recognize and assess any dangerous or hazardous situations. Common sense plays a key role in this aspect of Health and Safety.

The workers will be aware of their surroundings helping to eliminate uncertainty. All the employees shall be encouraged to take time to walk around the workplace and get a feel for their surroundings before starting any work.

Employees will report any problem areas immediately. If areas of concern pose a threat to the health and safety of an individual, that individual shall report immediately to the supervisor on site.

The supervisor will assess the situation and will take necessary steps to correct the problem. If the situation requires a great deal of attention, then action will be taken.

Each employee is trained in rigging, fall protection, asbestos, and job specific hazards as they arise.

Set of standards to be followed by the employees in case of reporting hazards.

1. Each employee will inspect the workplace prior to commencing work.
2. Each employee will record any hazardous conditions on the job site.
3. Any hazards that are detected shall be reported immediately to the acting site supervisor. The supervisor will then assess the degree of hazard and act accordingly.
4. The supervisor will determine if a third party will need to be called in.
5. The employee will always be aware of his/her surroundings. It will be worker's responsibility to report anything that he/she deems as hazardous.
6. Common sense is a key factor in preventing a hazardous situation.

HSE Trainings

HSE department will be conducted periodic HSE trainings of the staff on all the required relevant trainings.

Please refer to the **Annexure E** for the HSE training matrix.

HSE Inspections / Audits and Management Review

HSE department will conduct monthly HSE inspection to monitor that all the required HSE instructions and protocol are being followed. This will also include inspection of fire extinguisher and other fire-fighting systems.

Please refer to the **Annexure F** for the monthly HSE inspection checklist.

In addition HSE department will conduct HSE audit half yearly. After each audit, there will be HSE management review meeting to discuss the findings of the HSE audit. This management review meeting will be led BY GM and will be attended by all department heads and their key staff.

Internal audit reports and minutes of the management review meetings will also be shared with SHPL.

Emergency Response Procedures (ERP)

Emergency situation can occur at any time in any work place. An emergency can occur in many forms. Medical Emergencies, Natural Disasters, disgruntled employees, industrial fires, major accidents, robbery, assault and other types of emergency can affect the wellbeing of our employees and operations at the facility.

Immediate actions during emergency

Attempt to save the situation but don't endanger yourself

Move to the muster point if you are not a member of the ERT (Emergency Response Team).

Account for yourself and your neighbor

Move to the muster point

Await for instructions

Emergency procedures should be established for collapses of structures, fire, explosions, critical injury, and toxic spill or release.

Slow response, lack of resources, or absence of trained personnel can lead to chaos in an emergency. To minimize losses, especially fatalities and injuries, personnel should know their responsibilities, know the procedures to follow, and be able to communicate in an emergency.

Following steps will be followed in developing the emergency response procedure.

1. List possible areas where emergencies such as fire, explosion, structural collapse, or chemical spills might occur.
2. For each type of hazard, identify the possible results – fatalities, injuries, structural or environmental damage.
3. Determine the required response, such as rescue, firefighting, or evacuation.

Annexure A Risk Assessment Sheet & Risk Matrix

No	Activity	Hazard	Hazard Description	Risk			Prevention or Control Measures	Residual Risk
				Likelihood (L)	Consequences (C)	Risk rating (L x C)		

Risk Matrix


Risk Rating (RR) = Likelihood (L) x Consequence (C)

		Consequences				
		Insignificant (1) No injuries / minimal financial loss	Minor (2) First aid treatment / medium financial loss	Moderate (3) Medical treatment / high financial loss	Major (4) Hospitalable / large financial loss	Catastrophic (5) Death / massive financial loss
Likelihood	Almost Certain (5) Often occurs / once a week	Moderate (5)	High (10)	High (15)	Catastrophic (20)	Catastrophic (25)
	Likely (4) Could easily happen / once a month	Moderate (4)	Moderate (8)	High (12)	Catastrophic (16)	Catastrophic (20)
	Possible (3) Could happen or known it to happen / once a year	Low (3)	Moderate (6)	Moderate (9)	High (12)	High (15)
	Unlikely (2) Hasn't happened yet but could / once every 10 years	Low (2)	Moderate (4)	Moderate (6)	Moderate (8)	High (10)
	Rare (1) Conceivable but only on extreme circumstances / once in 100 years	Low (1)	Low (2)	Low (3)	Moderate (4)	Moderate (5)

Risk Rating Action Table

Risk Ranking	Required Action
5 - Catastrophic	Stop The Job – Significant & Urgent Actions Are Required – Work Cannot Commence. Full risk assessment needs to be undertaken and risks eliminated
4 – Major	Consult with manager. Work cannot commence or continue until verification that control measures have effectively reduced risk severity ranking to as low as reasonably practical.
3 – Moderate	Consult supervisor. Additional control measures may be required to reduce risk severity ranking to as low as reasonably practical before the job can commence.
2 – Minor	Exposure must be managed by using JSA or work instructions. Evaluate conformance.
1 - Insignificant	Risk tolerable. No further actions required.

Annexure B PTW

PAKISTAN PATRIND HYDRO POWER PROJECT			
CUTTING / WELDING /HOT WORK PERMIT		PERMIT TO WORK NO.	
JOB DETAILS			
SPECIAL TOOLS TO BE USED			
LOCATION			
Issue Date		Time	
Validity Date		Time	
Do not proceed with your work until your permit has been authorized by the relevant member of staff.			
HAZARDS AND PRECAUTIONS TO BE TAKEN			
PRIMARY HAZARDS - fumes, combustibles, flammables			
PLEASE ANSWER THE FOLLOWING QUESTIONS TRUTHFULLY		YES	NO
Are you qualified / trained to undertake this work?			
Cutting welding, flame or spark producing equipment is in good condition			
Electrical equipment's are properly grounded e.g. generator			
Are the required PPEs available?			
All flammable and combustible material have been removed.			
Warning signs attached.			
All sources of flammable vapors or combustible dusts have been eliminated.			
Flashback arrestors are installed with Oxy-acetylene / gas cutting welding equipment's?			
Opening have been covered.			
All equipment has been cleaned.			
Check fire extinguisher condition and location.			
Other Precaution Required			

Other Safety Equipment Required			
AUTHORISATION AND ACCEPTANCE			
I confirm that I have verified the above information and ensured that the necessary precautions have been taken. It is safe to carry out the work as defined above and the permit information has been explained to all workers involved. I accept responsibility for this work.			
Permit Requester name		Signature	
Issue Authorizing Name		Signature	
HSE Representative name		Signature	
COMPLETION OR CANCELLATION			
I confirm that the work has been completed / partially completed *, checked by myself and the area left in a safe and tidy condition. (*delete as appropriate)			
Permit Requester name		Signature	
Issue Authorizing Name		Signature	
HSE Representative Name		Signature	
THIS PERMIT IS ONLY VAILD WHEN ALL SECTIONS ARE COMPELTE.			

PAKISTAN PATRIND HYDRO POWER PROJECT



CONFINED SPACE	PERMIT TO WORK NO.
-----------------------	---------------------------

JOB DETAILS

SPECIAL TOOLS TO BE USED

LOCATION

IS ANY OTHER WORK CURRENTLY BEING UNDERTAKEN THAT MAY INTERACT OR AFFECT THIS PERMIT (QUOTE PERMIT NUMBERS WHERE APPLICABLE)

~~Do not proceed with your work until your permit has been authorized by the relevant member of staff~~

HAZARDS AND PRECAUTIONS TO BE TAKEN

~~PRIMARY HAZARDS - Toxic atmosphere, oxygen deficiency, Excessive heat, sludge etc.~~

PLEASE ANSWER THE FOLLOWING QUESTIONS TRUTHFULLY

YES

NO

Are you qualified / trained to undertake this work?

Has the confined space been isolated from all connected pipework?

Has the confined space been purged with steam / water / air?

Has the confined space been electrically isolated and locked out?

All required PPEs available or not?

Is a supply of respirable air assured / ventilation required?

Is there an acceptable means of access to and escape from the confined space?

Is breathing apparatus at hand and in good working order?

Is a safety line / tripod / harness and any other back-up equipment to hand?

Are there adequate emergency arrangements in place?

TIME OF TEST 1

RESULT

TIME OF TEST 2

RESULT

OXYGEN

%

PASS / FAIL

OXYGEN

PASS / FAIL

HYDROGEN SULFIDE
%

PASS / FAIL

HYDROGEN SULFIDE

PASS / FAIL

CARBON MONOXIDE
%

PASS / FAIL

CARBON MONOXIDE

PASS / FAIL

COMBUSTIBLE GASES (LEL) %	PASS / FAIL	COMBUSTIBLE GASES (LEL)	PASS / FAIL
Other Precaution Required			
Other Safety Equipment Required			

AUTHORISATION AND ACCEPTANCE

I confirm that I have verified the above information and ensured that the necessary precautions have been taken. It is safe to carry out the work as defined above and the permit information has been explained to all workers involved. I accept responsibility for this work.

Permit Requester name		Signature	
Issuing Authorizing name		Signature	
HSE Representative name		Signature	

COMPLETION OR CANCELLATION

I confirm that the work has been completed / partially completed *, checked by myself and the area left in a safe and tidy condition. (*delete as appropriate)

Permit Requester name		Signature	
Issuing Authorizing name		Signature	
HSE Representative name		Signature	

THIS PERMIT IS ONLY VAILD WHEN ALL SECTIONS ARE COMPELTE.

PAKISTAN PATRIND HYDRO POWER PROJECT



Electrical Maintenance Work

PERMIT TO WORK NO.

JOB DETAILS

SPECIAL TOOLS TO BE USED

LOCATION

Issue Date		Time	
Validity Date		Time	

Do not proceed with your work until your permit has been authorised by the relevant member of staff.

HAZARDS AND PRECAUTIONS TO BE TAKEN

PRIMARY HAZARDS - Shock, Electrocution, Flammables, combustibles

PLEASE ANSWER THE FOLLOWING QUESTIONS TRUTHFULLY

YES

NO

Are you qualified / trained to undertake this work ?

Has the electrical supply been switched off ?

Are fire extinguishers required ?

Is a fire blanket required ?

Have any combustibles / flammables been removed ?

Is LOTO required ?

Are the required PPEs available ?

Is earthing/grounding required ?

Are GFCI (Ground fault circuit breakers) required ?

Are caution / danger sign required ?

Other Precaution Required

Other Safety Equipment Required

AUTHORISATION AND ACCEPTANCE

I confirm that I have verified the above information and ensured that the necessary precautions have been taken. It is safe to carry out the work as defined above and the permit information has been explained to all workers involved. I accept responsibility for this work.

Permit Requester name		Signature	
Issuing Authorising name		Signature	
HSE Representative name		Signature	

COMPLETION OR CANCELLATION

I confirm that the work has been completed / partially completed *, checked by my self and the area left in a safe and tidy condition. (*delete as appropriate)

Permit Requester name		Signature	
Issuing Authorising name		Signature	
HSE Representative name		Signature	

THIS PERMIT IS ONLY VALID WHEN ALL SECTIONS ARE COMPLETED.



PAKISTAN PATRIND HYDRO POWER PROJECT

Mechanical Maintenance Work

PERMIT TO WORK NO.

JOB DETAILS

SPECIAL TOOLS TO BE USED

LOCATION

Issue Date

Time

Validity Date

Time

Do not proceed with your work until your permit has been authorized by the relevant member of staff.

HAZARDS AND PRECAUTIONS TO BE TAKEN

PRIMARY HAZARDS: Entanglement, moving parts, gases, liquids, painting fumes, falling objects etc.

PLEASE ANSWER THE FOLLOWING QUESTIONS TRUTHFULLY

YES

NO

Are you qualified / trained to undertake this work?

Are appropriate signs to be Placed?

Are crawl boards with handrails and roofing ladder to be used?

Is scaffolding /platform and / or body harness required?

Is electricity disconnected?

Has harness been inspected?

Are weather condition acceptable?

Is LOTO required?

Is there any risk from falling objects?

Is maintenance activity performing in confined space?

Is there any risk of releasing toxic gases like H₂s , CO etc.

Are personal protective equipment's required?

Other Precaution Required

Other Safety Equipment Required

AUTHORISATION AND ACCEPTANCE

I confirm that I have verified the above information and ensured that the necessary precautions have been taken. It is safe to carry out the work as defined above and the permit information has been explained to all workers involved. I accept responsibility for this work.

Permit Requester name

Signature

Issue Authorizing Name

Signature

HSE Representative name

Signature

COMPLETION OR CANCELLATION

I confirm that the work has been completed / partially completed *, checked by myself and the area left in a safe and tidy condition. (*delete as appropriate)

Permit Requester name

Signature

Issue Authorizing Name

Signature

HSE Representative name

Signature

THIS PERMIT IS ONLY VALID WHEN ALL SECTIONS ARE COMPLETE.

PAKISTAN PATRIND HYDRO POWER PROJECT



WORKING AT HEIGHTS

PERMIT TO WORK NO.

JOB DETAILS

SPECIAL TOOLS TO BE USED

LOCATION

Issue Date		Time	
Validity Date		Time	

Do not proceed with your work until your permit has been authorized by the relevant member of staff.


HAZARDS AND PRECAUTIONS TO BE TAKEN

PRIMARY HAZARDS -Unstable poor access, unprotected edges, voids, Deteriorating material etc.

PLEASE ANSWER THE FOLLOWING QUESTIONS TRUTHFULLY	YES	NO
Are you qualified / trained to undertake this work?		
Are appropriate signs to be Placed?		
Are crawl boards with handrails and roofing ladder to be used?		
Is scaffolding /platform and / or body harness required?		
If yes, is scaffolding platform in place and inspected?		
Has harness been inspected?		
Are weather condition acceptable?		
Risk Assessment conducted or not?		
If yes any hazards from fumes, etc.?		
Is there any risk from falling objects?		
Are there any existing overhead services crossing and /or adjacent to proposed height working		
Is edge protection / toe boards required?		

Is Personal Protective Equipment's required?			
Other Precaution Required			
Other Safety Equipment Required			
AUTHORISATION AND ACCEPTANCE			
I confirm that I have verified the above information and ensured that the necessary precautions have been taken. It is safe to carry out the work as defined above and the permit information has been explained to all workers involved. I accept responsibility for this work.			
Permit Requester name		Signature	
Issue Authorizing Name		Signature	
HSE Representative name		Signature	
COMPLETION OR CANCELLATION			
I confirm that the work has been completed / partially completed *, checked by myself and the area left in a safe and tidy condition. (*delete as appropriate)			
Permit Requester name		Signature	
Issue Authorizing Name		Signature	
HSE Representative name		Signature	
THIS PERMIT IS ONLY VAILD WHEN ALL SECTIONS ARE COMPELTE.			

Annexure C PPE Policy

	Personal Protective Equipment (PPE) Policy			The Best Water Partner
	Doc. ID.	Issue Date	Rev. #	
	K-water / HSE Policy-002	June 29, 2018	00	

PPE Policy

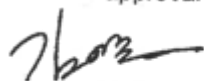
Personal protective equipment plays an important role in reducing the effects of an incident on people involved in it. K-water shall as far as is practicable eliminate or control hazards in the workplace. Personal Protective Equipment (PPE) shall be worn / used as a control measure where:

1. It is not otherwise practicable to eliminate or control the hazard effectively; or
2. As an additional protective measure to existing control mechanisms

Staff, contractors including subcontractors and visitors shall use PPE as required by the company and shall immediately inform their supervisor of any defects or deficiencies in such equipment of which they become aware.

Managers and supervisors or staff, contractors / subcontractors, visitors at all company operational sites (Power-site & Weir-site) shall ensure that:

1. All tasks performed are assessed to determine the requirement for PPE.
2. The selection, supply and maintenance of PPE is suitable and sufficient to adequately protect the users from hazards.
3. All persons required to use PPE receive appropriate instruction in the safe use and maintenance of PPE.
4. The requirement to use PPE is enforced.
5. Clear and appropriate signs are displayed in areas where PPE must be worn.
6. All persons entering the operational areas (process areas) shall wear the mandatory PPEs (Helmet, safety shoes, visible jacket, cover-all & ear-plugs / muffs). In addition, job specific PPEs shall be used by the relevant work-force at company operational sites, where required.
7. Company driver must wear company uniform and proper shoes (fit-for-purpose) while on duty.
8. Procurement process of the PPEs shall be initiated once the policy approved and company shall maintain suitable stock of the PPEs at all time.
9. This policy shall be effective from the approval date.
10. Timeline for the complete implementation of this policy shall be three (03) months from the approval date.



Young Ho Kim

General Manager

Patrind Hydro Power Plant

Annexure D Accident Report Form

ACCIDENT REPORT FORM

Name of Immediate plant general Manager:		
1. Date:	2. Time:	3. Location :
4. Type of Incident:		5. Nationality:
6. Name of Involved Person:		7. Job Title:
8. Incident Detailed Description:		
9. Witness of the Incident:		

10. Immediate Action Taken:

11. Corrective Action to be taken :
--

REPORTED BY: _____

NOTED BY: _____

Annexure E HSE Training Matrix

[illegible]

Compulsory for all

Job specific

Annexure F Monthly HSE Inspection Checklist

HSE Inspection Checklist

Inspected by:			
Project:		Pakistan Patrind Hydro Power Project	
Number of Employees:			Checklist for:
Date:			

1. PERSONAL PROTECTIVE EQUIPMENT	OK	Not OK	ACTION TAKEN
Hard hats worn	<input type="checkbox"/>	<input type="checkbox"/>	
Fall protection worn	<input type="checkbox"/>	<input type="checkbox"/>	
Skin protection: Worn	<input type="checkbox"/>	<input type="checkbox"/>	
Available	<input type="checkbox"/>	<input type="checkbox"/>	
Eye & face protection: Worn	<input type="checkbox"/>	<input type="checkbox"/>	
Available	<input type="checkbox"/>	<input type="checkbox"/>	
Hearing protection: Worn	<input type="checkbox"/>	<input type="checkbox"/>	
Available	<input type="checkbox"/>	<input type="checkbox"/>	
Respiratory protection: Worn	<input type="checkbox"/>	<input type="checkbox"/>	
2. FIRE PROTECTION	OK	Not OK	ACTION TAKEN
Extinguishers properly located	<input type="checkbox"/>	<input type="checkbox"/>	
Fully charged	<input type="checkbox"/>	<input type="checkbox"/>	
Adequately identified	<input type="checkbox"/>	<input type="checkbox"/>	
Emergency assembly point	<input type="checkbox"/>	<input type="checkbox"/>	
3. HOUSEKEEPING	OK	Not OK	ACTION TAKEN

Availability of colour bins for proper segregation and disposal of waste	<input type="checkbox"/>	<input type="checkbox"/>	
Clear walkways	<input type="checkbox"/>	<input type="checkbox"/>	
Clear work areas	<input type="checkbox"/>	<input type="checkbox"/>	
Clear access and landing	<input type="checkbox"/>	<input type="checkbox"/>	
4. POWER TOOLS, EQUIPMENT	OK	Not OK	ACTION TAKEN
General condition	<input type="checkbox"/>	<input type="checkbox"/>	
PPE	<input type="checkbox"/>	<input type="checkbox"/>	
Proper cable management	<input type="checkbox"/>	<input type="checkbox"/>	
Double insulated tools	<input type="checkbox"/>	<input type="checkbox"/>	
Proper guards as a physical barrier for Lathe machine, milling, shaping machines, power hacksaw etc.	<input type="checkbox"/>	<input type="checkbox"/>	
Proper grounding of all machines/Generators, transformers etc.	<input type="checkbox"/>	<input type="checkbox"/>	
5. GAS CYLINDERS	OK	Not OK	ACTION TAKEN
Properly located	<input type="checkbox"/>	<input type="checkbox"/>	
Properly secured	<input type="checkbox"/>	<input type="checkbox"/>	
Properly moved or lifted	<input type="checkbox"/>	<input type="checkbox"/>	
6. WORKER EDUCATION	OK	Not OK	ACTION TAKEN
WHMIS training	<input type="checkbox"/>	<input type="checkbox"/>	
Company safety policy & program	<input type="checkbox"/>	<input type="checkbox"/>	
Injury reporting	<input type="checkbox"/>	<input type="checkbox"/>	
Hazard reporting	<input type="checkbox"/>	<input type="checkbox"/>	
7. FIRST AID REQUIRMENTS	OK	Not OK	ACTION TAKEN
Adequate qualified first aiders on jobsite	<input type="checkbox"/>	<input type="checkbox"/>	

First aid kits: Adequate number	<input type="checkbox"/>	<input type="checkbox"/>	
Adequate contents	<input type="checkbox"/>	<input type="checkbox"/>	
8. GANTRY CRANES, HOISTS, ETC.	OK	Not OK	ACTION TAKEN
Safe setup of equipment	<input type="checkbox"/>	<input type="checkbox"/>	
Competent operator	<input type="checkbox"/>	<input type="checkbox"/>	
Condition of Lifting gears	<input type="checkbox"/>	<input type="checkbox"/>	
Safety latches on all hooks	<input type="checkbox"/>	<input type="checkbox"/>	
Proper use of tag lines	<input type="checkbox"/>	<input type="checkbox"/>	
Separate & safe entry route with handrails sport	<input type="checkbox"/>	<input type="checkbox"/>	
Fire extinguisher readily available	<input type="checkbox"/>	<input type="checkbox"/>	
9. MATERIALS STORAGE	OK	Not OK	ACTION TAKEN
Properly located	<input type="checkbox"/>	<input type="checkbox"/>	
Safely piled, stacked, bundled	<input type="checkbox"/>	<input type="checkbox"/>	
Properly moved or lifted	<input type="checkbox"/>	<input type="checkbox"/>	
Properly labelled (WHMIS)	<input type="checkbox"/>	<input type="checkbox"/>	
10. CONFINED SPACES	OK	Not OK	ACTION TAKEN
Proper access	<input type="checkbox"/>	<input type="checkbox"/>	
Air testing before entry	<input type="checkbox"/>	<input type="checkbox"/>	
Rescue equipment readily available	<input type="checkbox"/>	<input type="checkbox"/>	
Safety harness, lifeline properly anchored & used	<input type="checkbox"/>	<input type="checkbox"/>	
Second person for rescue	<input type="checkbox"/>	<input type="checkbox"/>	
Outgoing air monitored	<input type="checkbox"/>	<input type="checkbox"/>	
11. ENVIRONMENTAL CONDITION	OK	Not OK	ACTION TAKEN
(a) Fuel Storage	<input type="checkbox"/>	<input type="checkbox"/>	

Warning sinages, Fence to prevent unauthorised entry, No leakage, Fire fighting equipment are stand by	<input type="checkbox"/>	<input type="checkbox"/>	
(b) Housekeeping, sanitation & welfare	<input type="checkbox"/>	<input type="checkbox"/>	
Soap provided in washrooms, work area surface is free from scrap and debris, Adequate lighting and ventilation provided, Fumigation has been conducted periodically	<input type="checkbox"/>	<input type="checkbox"/>	
(c) Waste Disposal	<input type="checkbox"/>	<input type="checkbox"/>	
Hazardous wastes are properly segregated from others, Waste inventory to keep record of the types and quantities of waste present at sites	<input type="checkbox"/>	<input type="checkbox"/>	
(d) Wastewater treatment	<input type="checkbox"/>	<input type="checkbox"/>	
Wastewater disposal (contract with local sub-contractor, sampling test of treated wastewater prior to discharge	<input type="checkbox"/>	<input type="checkbox"/>	
(e) Air & Noise control	<input type="checkbox"/>	<input type="checkbox"/>	
Dust suppression (Plant, equipment's & Access roads), Monitoring/Measuring of noise level at plant sites and surroundings	<input type="checkbox"/>	<input type="checkbox"/>	
(f) MSDS	<input type="checkbox"/>	<input type="checkbox"/>	
Material safety data sheets of hazardous substances are displayed at workplaces, Training/Awareness given to the workers	<input type="checkbox"/>	<input type="checkbox"/>	

ANNEX-5

WASTE TRANSFER NOTES



Certificate of Waste Management Service

Waste collected from Patrind hydropower Project was disposed off at Shadra disposal site (Government Approved Disposal Site) after segregation having particular listed below:

Month of May-2018

Waste Management Service			
DATE	WASTE TYPE	WEIGHT	RECYCLE WASTE
10-May-18	Non Hazardous waste	324 KG	18 KG
17-May-18	Non Hazardous waste	317 KG	
24-May-18	Non Hazardous waste	263 KG	
31-May-18	Non Hazardous waste	235 KG	

Authorized sign




Stamp

Issue Date 6, July , 2018

Page 1 of 1

M/S QADRI ENTERPRISES

Waste Management Service

Dry,Food,Oily Rags & Recycle Waste According to Waste Tracking From

DRY TRASH		Location : Patind Hydro Power Project															MONTH OF MAY ,2018															TOTAL KG
Date		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
KG		0	0	0	0	0	0	0	0	0	230	0	0	0	0	0	0	210	0	0	0	0	0	0	180	0	0	0	0	0	175	805

FOOD WASTE		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL KG
KG		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90	0	0	0	0	0	0	0	0	0	0	0	0	0	53	294

OILY RAGS		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL KG
KG		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	13	0	0	0	0	0	0	7	40

304

317

263

235

Description	FOOD WASTE	DRY TRASH	OILY RAGS	FOOD+DRY+OILY=TOTAL	RECYCLE
Total Kg	294	805	40	1139	18



Certificate of Waste Management Service

Waste collected from Patriad hydropower Project was disposed off at Shadra disposal site (Government Approved Disposal Site) after segregation having particular listed below:

Month of Jun-2018

Waste Management Service

Particulars

DATE	WASTE TYPE	WEIGHT	RECYCLE WASTE
07-Jun-18	Non Hazardous waste	240 KG	13 KG
14-Jun-18	Non Hazardous waste	230 KG	
25-Jun-18	Non Hazardous waste	383 KG	
30-Jun-18	Non Hazardous waste	216 KG	

Authorized sign



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Issue Date 6, July, 2018

Page 1 of 1

M/S QADRI ENTERPRISES

Waste Management Service

Dry, Food, Oily Rags & Recycle Waste According to Waste Tracking From

DRY TRASH		Location : Patirind Hydro Power Project																														MONTH OF JUN (2018)	
Date		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	TOTAL	
KG		0	0	0	0	0	0	173	0	0	0	0	0	0	185	0	0	0	0	0	0	0	0	0	0	260	0	0	0	180	749		

FOOD WASTE																																	
Date		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	TOTAL	
KG		0	0	0	0	0	0	88	0	0	0	0	0	0	88	0	0	0	0	0	0	0	0	0	0	150	0	0	0	80	293		

OILY RAGS																																	
Date		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	TOTAL	
KG		0	0	0	0	0	0	10	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	36		

240


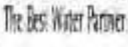
230

353

218

Description	FOOD WASTE	DRY TRASH	OILY RAGS	FOOD+DRY+OILY=TOTAL	RECYCLE
Total Kg	293	749	36	1069	13

ANNEX-6 PPES POLICY

	Personal Protective Equipment (PPE) Policy			
	Doc. ID.	Issue Date	Rev. #	
	K-water / HSE Policy-002	June 29, 2018	01	

PPE Policy

Personal protective equipment plays an important role in reducing the effects of an incident on people involved in it. K-water shall as far as is practicable eliminate or control hazards in the workplace. Personal Protective Equipment (PPE) shall be worn / used as a control measure where

1. It is not otherwise practicable to eliminate or control the hazard effectively; or
2. As an additional protective measure to existing control mechanisms

Staff, contractors including subcontractors and visitors shall use PPE as required by the company and shall immediately inform their supervisor of any defects or deficiencies in such equipment of which they become aware.

Managers and supervisors or staff, contractors / subcontractors, visitors at all company operational sites (Power-site & Weir-site) shall ensure that:

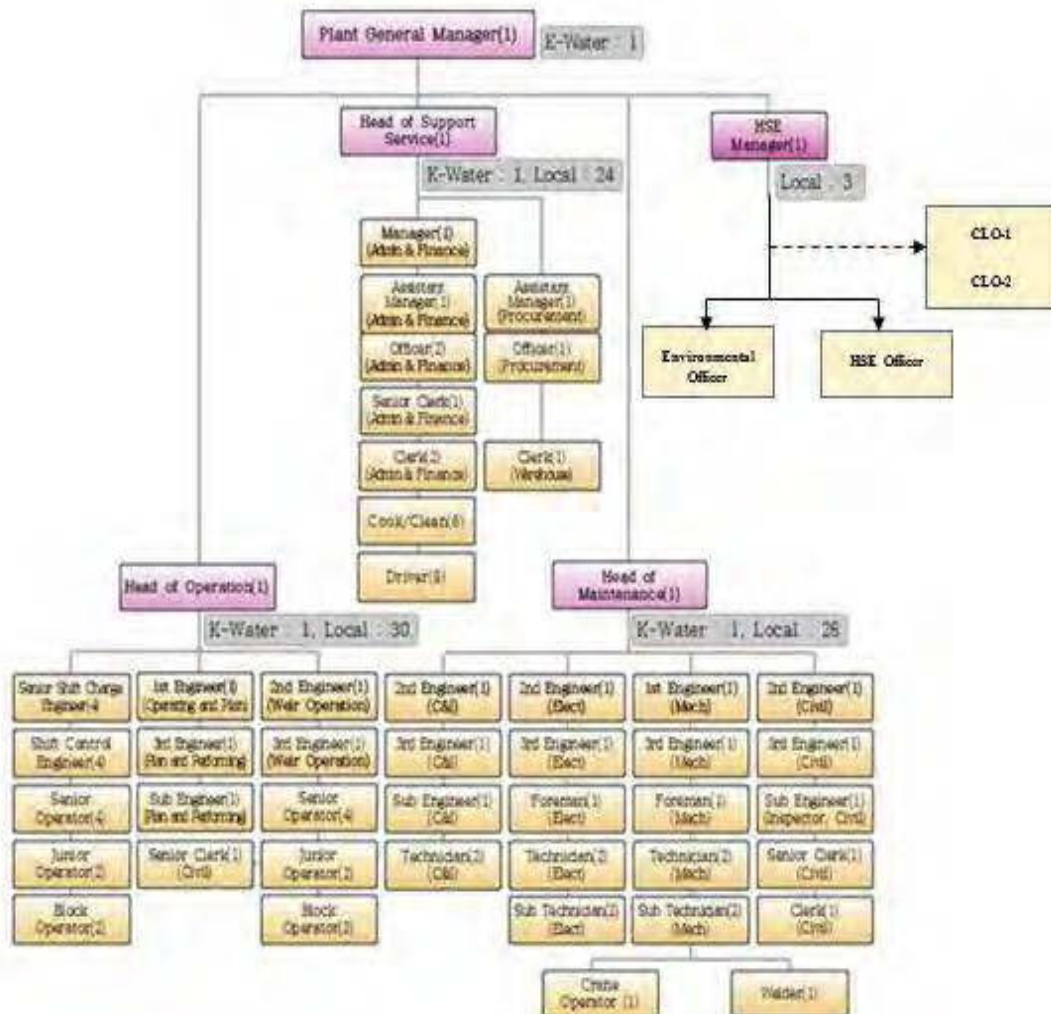
1. All tasks performed are assessed to determine the requirement for PPE.
2. The selection, supply and maintenance of PPE is suitable and sufficient to adequately protect the users from hazards.
3. All persons required to use PPE receive appropriate instruction in the safe use and maintenance of PPE.
4. The requirement to use PPE is enforced.
5. Clear and appropriate signs are displayed in areas where PPE must be worn.
6. All persons entering the operational areas (process areas) shall wear the mandatory PPEs (Helmet, safety shoes, visible jacket, cover-all & ear-plugs / muffs). In addition, job specific PPEs shall be used by the relevant work-force at company operational sites, where required.
7. Company driver must wear company uniform and proper shoes (fit-for-purpose) while on duty.
8. Procurement process of the PPEs shall be initiated once the policy approved and company shall maintain suitable stock of the PPEs at all time.
9. This policy shall be effective from the approval date.
10. Timeline for the complete implementation of this policy shall be three (03) months from the approval date.



Young Ho Kim
General Manager
Patind Hydro Power Plant

ANNEX-7

O&M ORGANOGRAM



ANNEX-8

ESMP COMPLIANCE STATUS

Environmental & Social Monitoring Report (Apr-Jun 2018)

Sr. No	Environmental Management Plan (Compliance Status)		
	Feature/Issue	Parameters/monitoring	Compliance Status/Action taken by EPCC
1.	Statutory Requirements	Compliance with approval conditions	<ul style="list-style-type: none"> Compliance with the conditions of approval by EPA-AJ&K, ADB's Safeguard Policy and IFC's Performance Standards is being ensured.
2.	Hydrology	River flow volume	<ul style="list-style-type: none"> Flow measuring gauges have been installed upstream and downstream of Kunhar River. The flow is being measured continuously.
3.	Head pond stability	Banks stability	<ul style="list-style-type: none"> The stability of river banks will be monitored according to the reservoir management plan throughout the project operations.
4.	Aquatic Ecology	Habitat availability and seasonal fish species and populations	<ul style="list-style-type: none"> Fish study was undertaken in 2nd Quarter, 2018. Fishing & hunting prohibited on project sites. No endanger species found.
5.	Water Quality	Wastewater treated prior to river discharge (Temperature, dissolved oxygen, pH, conductivity, turbidity, total phosphorous, inorganic phosphorous, total nitrogen, ammonia nitrogen, nitrogen oxides, biochemical oxygen demand and fecal coli forms)	<ul style="list-style-type: none"> Biannual monitoring was undertaken during the month of March, 2018 The results of analysis show that at location downstream of Jhelum river the turbidity value was on higher side. The reason for the higher turbidity is the addition of Kunhar river flow which is more turbid used for project operations and few rains in the upper reaches of Jhelum River. Kunhar river is very fast flowing river and river flow is mainly from snow melt. Kunhar river contains huge sediment load in the high flow season.
6.	Hazards/Risk	<ul style="list-style-type: none"> Monitor landslides Structural soundness 	<ul style="list-style-type: none"> Landslide monitoring shall be done on biannual basis Structural soundness shall also be monitored during the operational phase.

7.	Noise	Noise levels	<ul style="list-style-type: none"> • Shall be monitored according to the agreed frequencies
8.	Solid waste disposal	Visit disposal sites	<ul style="list-style-type: none"> • Waste management plan is formulated. For waste collection and its disposal, O&M operator has executed an agreement with third party contractor.
9.	Waste water discharge	Waste water quality in accordance with NEQS	<ul style="list-style-type: none"> • Study/monitoring undertaken in 2018, removal undertaken as indicated in EIA.
10.	Workers' health & safety	WAPDA safety codes for powerhouse	<ul style="list-style-type: none"> • HSE plan has been developed keeping in view the safety codes and is under implementation on both sides of the project i.e. powerhouse and weir

ANNEX-9 VEGETATION STUDY

Quarterly Flora Monitoring Report



April-June 2018

Muhammad Yousaf Qureshi

Edinburgh Direct Aid

1. Executive Summary

The damming on the river system, like Patrind Hydro Power Project, has two ways impact over the vegetation; one on the Intake side and the other on the Outlet (Power house) side.

River damming leads to strong hydro morphological alterations of the watercourse, consequently affecting river vegetation pattern. A multi temporal and spatial analysis of the dam effect on composition, structure and dynamic of the up and down stream vegetation has been performed on River Kunhar. The main research questions were as follows: How does plant landscape vary over time and along the river? Where does the dam effect on vegetation end? How does naturalistic importance of the vegetation affected by damming change over time? Data collection has been continuously performed during the period of studies during (2013) and after dam construction (2017) and reflected in the previous reports

The plant landscape has significantly changed over time and along the river, particularly as a result of the dam construction (2017). The major vegetation changes have involved riparian forests and macrophytes. Dam effect on vegetation is evident up to 13 km downstream (point of confluence with River Jhelum at Rarrah) and about 8 km behind the weir (impoundment area), and gradually decreases along an attenuation zone for about another 3 km. Woody cover on hydromorphic vegetative lands, mainly of *Ficus palmate* and pepper mulberry, increased from sparse to dense cover 2016-2017 at the tail of the lake (Shorran).

Despite the fact that the damming has caused strong local hydro morphological modification of the river ecosystem transforming it into a sub-lacustrine habitat, it has also led to the formation of wetlands of considerable naturalistic importance. Indeed, in these man-made wetlands, optimal hydrological conditions have been created by favoring both the expansion of pre-existing riparian communities and the rooting of new aquatic communities, albeit typical of lacustrine ecosystems. Some of these plant communities have become an important food resource, refuge or nesting habitats for aquatic fauna, while others fall into category of Natura 2000 habitats. Therefore, this river damming on Kunhar River seems to have indirectly had a "favourable" effect for habitat conservation and local biodiversity.

There seems to be the same positive impact on the powerhouse side because of effective protection of the site.

2. Introduction

River systems around the globe are being increasingly impacted by damming, diversion or abstraction in order to satisfy an increasing demand for electricity, water for agricultural, industrial and domestic uses. The environmental consequences of water dams are numerous and varied, depending on their size and nature and include direct impacts to the biological, chemical and physical properties of rivers and riparian (or "stream-side") environments.

The dam wall itself blocks fish migrations, which in some cases and with some species completely separate spawning habitats from rearing habitats. The dam also traps sediments, which are critical for maintaining physical processes and habitats downstream of the dam (include the maintenance of productive deltas, barrier islands, fertile floodplains and coastal wetlands).

Another significant and obvious impact is the transformation upstream of the dam from a free-flowing river ecosystem to an artificial slack-water reservoir habitat. Changes in temperature, chemical composition, dissolved oxygen levels and the physical properties of a reservoir are often not suitable to the aquatic plants

and animals that evolved with a given river system. Indeed, reservoirs often host non-native and invasive species (e.g. snails, algae, predatory fish etc.) that further undermine the river's natural communities of plants and animals.

The alteration of a river's flow and sediment transport downstream of a dam often causes the greatest sustained environmental impacts. Life in and around a river evolves and is conditioned on the timing and quantities of river flow. Disrupted and altered water flows can be as severe as completely de-watering river reaches and the life they contain. Yet even subtle changes in the quantity and timing of water flows impact aquatic and riparian life, which can unravel the ecological web of a river system.

A dam also holds back sediments that would naturally replenish downstream ecosystems. When a river is deprived of its sediment load, it seeks to recapture it by eroding the downstream river bed and banks (which can undermine bridges and other riverbank structures, as well as riverside woodlands). Riverbeds downstream of dams are typically eroded by several meters within the decade of first closing a dam; the damage can extend for tens or even hundreds of kilometers below a dam.

Riverbed deepening (or "incising") will also lower groundwater tables along a river, lowering the water table accessible to plant roots (and to human communities drawing water from wells). Altering the riverbed also reduces habitat for fish that spawn in river bottoms, and for invertebrates.

In aggregate, dammed rivers have also impacted processes in the broader biosphere.

Large dams have led to the extinction of many fish and other aquatic species, the disappearance of birds in floodplains, huge losses of forest, wetland and farmland, erosion of coastal deltas, and many other immitigable impacts.

The Project has two parts, the intake and the drop tunnel. River Kunhar has been blocked at Patrind and dropped at Alda for power production. The project was designed to produce 147 Megawatt of electricity on Kunhar river flow to contribute into the national grid system. K-water Company was given the responsibility of construction and operation of this project. The project became operational in 2017. The Project is located about 13 km upstream of the point of confluence of River Kunhar with River Jhelum, straddling the state of Azad Jammu and Kashmir (AJK) and the province of KPK. The EIA was conducted during the planning phase and further assessment is a continued process through EPIA. This project will have a social and biological impact on the area. Social impacts are continuously taken care off by different small projects covering compensation, provision of recreational facilities, approach roads, income generation activities, provision of possible employment opportunities and addressing any social issue.



River Kunhar originates from GitiDas some 200 km North in Kaghan Valley. There is a plan of constructing one more such dam somewhere near Balakot which will further impact the environment both in positive and negative ways. Vegetation of the area has been affected by the creation of impoundment at Patrind and due to the construction of tunnel towards Alda, Muzaffarabad.

3. Methodology

In order to gauge the potential effect of Patrind hydropower Project on catchment hydrology and vegetative cover, strategy was developed to survey the area having three ways impact. The downstream impact due to changed hydrology pattern (low flow, sudden release of water, flooding during the summer), impact of impoundment above the weir point and the impact of the tunnel, powerhouse and high power transmission line.

a) Downstream Impact:

About 8 km area was set for this study starting from the exit of the weir up to Boi. The distance of the river side was measured from the usual flow to the low flow and then changes in the morphology of lichen, algae and small saplings of the plants were visualized. The river has left the debris while receding which is the indicator of its optimal flow without the restriction of e-flow. The changes were recorded to analyze the impact. Water samples were collected to identify the macrophytes in the laboratory.



Pic: Leftover debris during the normal flow

b) Impact of upstream Impoundment

The dieback of the trees was observed from the visible stumps at the affected area and impoundment effects were analyzed on the mass of the soil beside it at the left bank. All species present beside the river were identified and recorded.

c) Impact on the powerhouse side.

Detail survey of the area was conducted to record the vegetation pattern, gaps, plantation done, dieback of the newly planted trees and success rate.

4. Discussion

Environmental influence on species distribution

We examined how reducing or changing the pattern of water flow in the main river will affect the riparian or hydromorphic vegetation. The change in water temperature will have a positive effect on the growth of lower aquatic plants like lichens and algae. Downstream low flow has an impact on the air temperature as well effecting the riparian plant species. The growth of plants in the open sun will be higher and change in the species composition also noted as more aggressive plants like Pepper Mulberry, Ailanthus and Robinea will have the dominance over the shade and low temperature loving plants like Ficus, Salix, Adhatoda, based on their distribution in relation to elevation above and distance from the river.

The plant canopy coming up with the changed pattern of the flow shows an excellent plant health with no dead individuals or canopy dieback. Other weeds are coming up rapidly and summer landscape looks lush green.

Impoundments and dieback

There was no apparent relationship between the water requirement of a species and mortality or dieback, in that the two species requiring either the most (Salix), or the least (C. australus) water both experienced substantial mortality or dieback in the submerged conditions, whereas dieback of other plants was negligible. However, consideration of the spatial distribution of dieback or mortality in relation to the river suggests a clearer interpretation. Little dieback is observed in individuals exposed to the greatest water stress, whereas individuals close to the river were in good health. The moisture content is not the factor of dieback as this is the zone receiving more than 60" of annual rainfall. Once the root system gets established, the plant's survival percentage becomes higher. Most probable reason of it is either the geology or long drought season. The water table at the land near to the impoundment is higher and moisture loving plants like poplar and salix will grow here with excellent health and rapid rate of growth.

Population persistence of riparian species

The species population response to an altered hydrological regime has implications for their persistence. Species composition has not yet changed but the signs are appearing with the drift of

seeds of Dodonia, Mulberry, Fig and Ailanthus as their new growth has been observed at a belt of about 200 meters near the town of Boi. These species are considered to be the riparian pioneer that colonize the newly created which is consistent with small individuals observed in this study being sited on the sandy-loam river bed.

The population structure of all other species in relation to distance from and elevation above the river Kunhar or nallah Boi suggests that there is no alteration in the species composition.

The prediction of the probable direction of population change in subtropical systems in the face of an altered flooding regime has been based on an understanding of the relationship between hydro-geomorphological activity and seedling establishment (Johnson, Burgess & Keammerer 1976; Streng, Glitzenstein & Harcombe 1989; Rood & Mahoney 1990; Johnson 1994). Establishment may be less of a constraint on population persistence in this subtropical system than subsequent growth and adult mortality, but is a key arena of future research in our riparian systems.

5. Findings and Observations

The detail survey and observations of the area reveals that the impact of the Patrind Hydro Power Project on the riparian plant species and vegetation of far of the bank has no considerable negative impact. More green area is expected to appear with the river in low-flow as the plants will have a new space to get established in the downstream area. The species survival will depend on the degree of water flow changes. More floods will wash away the saplings but once the root system is developed to sufficient strength, the temporary changes in the flow regime will not affect the well-established vegetation.

The area around the weir and the steep slopes behind the obstruction have been concreted to control the soil merger or erosion. The right bank has been strengthened with wire stone gabion provision at this place.

Dieback of the species is no more a problem and the plant species growing on both sides of the impoundment are in a good health condition.

The tail area of the impoundment is very rich in species population. Although the moisture loving plants are dominating here but the green patches show a good look near the bridge of Shorran village.

The area around the power house is mostly short created but some soil beds are planted with mixture of species. Dieback of Chir pine plantation under the high power transmission line and on the side slopes has been observed. A sample plot has been analyzed in detail. Six out of sixteen tube plants of Chir pine are dead. They are either affected by the cutworms or they were not irrigated with water. The base of the soil is shallow and gravel land formation does not allow the sapling to survive longer in the absence of water.

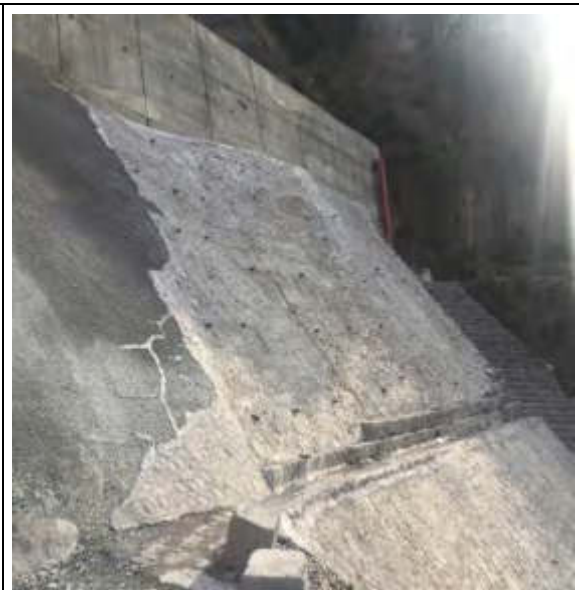
The plantation of broad leaved species carried out two years back has got established. These are nice looking patches and will serve as soil binders. The web root system of Robinia and Ailanthus may damage the short created structure when they get a good size but the eucalyptus with a deep rooted species will work as soil binder.



Step wall at powerhouse site to prevent sliding & erosion



Surge Shaft Slope Protection with shot concrete during construction phase



During construction phase the drainage pattern was constructed to avoid soil erosion and slope stabilization at surge shaft area



Embankment of the sides at the outlet Weir Site

PLANT SPECIES CHECKLIST

Following Tree species were documented in the project area both in Patrind and in Aladra:

<u>Common Name</u>	<u>Botanical Name</u>	<u>Type of Tree</u>	<u>Status</u>
Akhrot (Wallnut)	<i>Juglans regia</i>	fruit	common
Anjeer	<i>Ficus carica</i>	fruit	rare
Batang	<i>Pyrus patia</i>	fruit	common
Batcud	<i>Celtis australis</i>	soil binder	rare
Beence	<i>salix spp</i>	firewood	common
Ber	<i>Zizyphus mauritiana</i>	fruit	common
Chir	<i>Pinus roxburglii</i>	timber	common
Dhaman	<i>Grewia oppositifolia</i>	Fodder	common
Drawa	<i>Ailanthus anus</i>	firewood	common
Drek	<i>Melia azadrach</i>	firewood	common
Kangarr	<i>Pistacia khunjak</i>	soil binder	rare
Kau	<i>Olea cuspidate</i>	agri tools,	common
Kiker	<i>Acacia nilotica</i>	firewood	common

Nim	<i>Azadirachata indica</i>	firewood	common
Phagwarr	<i>Ficus Palmata</i>	soil binder	common
phulai	<i>Acacia modesta</i>	firewood	common
Pipal	<i>Ficus religiosa</i>	firewood	common
Robinia	<i>Robinia pseudoacacia</i>	firewood	common
Shahtoot	<i>Morus alba</i>	fruit	common
Sherol	<i>Alnus nitida</i>	firewood	common
Snatha	<i>Dodonaea viscosa</i>	soil binder	common
Talli (shisham)	<i>Dalbergia sisso</i>	furniture wood	common

The main contributor grass species are *Heteropogon contortus* (Sariala), *Cenchrus ciliaris* (Dhaman), *Desmostachya bipinnata* (Dab ghaas), and *Cynodon dactylon* (Khabbal).

6. Conclusion

Riparian systems are being increasingly impacted world-wide as management of water resources intensifies through impoundment, abstraction and diversion. Applied research has focused almost exclusively on the impact of large impoundments on large, perennial, rivers, clearly illustrating that an altered hydrological regime will affect the composition, structure and functioning of the downstream riparian system. Research on the ecological effects of impoundments in subtropical regions, particularly in foot hills of Muzaffarabad and its surroundings, has lagged behind. This study has provided evidence that the riparian and associated vegetation of a catchment within this region has not become desiccated as a result of the cumulative effect of many small and medium dams within the normal stream orders of the catchment and optimum rate of rainfall. The reduction of flow during low rainfall years in an environment characterized by pronounced interannual variability of rainfall is a likely explanation of the mortality and dieback of species that require either substantial amounts of water (e.g. *populous nigera*, *salix excelsa*) or of individuals (e.g. *Ficus palmata*) growing at their limits of water availability great distances from and high elevations above the river.

Small impoundments in this environments will also undoubtedly have an effect on the duration, timing, frequency and intensity of flooding, hence on geomorphological activity and on disturbance regime, that would affect ecosystem and population processes. In order to ensure the maintenance of riparian and hydromorphic vegetation in subtropical regions, policy on the water provision during the long drought, for vegetation based on research of its water requirements in the face of pronounced environmental variability and of conflicting demands needs to be pursued. Similarly, the plantations carried out at different places should not only be left at the mercy of the nature but this should be irrigated at least first two years in the dry season.

7. Recommendations

1. There is a very positive impact of the dam on the riparian species down and upstream and new watch and ward system will improve the position in the area. This watch and ward should be continued in a longer run for the sustainable establishment of natural vegetation cover along the riverside.
2. It was suggested in the previous study reports to apply the biological, engineering and Bio-engineering technology to control the adjacent slide effectively which include vegetated soft gabions, vegetated loose stone walls, gabion check dams, live brush wood check dams, planting, sowing and tufting, dry seeding, hydro seeding, hay seeding, grass sodding, sowing with geo- textile sheets, brush wattles, brush layering, hedge layering, semi-dead fences with live hedges. Patrind Hydropower agency should use this technology with a team of experts and should begin with small erosional features on small slopes before working on large slopes.
3. The mass of soil under the slide at the right bank of river Neelum should be planted with root-shoot cuttings of bamboo. These cuttings can be extracted from the bamboo plants just near to the old office building at Lower Chatter.
4. This December season should not be lapsed and intensive working should be done to control the landslide adjacent to the residential area.



8. References

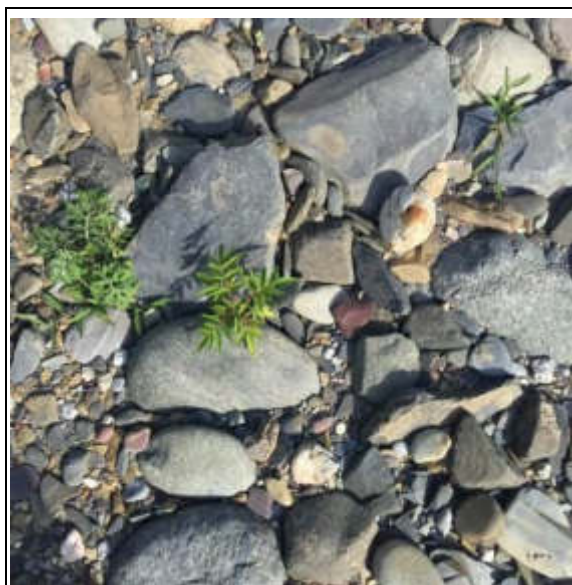
- i) Plants of Pakistan, TJ Roberts
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- iv) Environmental and social impacts of dams in India-Ice virtual Library
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<https://www.slideshare.net/MOHDSALMAN52/dams-and-thier-environmental-impacts>

9. Acknowledgements

I am thankful to the administration of Patrind Hydropower Project to show their confidence in me to conduct this study. They not only provided me the logistic facility but their relevant staff also supported me during the field visits. My special thanks to Mr. Syed Qamar Ali Shah and Mr. Imran Yousaf for their valuable inputs during all my field work. Our Driver Mr. Javaid Qureshi always showed his commitment to take us to the hard areas with a smiling face.







Some Photo shots



Pic: Riverside sapling of *Ailanthus anus*
(Drawa)



Pic: Riverside sapling of *Ficus palmata*
(Phagwar), an excellent soil binder tree

	
<p>Pic: Riverside plant of soil binder bush <i>Dodonia viscosa</i> (Snatha)</p>	<p>Pic: Riverside sapling of <i>Moras alba</i> (Mulberry)</p>
	
<p>Pic: Bamboo Plants near the old office building</p>	<p>Pic: Weeds have come up making a dense green look near the residential area</p>
	
<p>Pic: A view of two years old plantation got established in the uphill beds</p>	<p>Pic: Another view of two years old plantation</p>



Pic; Short Created surface behind the powerhouse



Pic: Cleared area under the high voltage transmission line – vegetation gap



Pic: Look of the landslide

ANNEX-10

FISH STUDY - PATRIND HPP

Quarterly Fish Fauna Monitoring Study Report

Kunhar River



April-June 2018

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Edinburgh Direct Aid

1. Executive Summary

The K-Water Company has constructed the 147 megawatts (MW) Patrind Hydropower Project on the Kunhar River. The Project is located about 13 km upstream of the point of confluence of River Kunhar with River Jhelum, straddling the state of Azad Jammu and Kashmir (AJK) and the province of KPK. The Project will generate electricity to be fed into Pakistan's national transmission network. Main features of the Project include about 80 m high dam, and a reservoir that will extend about 8 km upstream of the dam wall. The fish and aquatic life in the Project area is under pressure from illegal fishing, use of dynamites, poison and unregulated sand and gravel mining which damage the fish habitat and breeding areas. These pressures, though limited, are projected to increase over time. Developments in similar rivers in the region indicate that if present trends continue, the damage to river ecology will be highly significant in the long run, possibly overshadowing the impact from the Project itself.

There are 12 fish species reported in Kunhar River and its tributaries upstream of confluence point of Kunhar with Jhelum River that are important breeding grounds for fish. In addition to Mahaseer and Alwan Snow Trout that are classified as Endangered and Vulnerable respectively in the IUCN Red List of Threatened species. There are fish species present that are endemic, only found in this region of the world. In addition to Mahaseer and Alwan Snow Trout, species of food value include the Common Carp as well. The most affected fish species will be the comparatively long distance migratory Alwan Snow Trout which migrates from downstream elevations in spring to higher upstream elevations for breeding and returns to lower elevations in the fall. Its migration has been impacted due to dam which may result in decline in its population downstream of the dam. The Endangered Mahaseer shows local movement between the main river where the larger specimens take refuge in winter, and tributaries in the summer where they breed. This species is almost extinct even before the inception of the Patrind Project.

The dam might be operated in the peaking mode in the winter season when the river flow drops. In this mode of operation, water is stored in the reservoir during the day, and released through power generation turbines for three to four hours in the evening to meet the peak electricity demand. Sudden changes in flow may impact aquatic life when the water is released from the dam for peaking purposes.

The impact on the aquatic life can be reduced to a certain level and for that mitigation measures were suggested in the study reports carried out during the construction and then operational phases of the project.

2. Introduction

Run-of-the-river hydro power projects are playing important role in the development of Pakistan's hydropower sector and the regulation of water resources. However, they are also making profound impacts on the regional ecological environment. As these projects have long construction period, big investment, broad social impacts and complex social issues etc therefore the actual impacts of the completed projects prone to deviate from the predicted results in environmental impact assessments (EIAs). Once these projects are completed, the actual environmental impact can be investigated by post environmental impact assessment. The differences of environmental impacts between actual and predicted results can be used to testify the predicted results of EIA, reasonability of environment-protection design and evaluate the efficacy of environmental protection measures

of the completed projects. Additionally, the environmental impacts need to be repeatedly reassessed during operational phase so that additional remedial measures should be proposed, if required.

Patrind Project has been completed and became operational in November 2017. This study relates to the monitoring of project impacts on the aquatic fauna of River Kunhar during operational phase.

3. Scope of the Fish Fauna Monitoring Study

Fish fauna monitoring study mainly focused on water temperature, aquatic livings, terrestrial livings, hydrological regime, environmental geology, landscape and heritage, and the resettlement of migrants from reservoir.

3.1 Water temperature

The constructed reservoirs on the river greatly change the hydrological processes and hydraulic conditions of the river, and also modify the thermodynamic state of the river, which thus change water temperature. The typical water temperature effect of the reservoirs is the vertical thermal stratification.

3.2 Aquatic livings

The impact of constructed reservoir projects on aquatic livings focus on the effects on fishes. The dam blocking has a serious impact on migratory fishes due to destroying and disturbing their spawning, breeding and their habitats, which force the fishes from the river water gradually transform into the lake fishes, and make some environment-sensitively fish species be endangered. Therefore, the number and types of fishes will change, which impact remarkable local fisheries. Aquatic living of post environmental impact assessment mainly contained: (1) assessing the effects of the construction project on the planktonic animals and plants, benthic organisms, higher aquatic plants, fishes and other aquatic animals etc.; (2) focusing on evaluating the impact on rare aquatic livings; (3) analyzing the effects on the habitats of fish spawning; (4) discussing the efficiency of conservation measures for aquatic livings and proposing further protection measures.

3.3 Hydrological regime and downstream

For storing and regulating water, the dam and reservoir projects construction can change the process of runoff and sediment downstream, and the flow rate, water level and sediment transport, and so on, which might impact downstream agriculture and cause channel erosion and thus affect the construction of hydrological engineering on the lower reaches of the rivers. The environmental impact of hydrological regime and downstream mainly concern the statistical analysis of the measured runoff and sediment downstream after the operation of the project, the actual changes in river erosion and deposition data, and the investigation of the impact on hydrological projects and thus proposing the measures for reducing adverse effects of the projects. (Q.G. Wang et al. / Procedia Environmental Sciences.)

3.4 Water quality

Dam construction has expanded the water area of the reservoir, deepen water depth, slow water flow rate, and decreased the diffusion of pollutants, and thus the concentrations and distribution of pollutants in the waters of the reservoir has changed. Reservoir stores a lot of nutrients such as nitrogen, phosphorus, potassium, and thus promoting algae growth. This might cause the potential eutrophication of the reservoir. The environmental impact of water quality mainly focuses on the source and distribution of pollutants after storing water, changes of water quality in the reservoir, the trend of eutrophication, the status of pollutant enrichment in bottom sediments, water quality of the outflows from the reservoir and downstream.

3.5 Environmental Geology

The additional water loads and water permeation pressure in the reservoir after storing water might alter the stress state of rock mass and produce the intense stress in some area, and thus cause the earthquake. Meanwhile, because of water erosion and soaking, reservoir banks' stability might be changed and bank collapse may produce landslides, especially reservoir banks are more likely to slump. The environmental impact of environmental geology mainly includes: (1) investigating the reservoir induced earthquake running time, magnitude, epicenter location after the operation of the reservoir; (2) surveying the range of reservoir bank collapse, the number of bank collapse and geological conditions of the collapse area; (3) analyzing and assessing the tendency and causes induced earthquake and bank collapse; and (4) putting forward security measures of the projects.

3.6 Terrestrial livings

Flooding is the main effect of reservoir on terrestrial plants, while habitat loss, the feeding habitat transfer and limited activity space for wild animals, which causes many animals emigrating far away from the reservoir after impoundment. However, after the reservoir was filled up with water, the local climate can be regulated, and vegetation types are so rich around the reservoir. Moreover, irrigation development can provide the wet environment suitable for a number of waterfowl habitats. The environmental impact of terrestrial livings focusses on the effects of the projects in operation on animals and plants, especially rare flora and fauna, and the investigation of the efficiency of measures for plant protection and thus providing further protective steps to be taken.

3.7 Landscape and Heritage

Natural landscape and heritage might be submerged, destroyed or disturbed by the dam and reservoir project, meanwhile, the reservoir might add the new landscape. The environmental impact post-assessment mainly includes: investigating the natural landscape and heritage to be affected, analyzing and evaluating the efficiency of protective measures, and putting forward the better measures for further utilizing heritage landscape.

3.8 Migrants

Dam and reservoir development have an important influence on resettlement from the reservoir area, which is the direct influence on regional society and economy. The migration of population is caused by project land and reservoir flooding and the damage of arable lands, houses and infrastructure will directly impact the migrants' production and living. The environmental impact post-assessment dominantly focusses on resettlement of migrants, which is one of important measures to ensure the development of social economy of migrants without great effects of the project. And the resettlement level reflects the influencing degrees of dam and reservoir construction. How to realize the post assessment of hydropower projects investigation and comparison are the important research methods. Investigation is the important way to obtain the information of post environmental impact assessment. All actual data on environmental impact can be gotten through investigation. Comparison is the dominant approach used in the post assessment, that is, the actual environmental impacts and environmental quality after completing the project are compared with the environmental background values and the predicted values of EIA. Based on the integrative analysis, the environmental quality after completing the project is assessed to identify the actual positive and negative impacts and reasonable measures will be put forward to reduce the adverse impacts.

4. Present Status of Patrind Project

Temperatures prevailing at Muzaffarabad are more relevant to the Project area. At Muzaffarabad the months of May to August are the hottest months with temperature ranging between 26°C to 40°C while December to February are coldest with temperature varying between 6°C to 11°C. Fish study was undertaken in the Kunhar River. Fish fauna survey was conducted at six selected sites to find out the kind, number and quantity of fish available. Fishes consisted of Schizothorax plagiostomus (Swati), Snow trout Schizothorax curvifrons and Schizothorax labiatus. The number found was between 0-5 and the weight was less than one Kg in each case.

Nature of Impact as shown by the IUCN Report on Dams in AJK.

<i>HPP</i>	<i>Installed Capacity (MW)</i>	<i>Project Status</i>	<i>Executing Agency</i>	<i>Sensitivity of Ecological Zone</i>	<i>Nature of Impact in the Ecological Zone</i>
<i>Patrind</i>	<i>147</i>	<i>Complete</i>	<i>PPIB</i>	<i>Least</i>	<i>Extremely Critical</i>

The Patrind project is in its operational phase. E-flow of two cumecs is observed strictly. The catches of fish during the study period show that one new species, *Schizothorax labiatus* has also established its presence along with two species, *Schizothorax plagiostous* and *S. curvifrons*. Exotic trout fish can be introduced in the reservoir initially on experimental basis and then, depending on the positive results, on permanent basis, as recreational/sport fishery has been steadily increasing in the upper reaches with cold water.

There is another very positive impact of dam has appeared as recreational and entertainment activities have started upstream in and around the lake. The recreational park developed at the disposal point has become a good place for families to visit. Two colorful water boats have been introduced in the lake near the village Shorran and soon will in full bloom of operation.

5. Environmental Impacts of Dams

The environmental consequences of large dams are numerous and varied, and includes direct impacts to the biological, chemical and physical properties of rivers and riparian (or "stream-side") environments.

The dam wall itself blocks fish migrations, which in some cases and with some species completely separate spawning habitats from rearing habitats. The dam also traps sediments, which are critical for maintaining physical processes and habitats downstream of the dam (include the maintenance of productive deltas, barrier islands, fertile floodplains and coastal wetlands).

Another significant and obvious impact is the transformation upstream of the dam from a free-flowing river ecosystem to an artificial slack-water reservoir habitat. Changes in temperature, chemical composition, dissolved oxygen levels and the physical properties of a reservoir are often not suitable to the aquatic plants and animals that evolved with a given river system. Indeed, reservoirs often host non-native and invasive species (e.g. snails, algae, predatory fish) that further undermine the river's natural communities of plants and animals.

The alteration of a river's flow and sediment transport downstream of a dam often causes the greatest sustained environmental impacts. Life in and around a river evolves and is conditioned on the timing and quantities of river flow. Disrupted and altered water flows can be as severe as completely dewatering river reaches and the life they contain. Yet even subtle changes in the quantity and timing of water flows impact aquatic and riparian life, which can unravel the ecological web of a river system.

A dam also holds back sediments that would naturally replenish downstream ecosystems. When a river is deprived of its sediment load, it seeks to recapture it by eroding the downstream river bed and banks (which can undermine bridges and other riverbank structures, as well as riverside woodlands). Riverbeds downstream of dams are typically eroded by several meters within the decade of first closing a dam; the damage can extend for tens or even hundreds of kilometers below a dam.

Riverbed deepening (or "incising") will also lower groundwater tables along a river, lowering the water table accessible to plant roots (and to human communities drawing water from wells). Altering the riverbed also reduces habitat for fish that spawn in river bottoms, and for invertebrates.

In aggregate, dammed rivers have also impacted processes in the broader biosphere. Large dams have led to the extinction of many fish and other aquatic species, the disappearance of birds in

floodplains, huge losses of forest, wetland and farmland, erosion of coastal deltas, and many other immitigable impacts.

Several colonies of frogs were found in the stagnant water beside the river at the sampling point one and point two, similarly one more species of *Schizothorax labiata* was caught at the outlet point with the use of Gill net, Lichens and Algae production has increased and air temperature on the sides of the river is comparatively warmer impacting the side vegetation as well.

6. Impact on fish Migration from River Jhelum

The fish migration from Jhelum River to Kunhar River at the point of confluence at Raaraa would have been taking place for Mahsher (*Tor putitora*), Snow Trout (*Schizothoracinae*) and other migratory species. The lack of long term data on water quality, plankton concentrations and fish populations limits the conclusions that can be made about the aquatic ecology in the Project area. The scope of present study does not require covering of fish fauna present in Jhelum River along with its migration status. There is almost no possibility of upstream migration of fish fauna above Mangla Dam to the Project area as authenticated by the study results and supported by the local information recorded through the interviews. Thus, it can be safely concluded that the proposed Project will have an impact of river ecology in the stretch of 13 kilometers below the weir point due to shortage of water and 8 kilometers above due to increase in water level. There will be no impact on the available fish fauna as well as the migration of fish species above Mangla dam.

7. The Fish

River Kunhar has a rich potential in supporting a diversity of fish resources. Past history shows that the project area had a rich biodiversity in river Kunhar but present picture of the area is not that encouraging as most of the reported fish has disappeared altogether. This is, most probably, due to hydrological changes, stream flow pattern, very high and devastating floods of 1992 and beyond that, illicit hunting of fish by the use of destructive means like explosives, poisoning, electric currents etc. Common Otter (*Lutra lutra*) used to be very common once in the area, but now this has disappeared and most probably it is no more existing in River Kunhar. No government fisheries staff had ever been interacted during the study period. The departments of Fisheries of Khyber Pakhtunkhwa and AJK have not been able to protect the river Kunhar below the town of Gharri Habibullah most probably due to the shortage of conservation staff with them.

Probably the Fisheries Department of KPK has met the Hydropower project authorities for the management of reservoir at Patrind. First right of fish management is for the affected community of the area. They must be involved in any commercial activity of fisheries management of the reservoir.

The main natural factors which influence fish life in the Himalayan streams are: (i) current of velocity; (ii) fluctuation in water discharge; (iii) water temperature and dissolved oxygen level; (iv) substratum; (v) shelter from the current; and (vi) food availability represented mostly by organisms clinging to and growing on rock and stone surfaces in fast current.

Snow trout, a cold water riverine and medium migratory fish, is locally known as Malli or Swati. It belongs to the family Cyprinidae and sub-family Schizothoracinae which are widely distributed in the Himalayan and sub-Himalayan region and much of the rest of Asia. Altogether 28 species of Schizoranae are reported in Himalayn river waters but only three of genus *Schizothorax* are recorded this time in the study area of river Kunhar i.e., *Schizothorax curvifrons*, *Schizothorax labiatus* and *Schizothorax plagiostomus* and two of them are common in river Kunhar. All the species are phytophagous fish and have developed a special mouth to scrape the algae attached on

stones. They spawn twice a year during September/October and March/April, but September/October is the best season for spawning. Clear water, stony bottom of creeks composed of fine pebbles and gravel, and water flow of 2.8-4 m/sec, pH 6-7 and dissolved oxygen concentrations of 8-15 mg/L form good spawning conditions in the natural environment. Present study shows that the fish has migrated from downstream to possible upper reaches up to the outlet of the weir for spawning purposes as the catch percentage is higher than the last many periodic studies.

To cope with the steep fall in temperature in winter months, schizothoracines migrate from headwaters to lower altitudes where they represent a sizeable part in fish catches in large rivers and their tributaries. The rise in temperature in Kashmir and Kunhar streams from near-freezing level to 10-20°C during May-June induces *S. plagiostomus*, *S. longipinnis*, *S. kasmiriensis* and *S. curvifrons* to spawn. During the upstream migration the fish still finds itself in waters of low temperature of 8.0-9.5°C, owing to the steady influx of snow-melt water. This induces the species to migrate to and spawn in side streams or point of warm and cold-water confluence, which receive warmer ground water of 17.5-21.5°C. In the same drainage, *S. plagiostomus* and *S. curvifrons* migrate downstream to the lowermost reaches where it spawns from September to October at 15.0 to 21°C. These observations indicate that in some schizothoracines multiple spawning is determined by temperatures and flow rates optimal for egg laying. The eggs are large-sized (3.0-4.0 mm diameter) and sticky in nature. They are laid in shallow pools (50-70 cm depth) and remain adhered to the substratum until the hatching of fry.

A general observation during the last studies on seasonal fluctuation in river discharge in Kunhar river system indicate that the range of mean flow from October to March (winter months) represents only 8-10% of the total annual flow. There are also variations from year to year depending on the winter and monsoon precipitation. Reduction of torrential streams to stagnant pools exposes the fish to terrestrial predators and to depletion in dissolved oxygen concentrations, especially when autumn leaf fall takes place. However, due to low temperature, the level of dissolved oxygen may not fall below the optimum requirement of Coldwater fish (7.0-8.0 mg l). As soon as the flow is restored with spring rains and snow-melt water, a rapid re-colonization of the stream takes place.

Schizothorax and Schizothoracichthys spp are dominant among the cold-water fish in river Kunhar in terms of catch and abundance in all seasons. The substratum consists of boulders, stones, gravel and patches of aquatic vegetation in the pools with lichens on the shallow sides of the river.

As a result of this study in river Kunhar it came out that a gradual increase in water temperature and pH corresponds to a decrease in dissolved oxygen, decline in the density of nymphs of mayflies and stoneflies, but in an increase in larval and adult aquatic beetles. The information collected during expeditions is based on spot measurements and it does not represent average values. The following parameter ranges for the Kunhar River were recorded at six sampling points during the study. Following table shows the result; transparency; pH; water temperature (oC); dissolved oxygen.

8. Methodology

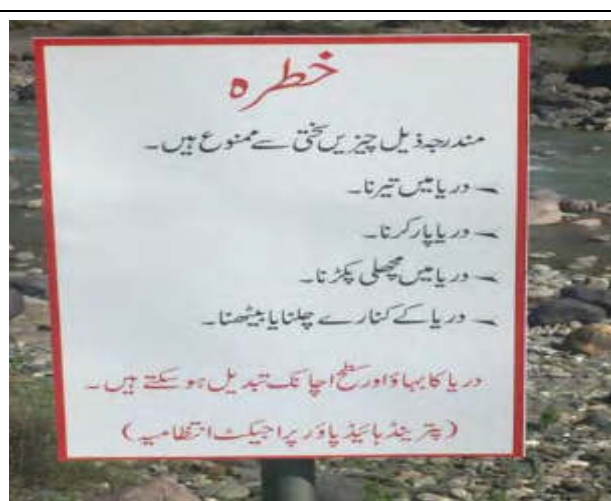
Six permanent sampling points were selected for conducting the study from the day 1 of this periodic study. The selection criteria was based on the ideal representation of the spots down and upstream. A standard cast net was used at 5 sampling points with a lead weigh of 6 kg and mesh size of 2 inches. Two female students Samina Tahir Ph. D, and Rida, M.Phil. of Zoology Department of University of AJK also took part as part of their assignment. One fisherman, Sajid Mehmood, was engaged for fishing in the river Kunhar at six sampling points.

Two types of nets, Gill nets and Cast net were used at the sampling points in the Kunhar River. The gadgets used to assess the quality of water were DO meter, Conductivity Meter, pH meter, Water Thermometer, Digital scale, measuring tap, water sampling bottles and Fish preservation Jars. Water release at this time 2.3 cumecs as reported by the accompanied project staff. Observation of water colour, taste and odour were made at the spot by the study group. The parameters collected are reflected in the table-1 below. Locals visiting the area were also interviewed for collecting the information about the status of the fish, fish markets and fishing intensity of the area.

One project security/watch guard was also interviewed. Notice Boards for the prohibition of fishing and warning about the sudden flooding are also placed at various place as are seen in the picture below. Gill net was used at the outlet of the weir as use of cast net was not possible here. This is the obstruction point and fish concentration could be higher here. River pollutants were also observed during the study. All possible impact causing elements and remedial possibilities were discussed amongst the University Scholars, project team and myself. University scholars will share their research findings in the next study to be conducted in September 2018 along with comparison of new data collected during the field study. Single samples of the fish species were preserved in the fish jars with 10% formalin.



Pic 2:. Fisherman Mr.Sajid Mehmood



Pic 3.Caution Board at Sampling Point-I



Pic 4: Study Tream L to R: Mr. Imran Yousaf, Mr. Qamar, Mr. Yousaf Qureshi, Miss Samina and Miss Ridha

Table-1 showing water parameters

Sample Points	Water Temp °C	pH	Total suspended particles (mg/l)	Inorganic Suspended solids (mg/l)	Organic Suspended solids (mg/l)	Rate of Flow (cu.m/sec)
1. Boi	19.5	6.5	88.71	59.95	23.42	2.8 m/s
2. Domail (nalla Boi)	19.5	6.5	90.33	66.45	26.35	1m/s
3. Padri	19	6.5	86.21	58.65	22.54	2.9 m/s
4. Weir Outlet	15	6.5	79.32	54.56	19.21	pool
5. Disposal Area	15	6.5	88.52	67.41	26.41	0.6m/s
6. Shorran	15	6.5	89.43	68.12	27.21	1.6 m/s

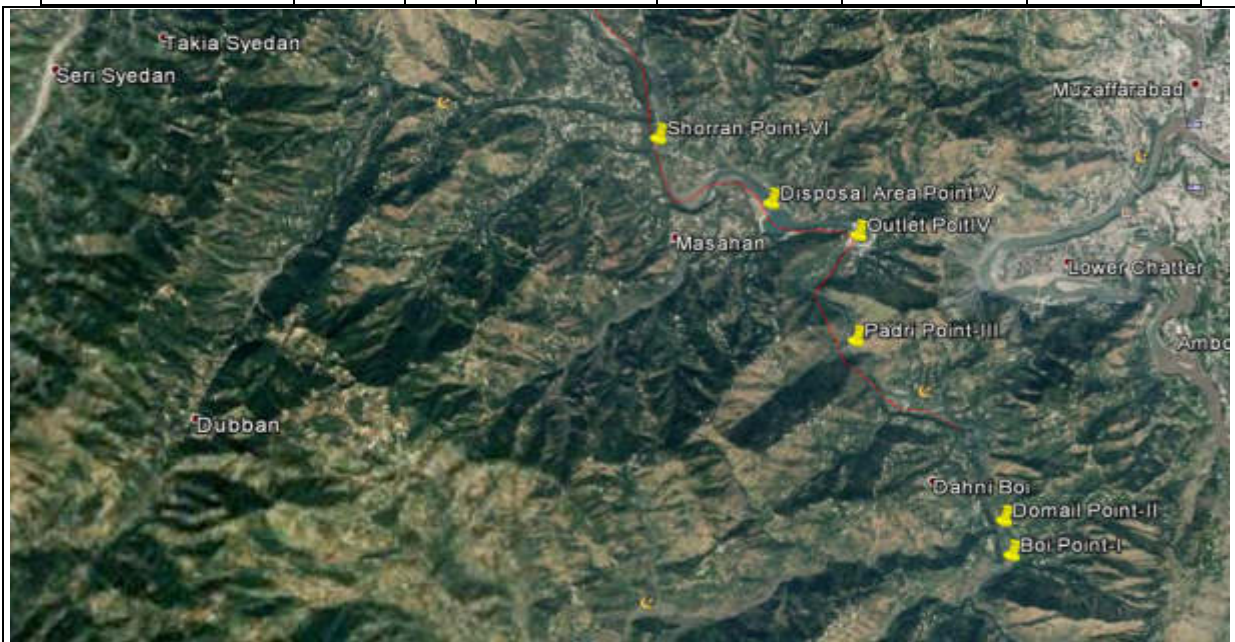


Illustration: Satellite image of project site with marked sampling points

Reported Fish species of River Kunhar in the past:

Family: Salmonidae

Oncorhynchus mykiss {Salmo gairdneri } (Rainbow Trout

Salmo trutta (Brown Trout)

Family: Cyprinidae

Schizothorax esomus

Schizothorax plagiostomus

Schizothorax micropogon

Schizothorax curvifrons (Snow Trout)

Schizothorax labiatus

Tor putitora

Tor tor

Labeo spp

Cyprinus carpio

Family: Sisoridae

Glyptothorax kashmiriensis

9. Reservoir and its Better Use

9.1 Aquaculture

The reservoir doesn't allow the local endemic fish species to survive in it because of changes in the aquatic ecology, water quality and impoundment. The best use of reservoir water is to farming of rainbow Trout fish species in it. Pen and cage culture is best suited for trout culture. With artificial feeding from outside. Cage Culture has been introduced in Gilgit and Baltistan area showing very encouraging results. This has to be experimented and planned very well by the expert to develop such facility. This could become a major income generation activity for the surrounding community and will be great reward from the project authority to the affected community.

9.2 Recreational facilities

The reservoir is very much suitable for water sports. Somebody has made investment in the provision of sailing boats and water scooters but it needs to be expanded and control the monopoly. Restrictions have been imposed on the water sports by the project authority to make it risk free.

One recreational park has been developed by the project at the disposal area and tourists very often visit this site but it needs lot of improvement and provision of related facilities of good quality.

10. Fisheries Status of River Kunhar in view of locals

Mr. Amjad resident of village Boi visited the lake side at Disposal point. To our query about the fisheries and fish status he responded, “Fishing below the weir and in the lake has been restricted by the Hydropower authority and there is no violation found here as I also used to catch the fish but no more.” He further added, “There has been decline in the fish catch downstream and no fish is found in the lake after the passage of time of appearance of the lake, above the lake fish is caught as usual towards the Gharri Habibullah town”. A fisherman at Shorran stated, “The fish catch has declined and size of the fish is also smaller now”.



Interview with Local

11. Field Results: (Sampling Points)

11.1 Point-I(Boi)

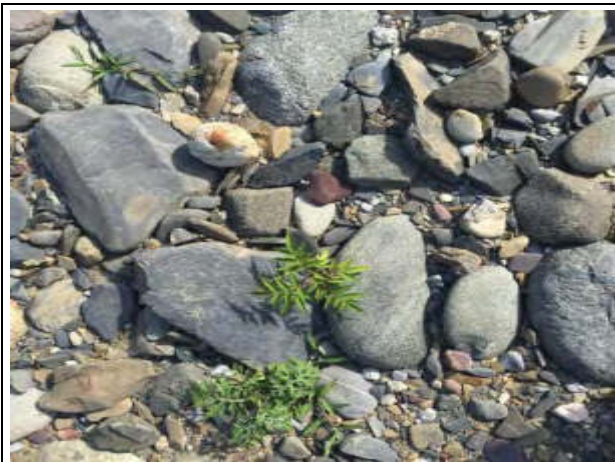
First sampling point of the study is situated at $34^{\circ} 18' 19''$ N, $73^{\circ} 26' 44''$ E at an elevation of 2422 ft above sea level. The water level is flow is about 3 cumecs including 2.3 coumeecs of weir discharge and rest of nallah Boi. Air temperature at this point is 32°C and water temperature 19.5°C . Signs of highest water flow point during the season is visible, Debris are lying on the right bank of the river at about 15 meters from the riverside at this time. Some riparian plant saplings have also appeared on the side. Most probably the seeds have been drifted by the high water current during the January or February 2018. The plants are fig (*Ficus palmata*), Snatha (*Dodonia viscosa*), Mulberry (*Morus alba*) and Drawa (*Ailanthus anus*)



Pic 6: *Ficus palmate*



Fig 7: *Dodonia viscosa*



Pic 8: *Ailanthus anus*

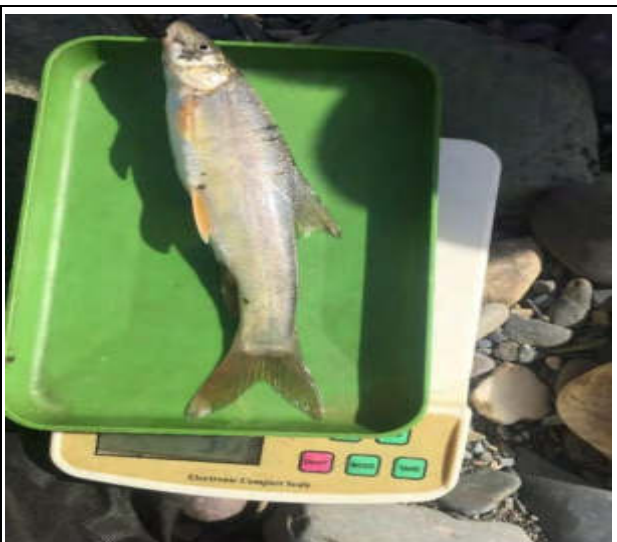


Pic 9: *Morus alba*

This is a very positive sign of good impact on the vegetation establishment on the sides of the river providing strength to the sides from erosion. One fish, *Schizothorax plagiostomus* was caught here with size of 29 cm and weight 70 gm.



Pic 10: Debris left behind by the high rive tide



Pic 11. The fish caught at Point-I

11.2 Point-II (Domail Boi)

This sampling point is situated at 34° 18' 36" N, 73° 26' 43" E at an elevation of 2398 ft above sea level. The nallah water and the river water both are greyish green in colour. Air temperature 27°C and water temperature 19.5°C. The river water speed is very slow and pool seems to be disturbed by whirling water. No fish could be caught here. Sides are covered by the hill shades so the air temperature of this point is lower than at Boi. This is the only bigger source of water contributing in the river Kunhar down the Boi to Domeshi.



Pic 12: Domail

11.3 Point-III: (Parri)

This sampling point is situated at 34o 19/ 47" N, 73o 25/ 35" E at an elevation of 2475 ft above sea level. The river flows through the river boulders and more centered. The small creek joins the river here. There is solid waste disposed of from the road into the river which will have very bad impact on the aquatic ecology of the area. This would have resulted in the full migration of the migratory fish. This impact can be reduced by making some artificila small pools through placing some boulders etc. in the flow of the river. No fish could be caught here.



Pic;13;: Garbage thrown in the river at Point-III



Pic 14:: River Water level at its lowest level (E-flow)

11.4 Point IV: Outlet

This point is situated at 34° 20' 30" N and 73° 25' 43" E. with an elevation of 2519 ft above mean sea level. The fisherman erected a Gill net here one night before to catch the fish for assessment. Astonishingly bigger size fish of three species were caught here and speculated, the concentration of the fish is very high here. The whirling water of the e-flow makes a larger pool and fish migration is blocked here due the dam. This seems to be the repetition of the last sampling but the size of the fish is larger this time. The fish found here must have come through migration from the downstream in search of a reasonable breeding ground. Astonishingly, 4 fish were caught and they were three different species. Two *Schizothorax plagiostomus* and one each *Schizothorax curvifrons* and *Schizothorax labiatus*. They were very healthy with good size and weight. PH of the water is 6.5 and temperature 15°C. Total number of fish caught is 7 at this point.



Pic 15: minimum E-Flow from the gate



Pic 16: *Schizothorax plagiostomus* (down) and *s. curvifrons* (up)

11.5 Point-V: Material Disposal Area

This point lies at 34o 20/ 43” N and 73o 25/ 01” E with an elevation of 2471 ft above mean sea level. Air temperature is 28oC and water temperature 15oC. There are many tourists enjoying the facilities of the recreational provided by the hydropower project authority here. The sailing boats are prohibited here because of the danger of accidental hazard. There is no possibility of fish survival now. Mosquitos and other crustaceans are present. The water seems to be highly eutrophic.



Pic 17: Two University Scholars conducting samples



Pic 18:: Fisherman catching Fish in Disposal Area

11.6 Point-VI Shorran

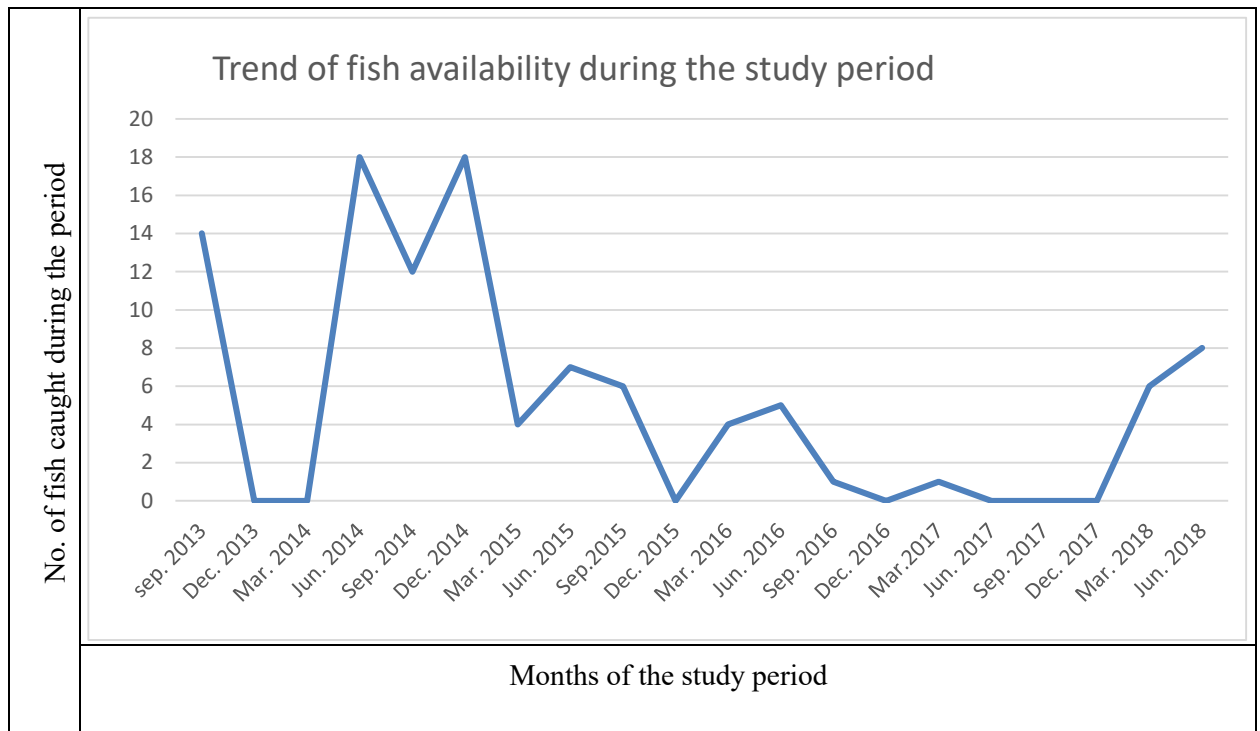
This is the tail point of the reservoir and is situated at 34o 21/ 09” N and 73o 24/ 12” E with an elevation of 2556 ft above mean sea level. Eutrophication can be observed here but it changes with the changing speed of water. A small fish, 5gm weight and 16cm length of *S. plagiostomus* could be caught here. The sides of the river are rich in vegetation. The air temperature is 32oC and water temperature was 15oC and pH 6.5.



Pic 18: Water parameter testing using the gadgets

Table-2 Showing Data collection at each sampling point

Point-I							
S No.	Air temp. °C	Water temp. °C	pH	DO mg/l	Fish Species	Weight (gms)	Length (cm)
1	32	19.5	6.5	8.14	<i>Shizothorax plagiostomus</i>	70	29
Point-II							
2	28	19.5	6.5	8.30	No fish		
Point-III							
3	32	19	6.5	8.28	No fish		
Point-IV							
4	32	19	6.5	8.61	<i>Shizothorax plagiostomus</i>	1059	46
					<i>Shizothorax plagiostomus</i>	1432	49
					<i>Shizothorax plagiostomus</i>	899	44
					<i>Shizothorax curvifrons</i>	311	32
					<i>Shizothorax curvifrons</i>	582	38
						436	34

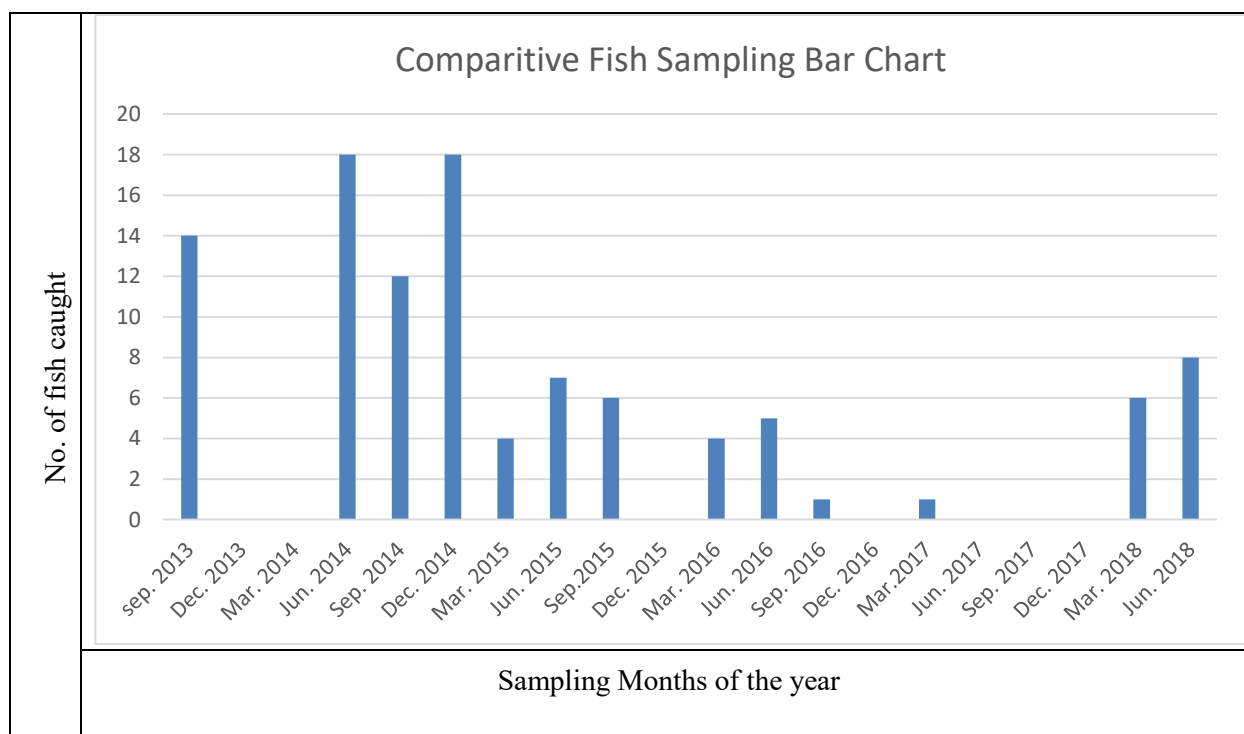


Graph showing trend of fish availability as derived from the studies of the project area

Table-3 Comparative number of fish Caught at sampling points

S.#	Study Month	Sampling Point						Total
		1	2	3	4	5	6	
1	September 2013	3	6	4	0	1	0	14
2	December 2013	0	0	0	0	0	0	0
3	March 2014	0	0	0	0	0	0	0
4	June 2014	5	7	4	0	0	2	18
5	September 2014	0	4	1	2	3	2	12
6	December 2014	6	5	0	4	0	3	18
7	March 2015	2	0	0	0	0	0	2
8	June 2015	3	1	1	0	0	2	7

9	September 2015	4	1	1	0	0	0	6
10	December 2015	0	0	0	0	0	0	0
11	March 2016	0	3	3	0	1	0	4
12	June 2016	4	0	0	0	0	1	5
13	September 2016	0	0	0	0	0	1	1
14	December 2016	0	0	0	0	0	0	0
15	March 2017	1	0	0	0	0	0	1
16	June 2017	0	0	0	0	0	0	0
17	September 2017	1	0	0	0	0	0	1
18	December 2017	0	0	0	0	0	0	0
19	March 2018	1	0	1	4	0	0	6
20	June 2018	1	0	0	6	0	1	8
21	September 2018							
22	December 2018							



12. Conclusions

The dam and reservoir construction play the important role in Pakistan's hydropower development and water resources regulation. Dam construction projects are considered as national basic items. However, the actual impact after the project is easily to deviate from the predicted data before the project construction due to long construction period, big investment and social impacts. Therefore, it is necessary to carry out environmental impact post assessment to assess the actual impacts of the dam construction on ecology and environment, which can provide scientific basis for better development of dam projects and propose some reasonable measures to reduce the adverse impacts.

13. Result

The project authorities have taken a great initiative by fixing many sign boards along the right bank of River Kunhar, prohibiting the fish catch and it is enforced by the provision of the services of a Security Guard. Mr. Mohammad Nasim who was roaming along the riverside to control the people to come near to the river so that sudden change in the river flow may not cost any life. This is a very good development which will not only control the fishing but will provide the opportunity for the fish to breed if other parameters remained suitable to it. The fish of the river downstream has come up for breeding to the pool down of the weir point. Months of March to September is the breeding period when river water temperature rises and favors fish. This time fish migrates to the upper reaches to find the suitable breeding places. Due to obstacle of the weir at Patrind, it could go only up to the water of the outlet. The fish behind the weir will migrate towards the town of Gharri Habibullah and breed at suitable points in the river. The phytogenic condition of the area also shows

changes due to squat water flow and rise in the air temperature at the sides of the river. Algal and Lichen growth is quite higher than before. A new fish species has come in the catch and amphibians have appeared in the water accumulated at the sides of the river.

	
Guard appointed by K-water to monitor the downstream area	Sign boards along the right bank of River Kunhar

14. Recommendations

1. The present watch and ward is a very good initiative by the project authority and it fulfilled one of the recommendations of the previous reports. This watch and ward on downstream area should be continued as this will not only provide the life security to the visitors who don't know the changing flow pattern of the river but it will protect the fish at least from the illegal fishing process.
2. There is no provision of fish hatchery facility under the project so the stocking of local fish in the river system is not possible; but, it is planned under the Kohala Hydro Power Project. This will be a better possibility to get benefit of this local fish hatchery facility in the near future and stock the depleted aquatic environment of River Kunhar.
3. Safe fish passage probability is now finished. Artificial propagation is possible if done under the supervision of experts.
4. Fisheries management concerns focus on protecting spawning grounds in affluent inflow areas, stocking with indigenous and non-indigenous fish species to increase production, development of a small pelagic fishery, and management of the water level to prevent erratic behavior deleterious to fish stocks.

5. The overall impact of the absence of fish pass on reservoir fisheries and downstream river fisheries has been determined in the report. Further disturbance has to be controlled by developing fisheries release facilities in the reservoir and downstream water.
6. Downstream river fisheries management concerns focus on aeration of anoxic discharge water from the dam. The release of artificial mini-floods and the provision of adequate dry season flow are crucial to maintaining a suitable environment for migratory fish species, especially endangered species.
7. Habitat improvement is an essential factor for fishery improvement. To avoid seasonal changes of water level, suitable pools should be created under the management of the local development authority. Such a practice will improve the fish habitat quality and avoid the winter desiccation.
8. Continued assessment is important to compensate the immediate measures in case emergency disaster to the aquatic life in the downstream area and in the reservoir.
9. Early planning and consultation with expert should be initiated to have aquaculture development in the cold-water lake appeared as a result of damming on river Kunhar at Patrind.
10. Trout culture could be a very economical and better option to be started at an experimental basis. This will not only become source of earning but the fish could feed on the mosquitoes and snails which may get established their population with the rise in temperature and they can become the source of some chronic diseases.



Trout Culture in a small cage in slow flowing river

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ANNEX-11 WASTE MANAGEMENT PLAN

The Best Water Partner



THE PATRIND HYDRO POWER PROJECT

WASTE MANAGEMENT PLAN



Pakistan Office

Korea Water Resources Corporation

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1. PURPOSE

This waste management plan provides a practical guide designed to identify all the wastes that will be generated throughout the operation of Patrind hydropower and to define options for their reuse or management.

This plan has been developed to ensure adequate response to the potential environmental impacts of the wastes produced by the project. This plan is designed to achieve and maintain environmentally sound practices for sanitation and for conservation of the environment.

To achieve these goals, K-water will emphasize the following:

- Optimize the use and reuse of materials.
- Analyze the environmental implications of all works activities.
- Collect and dispose of waste promptly
- Stringent housekeeping standards
- Monitoring and inspection of all operational activities to ensure environmental compliance.
- Thorough record keeping
- Effective training

2. Definitions

COMPANY:	Star Hydro
CONTRACTOR:	K- Water Resources Corporation
HAZARDOUS WASTE:	This is any gaseous liquid or solid wastes, which due to its physical, chemical or infectious characteristics have the potentials to harm human health or the environment when improperly handled. They include paints, thinners, organic solvent, sewage, sludge, lead, acid, batteries, clinical waste, welding rods, blasting grit, empty oil / chemical drums and used oil (lube / engine).
OHSAS	Occupational Health and Safety Assessment Series
PPE	Personal Protective Equipment

WASTE	Any unavoidable/unwanted material resulting from an activity or process which has no immediate economic value to the producer and which must be disposed.
DISPOSAL	Discharge, deposit, injection, dumping, spilling, leaking or placing of waste material into or on any land, underground or water body so that such waste, or constituent thereof, may enter the environment.
WASTE MANAGEMENT	The discipline associated with the control, generation, storage, collection, transfer and transport, processing and disposal of solid waste in a manner that complies with the best principles of public health, economics, engineering, conservation, aesthetics, and other environmental considerations.
WASTE MANIFEST	Duplicated form to record waste generation and transfer of that waste.
RECYCLING	The separation of certain materials suitable for reuse, reprocessing or remanufacture of these materials.
BIODEGRADABLE	Substances that can break down into simpler soluble or gaseous compounds by micro-organisms in the soil, water or atmosphere.
WASTE HANDLING	Activities associated with the management of the waste prior to storage, transfer and ultimate disposal route.
NEUTRALIZATION /STABILIZATION	Addition/dilution of waste to acceptable level of contaminants.
GENERATOR	In this context, Individual(s) who produce the waste stream and is responsible for placing the waste in the relevant segregation bin.
WASTE REGISTER	The inventory of the waste streams, both in terms of composition and quantity, produced at each of the facilities.
WASTE MINIMIZATION	Any technique process or activity which either avoids eliminates or reduces waste at its source or allows reuse or recycling of the waste
WASTE HANDLER	Person or corporate entity charged with the management of waste from generation to final disposal.
BEST PRACTICABLE ENVIRONMENTAL OPTIONS (BEOP)	Treatment option based on latest development in environmental science and technology, aimed at adverse environmental impact mitigation and having an established period of practical application taking into account economic and social factors.

3. INTRODUCTION

Reduction of waste shall be implemented. Throughout the project, materials and technologies shall be chosen that minimize the hazards associated with waste and the quantity of waste generated. Materials that are difficult to dispose of and have environmentally sounder alternatives shall be avoided in favor of the latter. All waste impacts shall be taken into consideration, including e.g. packaging for transport to site and final disposal when the end-of-life has been reached.

- Re-use and recycling shall be the norm.
- Final disposal of land filling shall be limited to what is strictly necessary. It shall be carried out by approved waste management Sub-contractor to an approved facility/plant.
- Land filling shall be properly implemented at disposal area by taking proper measures for seepage and prevention of ground water contamination.

4. RESPONSIBILITIES

4.1 K-Water HSE Manager

He ensures the:

- Waste Management is captured in the K-Water HSE audits program.
- Principle that only Pakistani Government approved waste Management Subcontractors are used in the project
- Monitor the overall implementation of the waste management procedure.
- Recommends and facilitate the implementation of recommended actions for improved waste management
- Ensure that the site personnel have been trained to the requirements of this plan.
- Ensure the accurate and up to date recordkeeping, including training records and reports.
- Ensure the implementation of all corrective actions from audits and inspection

4.2 K-Water Environmentalist

His responsibilities include:

- Implement the waste management plan on site and on locations, in particular, handling, Segregation, Storage and Disposal of hazardous waste
- Participate in the creation and / or improvement of training programs

- Collect data relating to site waste management and final destination and provide it to project HSE manager for reporting and maintaining the records.
- Perform inspection on waste management, tracking log and close out action items.

4.3 Supervisor/Foreman/Camp Boss

Their responsibilities include:

- Supervisors / Foreman Subcontractor and Camp Boss shall ensure that all personnel are aware of the requirements of this plan and monitor its implementation

5. PROCEDURES

5.1 General

- The project is committed to manage the waste generated from operations in a responsible manner, comply with the local authorities' regulations and to a high standard of environmental and economic efficiency.
- Licenses / permits or any other approvals or contractual agreements required to meet the requirements of the local, regional, and other stake holders related to waste management shall be obtained.
- K-water shall approve waste water/sewage treatment facilities while Rivers State Ministry shall approve the waste pits for all disposable waste, both hazardous and non-hazardous.
- Shall use or procure Local authorities approved substances for the execution of project. Any banned substances by Local Authorities and Company, shall not be used in the project.
- Shall provide equipment and/or service contracts (if necessary) for the operations of the onsite waste handling facilities and for transportation of waste from its premises to ultimate disposal sites.
- Wastes that are not identified in this plan that may be generated during the project operations shall be treated as potentially hazardous and handled accordingly.
- All the wastes generated from operational activities should be identified, labeled, stored and transported as per its category. Each type of waste must be kept separated from other types. In particular, any mixing of hazardous waste with non-hazardous waste shall be avoided.

- Waste Storage areas shall be designed to contain spills and leaks. Material Safety Data sheets (MSDS) for all chemicals and hazardous substances must be placed and accessible for all personnel handling these materials. Employees shall be trained in the safe handling of hazardous substances. With the approval of local authorities, approved waste disposal sites shall be selected, used for permanent disposal off waste from operations & maintenance.
- Housekeeping on working areas, offices, and residential areas shall be organized as a part of day-to-day operations.

5.2 Waste Management Approach

- Basic approach to the waste management is incorporation of a hierarchy of five best environmental operating practices. Such as Source reduction, Reuse, Recycle, Treatment and Ultimate disposal.
- Source reduction is the primary concern. Waste generation shall be reduced primarily at source by suitable operating practices rather than managing at later stages.
- Where waste generated is not avoidable, attempt to minimize it by reuse, recycle or recovery of wastes to the practicable extent. Treatment shall only be considered after reuse, recovery and recycling options have been completely exhausted. Ultimately, disposal is the last option and should be confined⁹ to designated and approved areas.

5.3 Waste Classification

In order to assess the potential impact on the environment and set priorities for waste management, wastes have been broadly classified into two categories.

1. Non Hazardous Waste
2. Hazardous Waste

Following are the common types of non-hazardous waste generated from the PPHPP Operations

- a) Timber (vegetation)
- b) Domestic Waste
- c) Food Waste
- d) Metal scrap
- e) Office Waste
- f) Non-hazardous chemical waste

Following are the common types of hazardous waste generated from PHPP operations:

- a) Waste lubricants (spent oil)
- b) Used filets, oily rags etc.
- c) Batteries
- d) Hazardous chemical waste
- e) Medical waste
- f) Oily sludge
- g) Contaminated sand (oily sand)
- h) Sewage sludge
- i) Tires

5.4 Waste Segregation

It shall be emphasized to practice waste segregation at all operational sites prior to disposal of any waste material. Waste segregation shall be practiced in accordance with hazard classification, physical and chemical properties, potential for reuse/recycle and ultimate disposal at all operational sites. Color coded waste storage bins shall be used. Segregation at source also facilitates easy collection, saves time, money and effort spent on sorting out waste materials at later stages. The intended contents of each container shall be clearly depicted in both script and pictorial representation of its use. The containers shall also be depicted by their color as listed below:

Waste category	Color code of container
Biodegradable waste (kitchen Waste)	Green
Combustible waste and Hazardous waste (Medical waste)	Yellow
Recyclable waste(Paper), Recyclable wastes (scrap metals and cans and Recycle waste (glass	Blue

5.5 Waste Storage Areas

Wastes shall be stored in containers, drums, plastic bags and / or equipment that have been specially designed for such purpose. Waste storage areas shall be clearly demarcated, labeled or marked and the categories of waste, which may be stored, shall be identified with signboards. Storage areas shall be fenced and provided with multi language warning signs in accordance with applicable standards.

Sufficient number of waste collection containers/drums shall be provided at all operational, residential office and recreational areas. Waste storage areas shall:

- Comply with applicable requirements of local, regional and federal administrations
- Located away from the sensitive areas (surface water bodies, residential areas etc.)
- Clearly fenced (to prevent access to live stock and unauthorized personnel)
- Sufficient size to accommodate generated waste volumes
- Secondary containment walls shall be provided
- Proper shelter shall be provided in order to prevent nuisance by windblown rubbish.
- Hazardous waste shall be stored only in designated areas and proved with lockable gates to prevent unauthorized entry.
- Material Safety Data Sheets (MSDS) and Firefighting facilities shall be provided at all waste storage areas.

5.6 Waste Collection and Transport

It is anticipated that this service will be given to a locally approved subcontractor from the local authorities. He is responsible for daily collection, segregation of waste from waste storage areas to recycle, reuse, treatment and disposal facility from fabrication operational sites. A subcontractor who has permit for hazardous waste management shall be responsible for recording waste streams as per the specified format. However, the following measures shall be taken in general:

- Wastes shall be transported in a safe and responsible manner.
- Hazardous waste and non-hazardous waste shall not be transported together.
- Prohibit the overloading of vehicles with waste loads.
- Provide containment and labeling for waste during transportation.
- Ensure drivers are trained and fully aware of any risk associated with the waste materials.
- Vehicles shall be provided with netting or tarpaulin to prevent flying of waste.

5.7 Waste Disposal

Waste shall be finally disposed on two ways based on whether it has a value or not. Waste of “value” i.e. which can be sold to recyclers or handed over at free of cost. Waste of “no value” shall be disposed in line with local and international authority’s regulations.

All disposal options will be contracted out to waste subcontractor approved by the appropriate organizations and recognized by the client.

5.8 On Site Waste Management Practices

The following are the common practices for management of wastes, which shall be implemented at all sites. In some cases, the concepts of Best Available Not Entailing Excessive Cost (BATNEEC) and Best Practicable Environmental Options (BEOP) should be explored and used as guidelines in managing different types of wastes.

5.9 Non - Hazardous Waste

Domestic waste includes litter, paper, aluminum cans, glass, cartoons, and kitchen waste and timber and vegetation cuttings. Domestic waste may include some recyclable materials such as paper, steel and aluminum cans, printer toner cartridges and disused electronic and computers. These materials shall be segregated at source for recycling and transported to a dedicated licensed waste handling facility for recycling.

The remainder of the domestic waste shall be disposed of in an approved sanitary landfill site. Timber can be salvaged into small pieces and can be allowed to collect by the local residents as firewood.

Storage

Waste shall be stored in dedicated containers with lid proof. Recyclable domestic waste shall be stored in separate containers. In sites where the waste generation is large, waste storage skips of suitable size shall be provided. Kitchen waste mainly contains excess food shall be collected in PVC bags separately.

Collection

Compactor trucks of suitable size shall be used for the collection of domestic and kitchen waste from residential and office areas.

Camp boss is responsible for checking sure all the quantity of kitchen waste before transportation to disposal site on a daily basis.

5.10 Hazardous Wastes

The following are main types of hazardous waste being generated from PPHPP operations.

1) Waste Lubricants

Waste lubricants also called spent oil mainly generated from plant/equipment maintenance works. It shall be collected from operational sites as well as from workshops and stored in dedicated, metallic drums. Waste lubricants shall be transported to dedicated licensed waste facility for recycling.

2) Oily sand

Contaminated oily sand including oil-spill cleanup material shall be collected and transferred to a licensed waste management facility capable of accepting this type of waste. The hydrocarbon-contaminated sand shall be treated by land farming

3) Paint and Paint Related materials

Paint is a generic term covering all types of industrial coatings and most surface protective materials included in this classification would be oil and water - based paints, spent paint thinner, wood preservatives, rust preventatives, and their containers.

It is important to review product information to find out the presence heavy metals like lead, mercury, chromium, cadmium and methyl-ethylketone. Thinners and oil-based paints are generally considered as hazardous because of their ignitability.

Examples:

- Oil based paint Latex
- Water based paint Spent thinner
- Epoxies Paint cans
- Paint remover Handling and disposal Practices

As much as possible, projects requiring painting should be coordinated to reduce excess leftover paints. All painting materials should be completely used. Waste paints shall be collected in sellable drums for further removal. Paint/coating shall not be drained onto the ground or buried. Empty cans shall be punctured and disposed for land filling.

6. Compliance

6.1 Awareness Training

Before the commencement of any operational works, all personnel shall be informed about the contents of this waste management plan through HSE awareness meetings. Attendance will be taken at the end of such meetings. Suitable notices, posters, bulletins on environmental issues shall be displayed at all operational sites to remind the all project employees.

6.2 Monitoring

Project HSE Manager shall carry out Environmental Audits regularly (not less than three monthly) on waste management plan including performance of waste handling sub-contractor. The results of such audits and corrective actions identified shall be communicated to the line management for compliance.

Environmental Engineer will regularly monitor waste storage, segregation, transfer and disposal facilities. He will also ensure a high standard of housekeeping and good material storage at all operational sites.

7. RECORD KEEPING

Record Keeping shall be done for movements of all types of wastes such as non-hazardous, hazardous, reused and or recycled waste. The purpose of record keeping is to:

- Provide the design information on characteristics and volume of waste generated at each operational site.
- Provides a control mechanism for safe handling, transport, treatment and disposal of waste streams in line with the waste management plan.
- To monitor waste generation on consistent manner.
- Generally, waste log shall contain the following minimum details:
 - Date & Time
 - Source
 - Waste Type
 - Weight or estimated volume in m³.
 - Final Disposal
 - Uplift authorized by

The Consignment note will be maintained on and will be compiled on monthly basis.

ANNEX-12 TRAFFIC MANAGEMENT PLAN



THE PATRIND HYDRO POWER PROJECT

Traffic Management Plan



Pakistan Office

Korea Water Resources Corporation

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1. Introduction

The TMP provides traffic management strategy to promote employees and community road safety awareness to ensure road environment where all people feel safe from traffic movements associated with operation of Patrind Hydropower Project.

2. Aims & Objectives

The aims and objectives of TMP are:

- To minimize the potential hazards of traffic resulting from vehicle movements
- compliance with occupational health and safety standards
- implementation of the appropriate Occupational Health & Safety controls for traffic management
- To restrain traffic speeds and safeguard the environment
- To achieve safe movement by reducing accident levels
- To improve pedestrian safety, accessibility and convenience

3. Safety Precautions

3.1 Installation of sign boards

The traffic sign boards (Speed limits, School children crossing, tuck shop, heavy vehicle crossing, Pedestrian walkways, parking & No parking signs, vehicle turning signs) must be installed at access roads of both weir and power house sites.

3.2 Driver's safety induction

Safety induction of all drivers must be conducted by HSE department; check their licenses and validity as well. Give them awareness about the traffic management plan.

3.3 Vehicles speed limit

Drivers must be familiar with traffic rules and regulations, follow the speed restrictions, and observe the posted speed limits on sign boards. The maximum speed limit in project area is 20 Km/h.

3.4 Overtaking Restriction

Overtaking cause serious accidents. Overtaking is strictly prohibited in project sites, schools, crowded public places and near pedestrian's access area to avoid accidents.

3.5 Driver Fatigue

Fatigue is major cause of accidents. In condition of extreme tiredness resulting from physical or mental exertion, feeling drowsy or illness the driver will be not allowed to drive any vehicle.

4. Driver code of conduct

- Complete the pre-start vehicle checks every day
- Keep your vehicle in a clean and tidy state at all times
- Always wear you seat belt and ensure all passengers wear their seat belt
- When reversing always check area behind is clear
- Use of illegal and non-prescriptive drugs is strictly prohibited
- Do not drive under the influence of alcohol
- Do not drive if you are taking medication that may cause drowsiness
- Plan your journey and take regular breaks when on long journeys, no more than two hours driving before taking a break
- Always drive defensively
- Drive very slowly through local villages and be aware of small children and livestock
- Always drive at speeds suitable to the road and weather conditions
- Do not exceed the speed limit
- Do not use mobile telephones while you are driving, pull over and stop to make or receive telephone calls

Powerhouse & Weir site road access pictures are attached below:



Powerhouse site road access



Weir site road access