Federal Flood Commission

GOVERNMENT OF PAKISTAN
MINISTRY OF WATER RESOURCES

PAKISTAN NATIONAL MASTER PLAN FOR FLOOD TELEMETRY NETWORK

Office of Chief Engineering Advisor /Chairman
Federal Flood Commission

Water & Power Development Authority (WAPDA)

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FFICE OF CHIEF ENGINEERING ADVISOR /CHAIRMAN
FEDERAL FLOOD COMMISSION
WATER & POWER DEVELOPMENT AUTHORITY (WAPDA)

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LIST OF ABBREVIATIONS/ACRONYM

A

ADB - Asian Development Bank
ADP - Annual Development Programme
AJ&K - Azad Jammu and Kashmir
AMSL - Above Mean Sea Level
AWS -Automatic Weather Station

C

CEA -Chief Engineering Advisor
CFFC -Chairman Federal Flood Commission

D

DEM - Digital Elevation Model
DHDC - Digital Hydro Data Centers
DTM - Digital Terrain Model

E

EAD -Economic Affairs Division

F

FFT -Flood Forecasting Telemetry
FATA - Federally Administered Tribal Areas
FDRP - Flood Damages Restoration Project
FEWS - Flood Early Warning System
FFC - Federal Flood Commission
FFD - Flood Forecasting Division
FPM - Floodplain Map
FPSP - Flood Protection Sector Project
FLAs - Federal Line Areas

G

GB - Gilgit Baltistan
GSM -Global System for Mobile Communication
GIS - Geographical Information System
GoP - Government of Pakistan

GPS - Global Positioning System

GPRS - General Packet Radio Service

H

H&R - Hydrology and Research

H&WM -Hydrology and Water Management

I

IFM - Integrated Flood Management

IMF - International Monetary Fund

IRSA - Indus River System Authority

K

KP - Khyber Pakhtunkhwa

L

LOC - Line of Control

M

MAF -Million Acre Feet

M/Stn - Master Station

MBC -Meteor Burst Communication

M&R - Maintenance and Repairing

MoWR - Ministry of Water Resources

MP - Master Planning

N

NDMA - National Disaster Management Authority

NESPAK - National Engineering Services Pakistan

NFPP - National Flood Protection Plan

NMP -National Master Plan

NGO - Non-Governmental Organization

O

O&M - Operation and Maintenance

P

PC - Planning Commission
PD&R -Planning Development and Reform
PDMA - Provincial Disaster Management Authority
PID - Provincial Irrigation Department
PMD - Pakistan Meteorological Department
PMPIU - Project Management and Policy Implementation Unit

Q

QPF - Quantitative Precipitation Forecast

R

RS - Remote Sensing

S

SoP - Survey of Pakistan
SOP - Standard Operating Procedure
SWH - Surface Water Hydrology

T

ToR - Terms of Reference

U

UNESCO - United Nations Education, Scientific and Cultural organization
USAID - United States Agency for International Development
UIB - Upper Indus Basin

W

WAPDA - Water and Power Development Authority
WCAP - Water Sector Capacity Building and Advisory Services Project
WMO - World Meteorological Organization
WRD - Water Resources Division of NESPAK

EXECUTIVE SUMMARY

In Pakistan, the rational prevention of natural disasters, such as floods and droughts, is strongly connected with a forecasting technology which cannot be achieved without hydro-meteorological observations. Adequate and accurate hydro-meteorological data at fine time scale is very important and it is essential to improve the monitoring infrastructures by taking advantage of modern technologies for remote control and data management for performing a range of hydrological studies.

The existence of a dense telemetry network of instruments is required in order to be able to model, predict, and plan for catastrophic events which have obvious negative impacts on public health and socioeconomic aspects in the country. The Federal Flood Commission (FFC) formulated and approved NFPP-IV on May 02, 2017 that aimed at improving the country-wide comprehensive flood management plan with focus on acquiring real time hydro-meteorological information through telemetry network for better flood forecasting. Accordingly, all stakeholders, Indus River System Authority (IRSA), the Federal Flood Commission (FFC), the Pakistan Commissioner for Indus Water (PCIW), the Pakistan Meteorological Department (PMD), Provincial Irrigation Departments (PID's), Federal Line Areas (LFAs) and different formations within WAPDA, came up with proposals on up-gradation of existing flow networks to telemetric systems and installation of additional telemetry networks.

Asian Development Bank (ADB) showed interest to provide funds for this proposed telemetry system. The Mission suggested FFC to prepare a joint proposal through WAPDA and come up with a National Master Plan of Flood Telemetry System, comprising inventory of existing telemetry facilities with respect to Gauging Stations/ Telemetry Network within each Province/ FLAs and new proposed stations. This proposal would also include a present O&M system for these installations and future mechanism for O&M along with cost estimate, ensuring sustainable operation once the system is installed. Accordingly, this report is the Telemetry Master Plan developed by WAPDA. Following is the summary of that plan:

Flood Early Warning System (FEWS) of Pakistan was developed under the 'Flood Protection Sector Project, beginning in 1990s and completed in 2007. Operation, Maintenance and up-gradation of this system are the responsibility of Pakistan Meteorological Department (PMD). This Master Plan also portrays in detail the existing meteorological monitoring networks of PMD in the country.

Similarly, Flood telemetry network in Pakistan was developed and installed under Flood Protection Sector Project' beginning in 1990s and completed in 2007. Pakistan Water & Power Development Authority WAPDA was tasked with providing flood data of river flows to all other stakeholders mentioned above.

WAPDA is responsible for installation and maintenance of Telemetry Network along various rivers and the two major reservoirs, Tarbela and Mangla. This data is collected through the existing Hydro-meteorological Network, stored and then disseminated to the stakeholders. Following WAPDA departments are involved in this process:

- Surface Water Hydrology Project (SWHP)
- Hydrology and Research Directorate (H&R)
- Glacier Monitoring and Research Centre (GMRC)
- Water Resource Management Directorate (WRMD)

In a meeting of all the stakeholders chaired by Chairman Federal Flood Commission (Feb 25, 2020) it was agreed that WAPDA will prepare the Flood Telemetry Master Plan for the country to meet

the federal monitoring requirements as well as the Provincial requirements for each province. Subsequently the implementation could be carried out in phases as per available investments. However, the first phase comprising essential telemetry sites would be implemented through the approved provision of Rs. 6 Billion. It was also decided that PIDs & (FLAs) will bear/ provide the O&M cost of the Flood Telemetry Network installed in their area of jurisdiction. WAPDA will provide technical support on O&M to ensure fault free operation after installation **(Annex-1).**

A Hydrological Data Proforma was developed in the beginning to obtain as much information as available from all the stakeholders about the existing hydrological networks, ongoing installations, and proposed network improvements/ enhancements. Separate Tables are prepared for each province / region showing existing, on-going and proposed stations. This data was then transformed into GIS maps. While preparing the maps it was realized that given coordinates of number of stations were not correct which were later corrected. Accordingly, the maps for all the provinces / regions showing existing and proposed networks by different stakeholders / departments are prepared. The final area wise Status Summaries, data tables and maps are presented as **Annex 3 to 5.**

One of the objectives of this assignment was to analyses all the catchments and sub catchments of Pakistan and identify locations of gauging stations based on international standards and engineering judgment, ignoring the existing and proposed stations. Later, data of existing and proposed stations was superimposed on this map and duplicate and redundant locations were identified and removed.

The proposed Flood Telemetry Master Plan includes data acquisition through telemetry and Data Management through establishing Digital Hydro Data Center (DHDC). Therefore, already installed manual stations are being recommended to be upgraded to new telemetry station network. Proposed Stations have been further categorized according to their importance with regard to flood management, into category A, B and C for implementation purpose.

This report reviews the status of Hydrological Gauging Network (telemetry/manual) installed by various government departments and agencies, their condition, and their data sharing mechanism. Also, reviews the present O&M system of the existing installations and propose future mechanisms of O&M ensuring sustainable operation once the system is in place. This Flood Telemetry Master Plan report compiles all proposed stations for observation network including up-gradation of operational manual stations to telemetric system in order to develop a nation-wide connected hydro-meteorological network.

The basic concept of this Flood Telemetry Master plan is presented in the figure 2.1. Accordingly, establishment of a Digital Hydro Data Center (DHDC) with WAPDA in Lahore and Regional Data Centers in all the Provinces /FLA's are also recommended for an integrated data management.

Chapter 1 discusses existing monitoring systems in the country. Chapter 2 discusses the methodology for proposing observation stations for the National Flood Telemetry Network. Chapter 3 explains the communication system and chapter 4 explains the observation hardware. Chapter 5 discusses the operation, maintenance and calibration of equipment. Finally, cost estimates for flood telemetry network including new installations and up-gradations are presented in chapter 6.

CHAPTER - 1

INTRODUCTION & EXISTING MONITORING SYSTEMS

1. INTRODUCTION & EXISTING MONITORING SYSTEMS

1.1 BACKGROUND

Pakistan's major Hydrologic Units are Indus River Basin, Kharan Desert Basin and Makran Coastal Basin. Main rivers originate from Indus River Basin (IRB) of the northern mountains of Himalaya, Karakoram, Hindukush ranges and Kashmir. Indus River is the twelfth largest river in the world and a trans-boundary river in Asia.

Since the last few decades, climate change has significantly influenced the flood flows in the country and Pakistan has become one of the highly vulnerable countries regarding floods. The rational prevention of natural disasters, such as floods and droughts, is strongly connected with a forecasting technology which cannot be achieved without hydro-meteorological observations. Adequate and accurate hydro-meteorological data at fine time scale is very important and it is essential to improve the monitoring infrastructures by taking advantage of modern technologies for remote control areas and data management for performing a range of hydrological studies. The existence of a dense telemetry network of instruments is required in order to be able to model, predict, and plan for catastrophic events which have obvious negative impacts on public health and socioeconomic aspects in the country.

After the disastrous flood of 2010, the Federal Flood Commission (FFC) responsible for planning and coordination of the flood related tasks in the country formulated and approved NFPP-IV on May 02, 2017 that aimed at improving the country-wide comprehensive flood management plan with focus on non-structural measures. It was found imperative to have real time hydro-meteorological information through telemetry network for better flood forecasting, and developing plans to manage any possible catastrophic event. The devastating flood of 2022 has further emphasized the necessity of these requirements to be in place at the earliest.

The National Water Policy-2018 also includes telemetric monitoring as one of major interventions required to be implemented by 2030 (refer Para 28.11 of NWP) and reflects the following;

a) Real-time monitoring of river flows by IRSA through inter alia telemetric monitoring to maintain transparent water accounting system and to check the increasing trend of unaccounted-for water in the Indus System of Rivers (refer Para 28.4 (v) of NWP).

b) In order to maintain a reliable assessment of water resources in the country, federal and provincial water sector organizations would develop a standardized and uniform mechanism for data collection of various parameters of water resources including but not limited to rivers/canals gauge and discharge, rainfall/snowfall depth to groundwater table, surface/ subsurface water quality parameters, river canal and reservoir sedimentation (refer Para 28,4 (vi) of NWP)

Accordingly, all stakeholders, Indus River System Authority (IRSA), the Federal Flood Commission (FFC), the Pakistan Commissioner for Indus Water (PCIW) and the Pakistan Meteorological Department (PMD), Provincial Irrigation Departments (PID's), relevant departments of FLAs and different formations within WAPDA, came up with proposals on up-gradation of existing flow networks to telemetric systems and installation of additional telemetry networks. Subsequently, on the basis of these proposals a flood telemetry plan was submitted by WAPDA that was discussed

in detail with FFC and Asian Development Bank (ADB) Mission during a meeting held on 4th & 5th of March 2020 with all stakeholders.

ADB Mission suggested FFC to prepare a joint proposal through WAPDA and come up with a National Master Plan of Flood Telemetry System, comprising existing telemetry facilities with respect to Gauging Stations/ Telemetry Network within each Province/ FLAs and new proposed stations. This proposal would also include a present O&M system for these installations and future mechanism for O&M ensuring sustainable operation once the system is installed. Master Plan would also prioritize the need of telemetric system installations/ improvement and avoid duplication of efforts.

1.2 ASSIGNMENT

Presently, the existing gauging of river flows/major nullahs located in various Provinces is being done manually by different departments in Pakistan. The existing hydrological network needs to be upgraded and further enhanced to obtain real time or near real time data from weather and gauging stations situated remotely on rivers of Pakistan. As suggested by ADB, FFC under NFPP-IV/FPSP-III initiated preparation of National Master Plan for Flood Telemetry Network through WAPDA, having seven (07) sections / components, WAPDA (1), one each for four provinces (4), Gilgit-Baltistan (1) and AJK (1). ADB provided technical support of a team consisting following four (4) experts as resource persons to help WAPDA in preparation of this Master Plan.

1. Tariq Altaf – Senior Water Resources Specialist
2. M. Arshad Pervez – Water Resources Specialist
3. Dr. Umair Rabbani – Spatial Hydrologist
4. Muntazir Mehdi – GIS Specialist

1.3 SCOPE OF WORK

The scope of work of this study for this master plan will be the following:

1. Review the status of Hydrological Gauging Network (telemetry/manual) installed by various government departments and agencies, their condition, and their data sharing mechanism as required for an assessment.

2. Review existing Enhancement Plans prepared by the Provincial Departments and other agencies/FLAs to establish telemetry stations under NFPP-IV/FPSP III umbrella PC-1 and other national level initiatives to ensure that the Master plan effectively avoids duplication and/or encroachment of mandate.

3. Establish the requirement for installation of telemetry system across the country based on gaps in existing system, hydrological condition of respective catchments / sub-catchments fulfilling International Data Standards / requirements to ensure registering of flows in all main rivers, secondary and tertiary rivers, small nullahs and streams.

4. Review the present O&M system of the existing installations and propose future mechanisms of O&M ensuring sustainable operation once the system is in place.

5. Preparing GIS Maps for the existing and proposed Hydro-meteorological networks.

6. This Flood Telemetry Master Plan for the country will be developed to meet the federal monitoring requirements as well as the Provincial requirements for each province. Subsequently the implementation could be carried out in phases as per available

investments. However, the first phase comprising essential telemetry sites would be implemented through the approved provision of Rs. 6 Billion and a Proposal for inclusion in FPSP-III should also be prepared accordingly.

7. Prepare Master plan in the form of Report including all necessary details for inclusion in the Umbrella PC-1 of FPSP-III of NFPP-IV along with GIS Maps prepared for identified location for telemetry stations in Pakistan.

8. Recommendation to strengthen data infrastructure and linkages between organizations involved in the processing / dissemination for effective utilization of data in the country.

1.4 EXISTING FORECASTING AND EARLY WARNING SYSTEM

Flood Early Warning System (FEWS) of Pakistan was developed under the 'Flood Protection Sector Project' beginning in 1990s and completed in 2007. The Pakistan Meteorological Department (PMD), an autonomous and independent institution under the Cabinet Secretariat (Aviation Division) was tasked with providing forecasts and public warnings, for the purposes of protection, safety, and general information.

Similarly, Flood telemetry network in Pakistan was developed and installed under Flood Protection Sector Project' beginning in 1990s and completed in 2007. Pakistan Water & Power Development Authority WAPDA was tasked with providing flood data of river flows to Indus River System Authority (IRSA), the Federal Flood Commission (FFC), the Pakistan Commissioner for Indus Water (PCIW) and the Pakistan Meteorological Department (PMD), Provincial Irrigation Departments (PID's), relevant departments in FLAs and also within WAPDA for water regulation/ accounting and issuance of early Flood Warnings through FFD.

1.5 EXISTING HYDRO-METEOROLOGICAL OBSERVATION NETWORKS

Generally, the Hydrologic Stations in Pakistan have been installed on the valleys of the main rivers and tributaries and the discharges of the rivers are measured at all the barrages. The observation networks are installed and maintained by WAPDA, PMD and the Provincial Irrigation Departments as discussed below. The collected Hydro meteorological data is processed and used for the following purposes;

- Water resources assessment at basin or sub-basin scale.
- Water resources assessment for administrative geographical units.
- Water resource Project Planning including;
- Water Storage Reservoirs
- Irrigation
- Hydroelectric power generation
- Industrial requirements
- Assessing impacts of Climate Change on Water Resources.
- Flood forecasting, warning and preparation of flood management plan.
- Management of Reservoir Operation.

The following major offices deal with the Hydro-meteorological Monitoring, analysis and data Management;

1.5.1 WATER AND POWER DEVELOPMENT AUTHORITY (WAPDA)

WAPDA has a lead role in providing hydrologic data from the whole river network in Pakistan. WAPDA is responsible for installation and maintenance of Telemetry Network along various rivers and collection of the river flow data. The operation of major reservoirs; Tarbela and Mangla, which play a significant role in mitigating floods, is also the responsibility of WAPDA. It has vast experience in installations, operation and maintenance of hydro-meteorological monitoring networks.

- **Surface Water Hydrology Project:** The Surface Water Hydrology Project (SWHP), WAPDA was created in 1960 with the aim to collect and monitor data relating to surface flows and climate parameters for Planning and Development of Water Resources and Water Management in Pakistan. It is responsible to observe, collect, analyze and publish the data of stream flows, sediment, water quality and climate, including O&M and up-keep of hydro-met stations spread throughout the country.

  The SWHP is switching to the Modern Equipment for efficient and more accurate data observation through up-gradation of the existing system to real time monitoring system. Most importantly its Data Management System has been upgraded with latest technology. Hydromet. data are provided to IRSA, PCIW, Army, PIDs, FFC, PMD, WAPDA Formations, Research Institutions, Universities and P&D Division GOP.

- **Hydrology and Research Directorate (H&R):** The Hydrology and Research (H&R) Directorate under HRM Division WAPDA is operating and maintaining a telemetry network comprising 44 remote stations (**Table- 1.1**). of national interest installed in the Upper Catchments of Punjab, Azad Jammu and Kashmir (AJ&K) and Khyber Pakhtunkhwa (KP) provinces and 05 No. Hydro-meteorological Data Sites in Khyber Pakhtunkhwa (KP) and Gilgit Baltistan (GB) provinces of Pakistan.

  Historically the hydrological observation of normal stream flows and meteorological stations were being carried out by Surface Water Hydrology Project of WAPDA whereas water stage recorders of flood monitoring network of H&R department of WAPDA would activate only when water stage rise to the flood level of respective river/ stream. However, for new installations/up-gradation H&R, WAPDA intends to monitor all stages of rivers/ streams and would also include additional sensors for monitoring weather parameters as well to convert the stations to all-purpose stations.

  Accordingly, H&R Directorate under GM (HRM) WAPDA is progressively expanding / strengthening the existing Flood Telemetry Network and all the existing flood telemetry stations are being converted into complete stations, through integrating the meteorological sensors in the existing stations to have detailed hydro-meteorological information of the rivers / catchment. In addition, installation of Automate Stream Gauging Telemetry Stations is also in progress

  These up-gradations/new installations are already ongoing on Neelum River of AJK, Kabul, Swat and Chitral of KP and on Indus at Besham under funding from different agencies and the same mechanism will follow for the establishment of new flood telemetry networks of H&R, WAPDA under National Flood Telemetry Master Plan.

- **Glacier Monitoring and Research Centre (GMRC):** GMRC is maintaining a Network comprising 20 No. Automatic Weather Stations in the Upper Indus Basin that uses meteor burst communication system for automatic data transmission on an hourly basis (**Table- 1.2**). Data received from the weather stations network are used for seasonal and 10-Daily Flow Forecast for Indus River at Tarbela, Jhelum River at Mangla and Kabul River at Nowshera by using the UBC Hydrological model. GMRC is also implementing Pakistan Glacier Monitoring Network Project to enhance the high-altitude network by adding more Automatic Weather Stations. This monitoring, in turn, helps in better planning of water sector projects and optimal operation of existing water storage dams and hydropower facilities.

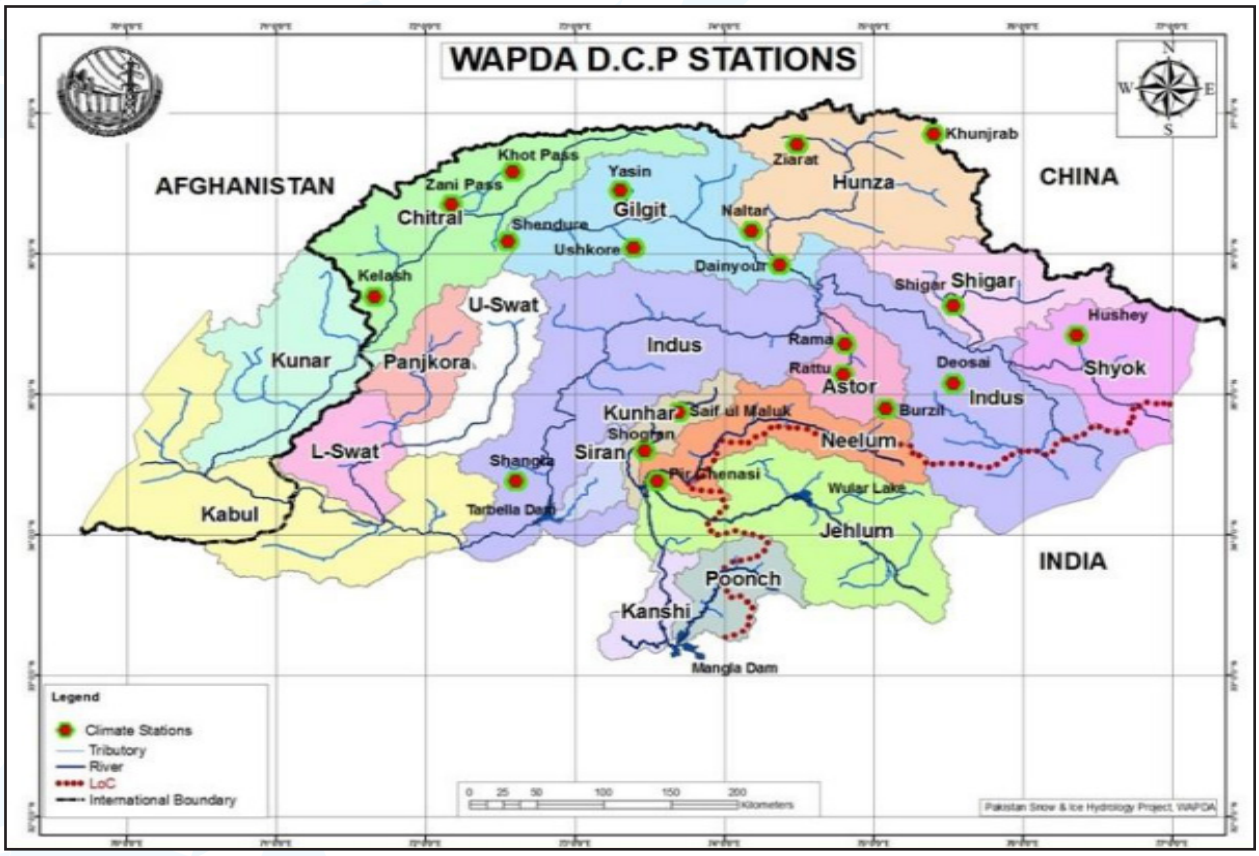
- **Water Resource Management Directorate (WRMD):** WRMD operates and maintains 21 HF Radio Communication Station that transfer hourly river level and rainfall data communication to the receiving center at Lahore (**Table-1.3**). Physically these sites are maintained by SWHP but additionally High Frequency Radios facility has been provided/ operated by WRMD for swift transmission of hydrological data to Master Control at Lahore. WRMD is also responsible for collection, compilation, analysis and publication of hydrological data reports and preparation of daily hydrological data reports and WAPDA press releases.

Table - 1.1: Flood Telemetric Stations of H&R Directorate, previously on Meteor Burst Communication has been converted to GSM Communication System.

Sr No.	Station	River	Catchment	Sr No.	Station	River	Catchment
1	Besham	Indus River	Indus	23	Plandri	Jhelum River	Jehlum
2	Attock / Khairabad	Indus River	//	24	Sair ka kota	Jhelum River	//
3	Nowshera	Kabul River	//	25	Kund	Jhelum River	//
4	Warsak	Kabul River		26	Talhatta	Kunhar River	//
5	Chakdara	Swat River	//	27	Palote	Jhelum River	//
6	Odhi	Rain Station	//	28	Sara-i-Alamgir	Jhelum River	//
7	Daggar	Rain Station	//	29	Chakri	Bunha River	//
8	Phulra	Rain Station	//	30	Baba Shah Jalal	Jhelum River	//
9	Tanda Dam	Toi	//	31	Rohtas	Kahan River	//
10	Kurram Garhi	Kurram	//	32	Marala (D/S)	Chenab River	Chenab
11	Dara - e - Tang	Kurram	//	33	Alexandra Bridge	Chenab River	//
12	Rashid Abad	Kalpani Nullah	//	34	Bhimber Nullah	Chenab River	//
13	Dhokpathan	Swan River	//	35	Zafarwal	Rain Station	
14	Dartian	Haro River	//	36	Daulat Nagar	Rain Station	//
15	Garhiala	Haro River	//	37	Kotnaina	Ravi River	Ravi
16	Nauseri	Neelum River	Jhelum	38	Ravi Siphon	Ravi River	//
17	Muzaffarabad	Neelum River	//	39	Jassar	Ravi River	//
18	Hattian Bala	Jhelum River	//	40	Deg Diversion	Deg Nullah	//
19	Domel	Jhelum River	//	41	Shakargarh	Bein Nullah	//
20	Chattarklass	Jhelum River	//	42	Palku	Sialkot Nullah	//
21	Kotli	Poonch River	//	43	Ura	Aik Nullah	//
22	Mangla	Jhelum River	//	44	Gand sing wala	Sutlej River	Sutlaj

Table - 1.2: Automatic Weather Stations of GMRC, WAPDA with Meteor Burst Communication

Sr. No.	Name	Elev. (M)	Sr. No.	Name	Elev. (M)
1.	Gilgit	1479	11.	Pir Chinasi	2594
2.	Shangla	2240	12.	Zani Pass	3839
3.	Shigar	2367	13.	Yasin	3280
4.	Rattu	2718	14.	Saif Ul Muluk	3230
5.	Rama	3179	15.	Khot Pass	3624
6.	Naltar	2898	16.	Shendure	3712
7.	Shogran	2740	17.	Ziarat	3020
8.	Ushkore	3051	18.	Burzil	4239
9.	Hushey	3075	19.	Deosai	4149
10.	Kelash	2920	20.	Khunjerab	4750



Tarbela Network	Mangla Network
Skardu	G.H.Ullah
Jaglot	Muzaffarabad
Besham	Domel
Daggar	Chattar Kalas
Oghi	Azadpattan
Phulra	Plandri
Shinkiari	Kallar Syedan
Nowshera	Kotli
Khiarabad	
Chashma	
Tarbela (Sub Control)	Mangla (Sub Control)
Lahore (Master Control Station)	

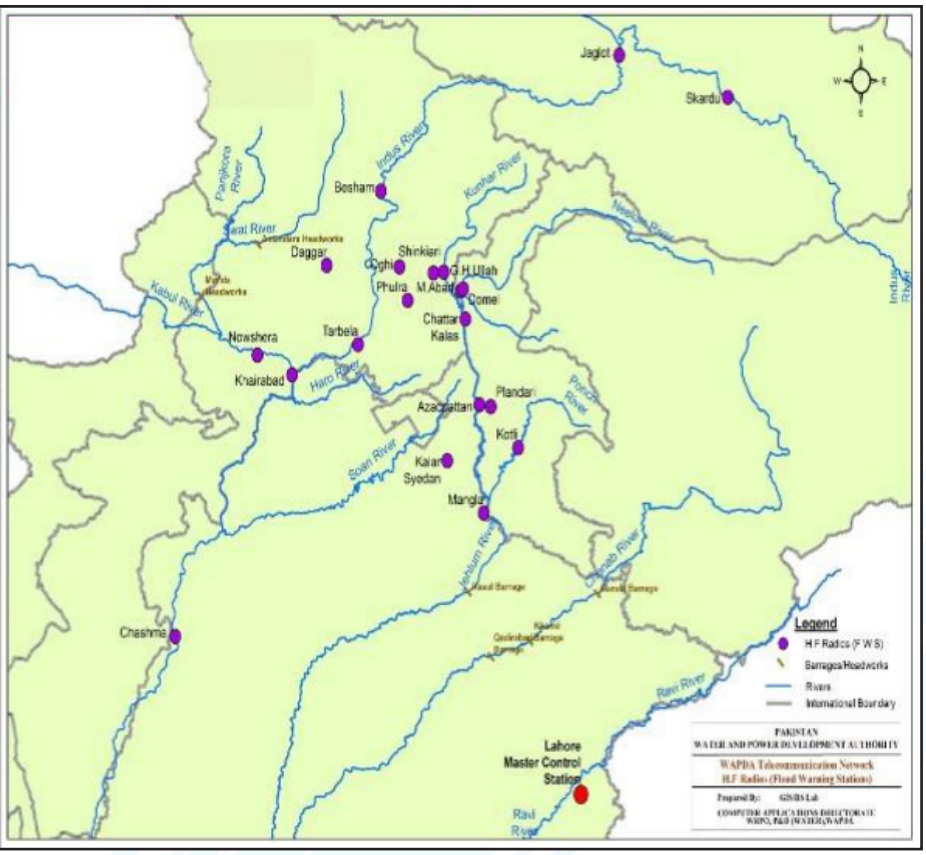


Table- 1.3: SWHP stations with High Frequency Radio Communication by WRMD

1.5.2 PAKISTAN METEOROLOGICAL DEPARTMENT (PMD)

Pakistan Meteorological Department (PMD) is an attached department of the Ministry of Aviation (Aviation Division) and is the sole National Meteorological Organization responsible for providing early warnings for Weather, Tsunami, Aviation, Marine, Flood and general public. It is a scientific and technical organization, responsible for the collection of real time meteorological, climatological, agro-meteorological and seismological data for undertaking multifarious activities mainly in the field of Meteorology, Hydrology and Seismology in the fulfillment of its objectives and obligations. PMD has one of the key responsibilities of flood forecasting through collection of meteorological data, its analysis, prepare a flood early warning report and provide necessary alerts and flood warnings to various stakeholders including provincial and federal flood managing organizations. In this regard PMD has a network of observatories for rain fall and other meteorological observation and a network of Automatic Weather Observing Stations (AWSs) that provide real time data. This network functions under the technical and administrative control of PMD's Regional Directorates established at Lahore, Karachi, Peshawar, Quetta Gilgit and its Headquarters office at Islamabad. Further, PMD also has a network of weather radars at various locations in the country. The weather radars at Mangla, Sialkot, Islamabad and Lahore have been installed to provide aerial rainfall estimates of the various sub-basins of Jhelum, Chenab, Ravi and Sutlej rivers. Besides, PMD is also installing two weather Radars at Multan and Sukkur to cater the needs of Indus River catchment areas. In view of vital role of PMD in flood forecasting and being real user of the flood monitoring data, provision of data ports for visualization of real time data in PMD regional offices at Lahore, Islamabad, Karachi, and Peshawar has also been made in this Master Plan. Province wise installations details of Observatories and Automatic Weather Station are given hereafter **(Table 1.4 to 1.14 and Fig 1.1 to 1.6)**

FUTURE NETWORK ENHANCEMENT PLANS

PMD intends to further densify its monitoring network to enhance the quality of data through the following Projects;

Pakistan Hydro-Met and Climate Services Project (PHCSP)
On the bases of National Disaster Management Plan, prepared by JICA in 2012, The PMD project proposal was approved by the Prime Minister's Office in 2016. World Bank agreed to finance the proposed project plan of PMD. The major area of focus is as under;

- 04 Weather Radars Quetta, Sialkot, Gwadar and Cherat
- 300 Automatic weather Stations for real time Hydro meteorological data observation.
- 07 Wind Profilers for major Airports as per ICAO Audit compliance
- 01 High Performance Computer 220 Tera Flop
- 16 Lightening Detection System as per ICAO Audit compliance
- 06 Regional Agromet Centers and 100 New Agromet Data centers.
- Upgradation & Strengthening of Institute of Meteorology and Geophysics.
- Improvement of PMD Service Delivery System

The Grant Implementation Agreement was signed between NDRMF, Aviation Division and PMD on 30-08-2022. Finance Division allowed opening the Current Account in respect of the PHCSP Project on 29-09-2022. The project is cancelled by the World Bank and PMD is exploring for alternative funding opportunities for the project.

The Chief Mets and all four Regional Directors were assigned the task to select the sites for selection of sites for AWS and the work is under progress under time lines. The necessary NOC's for Radars are under process and PMD team is visiting Gwadar during next week for selection of site.

Installation of Weather Surveillance Radar at Dera Ismail Khan
PMD project for installation of new C Band Dual polarized Radar has been approved by the DDWP and NDRMF Board, at a total cost of 465.467 million. It was made as the part of the PHCSP project funded by the World Bank. The Grant Implementation Agreement was signed between NDRMF, Aviation Division and PMD on 30-08-2022. Case of opening the account of the project is under process in Finance Division.

Installation of Weather Surveillance Radar at Multan and Sukkur
PMD has collaborations with the diversified donor organization. JICA has helped PMD to strengthen its Radar network. In this regard two radars at Islamabad and Karachi have already been installed. However, two more projects are under implementation for installation of weather Radars at Multan nd Sukkur. These projects are expected to complete by December 2026.
Flood Protection Sector Project-III

Flood Protection Sector Project aims to mitigate the disaster caused by flash flooding, urban flooding and riverine flooding to enhance the social economic status of the communities of Pakistan. The project was launched by Federal Flood Commission (FFC) after devastating super flood in 2010.

CDWP in its meeting held on 03.03.2020 approved the Concept Clearance Proposals of Flood Protection Project-III based on NFPP-IV. The FPSP-III contained the investment of Rs.4.110 billion

for PMD's projects mentioned above in the umbrella of FPSP-III.
In wake of recent devastating flooding in Pakistan during monsoon season 2022 that caused huge loss of precious lives besides damage to infrastructure and public property, FFC has asked PMD to submit proposals for the PMD's sub-projects for inclusion in the updated portfolio of FPSP- III. In response PMD proposed the following revised sub-projects to be included in the said programme; -

- Establishment of six (6) No. Regional Flood Early Warning Centers at Quetta, Gilgit, Karachi, Peshawar, Multan and Muzaffarabad.
- Expansion of Met AWS in Pakistan
- Installation of Eight (8) No. Radars at Lahore, Mangla, Khuzdar, Zhob, Gilgit, Dalbandin, Swat and Muzaffarabad.
- Establishment of Urban / Flash Flood Warnings in major cities.
- Establishment of extreme Weather Early Warning System

Accordingly, PMD has submitted the PC-I's of first two projects work 5.2 billion and requested FFC to allocate more funds for the rest of the project in the list as above.

PUNJAB PROVINCE

Table: 1.4 - PMD Weather Network (AWS)

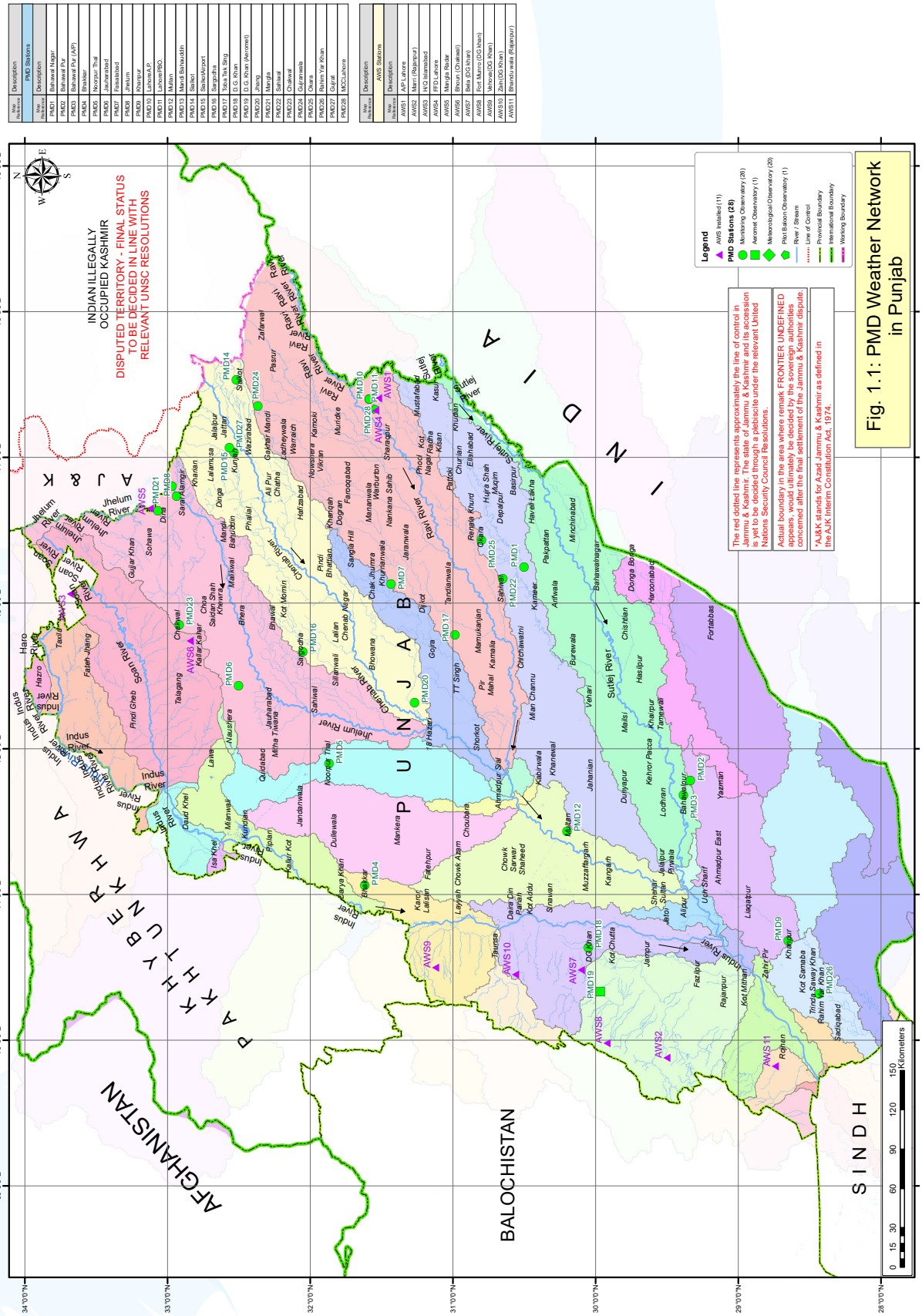
Sr. #	Province	Station Name	Location / Address	Latitude	Longitude
1	Punjab	A/P Lahore	PMD Obs.	31.52	74.406
2	Punjab	Marri (Rajanpur)	Border Military Police check post	29.5	69.88
3	Punjab	H/Q Islamabad	PMD H/Q	33.68	73.06
4	Punjab	FFD Lahore	PMD RADAR	31.54	74.32
5	Punjab	Mangla Radar	PMD Radar	33.12	73.65
6	Punjab	Bhoun (Chakwal)	Agriculture research center	32.84	72.74
7	Punjab	Bela (DG khan)	Irrigation rest house	30.1	70.48
8	Punjab	Fort Munro (DG khan)	Irrigation rest house	29.92	69.98
9	Punjab	Vehova((DG Khan)	Border Military Police check post	31.12	70.5
10	Punjab	Zain(DG Khan)	Border Military Police check post	30.56	70.45
11	Punjab	Bhandu wala (Rajanpur)	Border Military Police check post	28.74	69.82

Table: 1.5 - PMD Weather Network (Observatories)

Sr. No.	Province	Name of Station	Index No.	Elevation/Height a.m.s.l.(meters)	Latitude	Longitude
1	Punjab	Bahawal Nagar	41678	161.05	30.500	73.250
2	Punjab	Bahawal Pur	41700	110.00	29.333	71.783
3	Punjab	Bahawal Pur (A/P)	41701	119.00	29.383	71.683
4	Punjab	Bhakkar (AP)	41625	162.00	31.617	71.067
5	Punjab	Noorpur Thal (AP)	41626	186.00	31.867	71.900
6	Punjab	Jauharabad (AP)	41627	187.00	32.500	72.433

7	Punjab	Faisalabad	41630	185.60	31.433	73.133
8	Punjab	Jhelum	41598	287.19	32.933	73.733
9	Punjab	Khanpur	41718	88.41	28.650	70.683
10	Punjab	LahoreA.P.	41641	216.15	31.583	74.400
11	Punjab	LahorePBO.	41640	214.00	31.550	74.333
12	Punjab	Multan	41675	121.95	30.200	71.433
13	Punjab	Mandi Bahauddin	41597	252.97	32.967	73.800
14	Punjab	Sialkot	41600	255.10	32.517	74.533
15	Punjab	SialkotAirport	41600	240.00	32.533	74.033
16	Punjab	Sargodha	41593	187.00	32.050	72.667
17	Punjab	Toba Tek Sing	41638	155.00	30.983	72.783
18	Punjab	D.G. Khan	41652	148.10	30.050	70.633
19	Punjab	D.G. Khan (Aeromet)	NIL	141.00	29.967	70.333
20	Punjab	Jhang	41636	---	31.267	72.317
21	Punjab	Mangla	41576	283.30	33.067	73.633
22	Punjab	Sahiwal	41680	172.00	30.650	73.167
23	Punjab	Chakwal (AP)	4162	519.00	32.917	72.850
24	Punjab	Gujranwala (AP)	41642	227.00	32.367	74.350
25	Punjab	Okara	41646	180.00	30.800	73.433
26	Punjab	Rahim Yar Khan	41716	82.93	28.433	70.317
27	Punjab	Gujrat	NIL	---	32.567	74.067
28	Punjab	MCCLahore	NIL	216.15	31.583	74.400

Figure 1.1: PMD Weather Network in Punjab



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KHYBER PAKHUNKHWA PROVINCE

Table: 1.6 - PMD Weather Network (AWS)

Sr. No	Province	Station Name	Location / Address	Latitude	Longitude
1	KPK	Besham	Wapda Obs.	34.91	72.81
2	KPK	Warsak Dam	WAPDA Obs.	34.16	71.4
3	KPK	Mohmand Dam	WAPDA Obs.	34.35	71.54
4	KPK	Mardan	PMD Radar	34.19	72.02
5	KPK	Chitral	PMD Obs.	35.88	71.79
6	KPK	PBO MalamJabba	PMD Obs.	34.8	72.56
7	KPK	PBO Upper Dir	PMD Obs.	35.19	71.87
8	KPK	PBO kalam	PMD Obs.	35.47	72.57
9	KPK	Buner		34.64	72.47

Table: 1.7 - PMD Weather Network (Observatories)

Sr. No.	Provice	Name of Station	Index No.	Elevation/Height a.m.s.l.(meters)	Latitude	Longitude
1	KPK	Balakot	41536	995.40	34.550	72.350
2	KPK	Cherat	41565	1372.00	33.817	71.550
3	KPK	Chitral	41506	1497.80	35.850	71.833
4	KPK	D.I.Khan (PBO)	41624	171.20	31.817	70.933
5	KPK	D.I.Khan (Aeromet)	NIL	172.30	31.917	70.867
6	KPK	Dir	41508	1375.00	35.200	71.850
7	KPK	Drosh	41515	1463.90	35.567	71.783

8	KPK	Kakul (Abbottabad)	41535	1308.00	34.183	73.250
9	KPK	Parachinar (PBO)	41560	1725.00	33.867	70.083
10	KPK	Parachinar (Aeromet)	NIL	1775.00	33.900	70.067
11	KPK	Saidu Sharif (Aeromet Obsy)	NIL	949.00	34.733	72.550
12	KPK	Saidu Sharif (Met Obsy)	41523	961.00	34.733	72.350
13	KPK	Kalam	NIL	2103.01	35.833	72.983
14	KPK	Malam Jabba	NIL	2590.67	34.750	72.900
15	KPK	Mir Khani	NIL	1250.00	35.500	74.700
16	KPK	Bannu	NIL	406.00	33.000	70.100
17	KPK	RMCPeshawarPBO	NIL	327.00	34.020	71.560
18	KPK	Met Observatory Timergara (Lower Dir)	NIL	460.00	34.828	71.842
19	KPK	Met Observatory Pattan (Kohistan)	NIL	739.00	35.060	73.000

Figure 1.2: PMD Weather Network in KPK

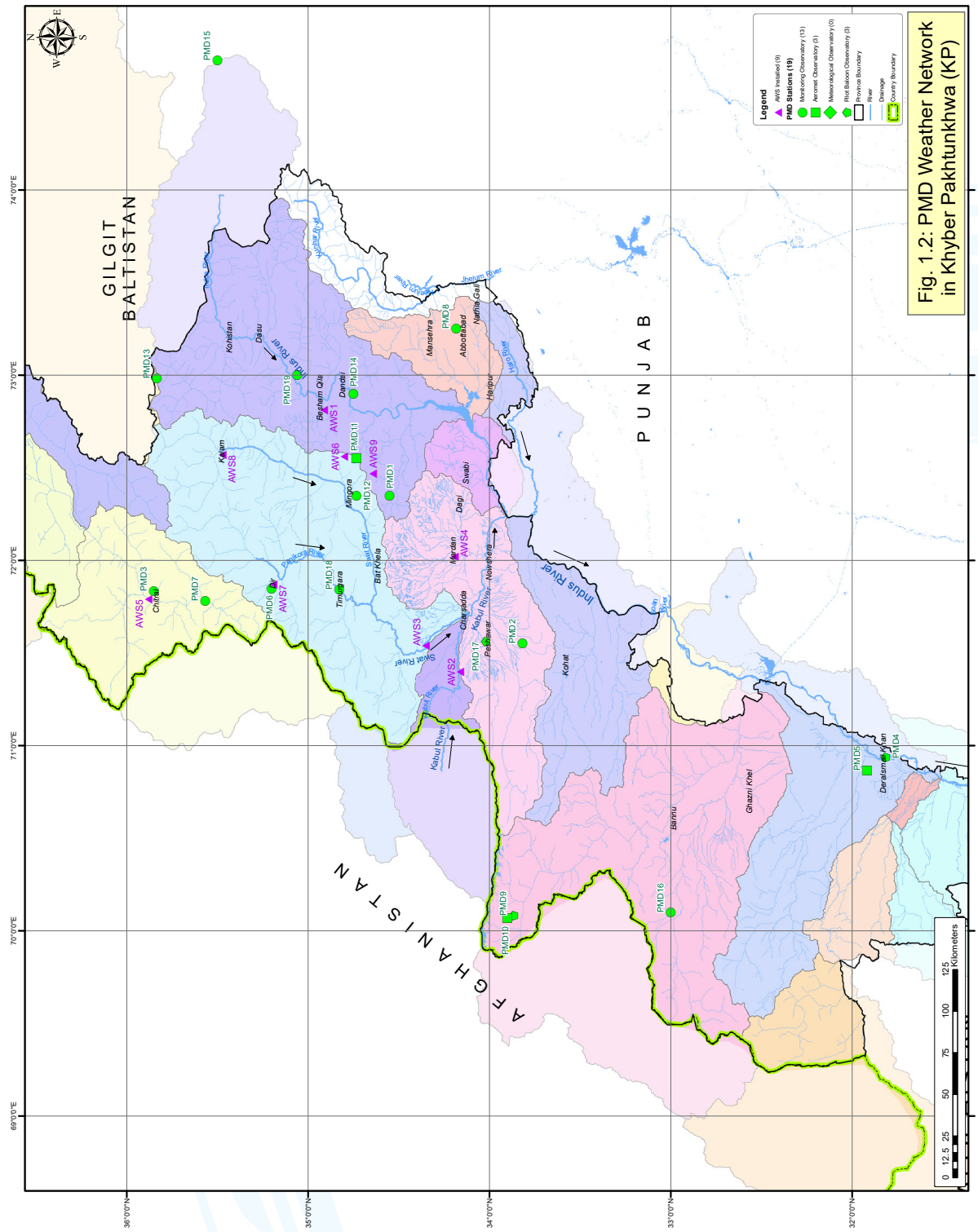

Fig. 1.2: PMD Weather Network in Khyber Pakhtunkhwa (KP)

PMD Stations	
Map Reference	Description
PMD1	Balakot
PMD2	Cherat
PMD3	Chitral
PMD4	D.I.Khan (PBO)
PMD5	D.I.Khan (Aeromet)
PMD6	Dir
PMD7	Drosh
PMD8	Kakul (Abbottabad)
PMD9	Parachinar (PBO)
PMD10	Parachinar (Aeromet)
PMD11	Saidu Sharif (Aeromet Obsy)
PMD12	Saidu Sharif (Met Obsy)
PMD13	Kalam
PMD14	Malam Jabba
PMD15	Mir Khani
PMD16	Bannu
PMD17	RMC Peshawar PBO
PMD18	Met Observatory Timergara (Lower Dir)
PMD19	Met Observatory Pattan (Kohistan)

AWS Stations	
Map Reference	Description
AWS1	Besham
AWS2	Warsak Dam
AWS3	Mohmand Dam
AWS4	Mardan
AWS5	Chitral
AWS6	PBO MalamJabba
AWS7	PBO Upper Dir
AWS8	PBO kalam
AWS9	Buner

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SINDH PROVINCE

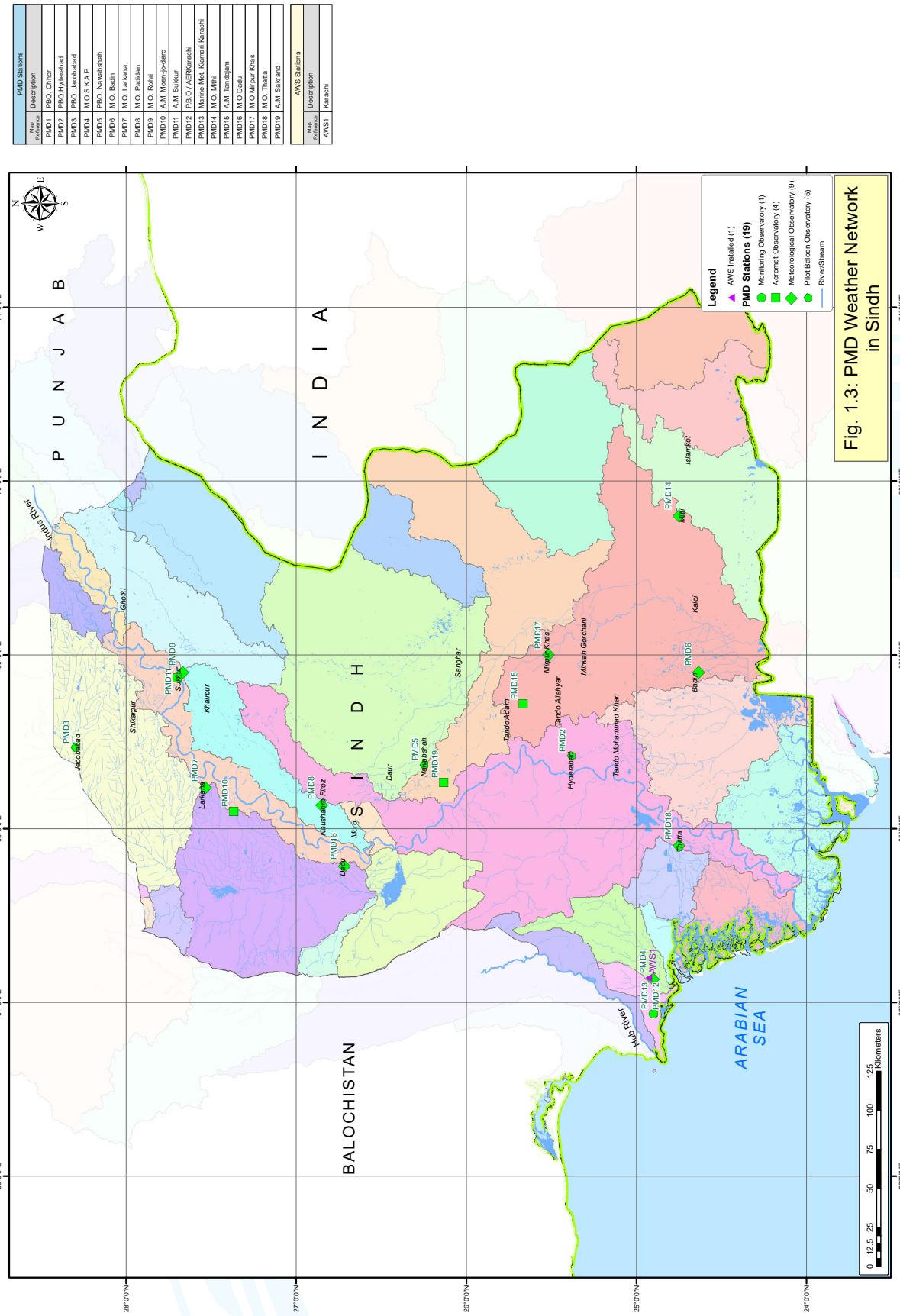
Table: 1.8 - PMD Weather Network (AWS)

Sr. No.	Provice	Name of Station	Location / Address	Latitude	Longitude
1	Sindh	Karachi	PMD Obs.	24.93	67.14

Table: 1.9 - PMD Weather Network (Observatories)

Sr. No.	Provice	Name of Station	Index No.	Elevation/Height a.m.s.l.(meters)	Latitude	Longitude
1	Sindh	PBO. Chhor	41685	05.00	29.883	69.717
2	Sindh	PBO.Hyderabad	41764	28.00	25.383	68.417
3	Sindh	PBO. Jacobabad	41715	55.00	28.300	68.467
4	Sindh	M.O S K.A.P.	41780	22.00	24.900	67.133
5	Sindh	PBO. Nawabshah	41749	37.00	26.250	68.367
6	Sindh	PBO. Panjgur	41739	968.00	26.967	64.100
7	Sindh	PBO. Pasni	41759	09.00	25.267	63.483
8	Sindh	M.O. Badin	41785	09.00	24.633	68.900
9	Sindh	M.O. Gwadar	OPGD	29.86	25.133	62.333
10	Sindh	M.O. Larkana	41748	52.70	27.533	68.233
11	Sindh	M.O. Lasbella	41742	8700	26.233	66.167
12	Sindh	M.O. Padidan	41746	46.00	26.850	68.133
13	Sindh	M.O. Rohri	41725	66.00	27.667	68.900
14	Sindh	A.M. Moen-jo-daro	41747	51.80	27.367	68.100
15	Sindh	A.M. Ormara	41760	02.00	25.200	64.400
16	Sindh	A.M. Turbat	41738	155.00	25.983	63.067
17	Sindh	P.B.O. / A.M. Sukkur	OPSK	68.50	27.700	68.867
18	Sindh	Marine Met. AERKarachi	--	22.00	24.900	66.933
19	Sindh	Kiamari.Karachi	--	22.00	24.900	66.933
20	Sindh	M.O. Mithi	41786	30.00	24.750	69.800

Figure 1.3: PMD Weather Network in Sindh



BALOCHISTAN PROVINCE

Table: 1.10 - PMD Weather Network (AWS)

Sr. No	Province	Station Name	Location / Address	Latitude	Longitude
1	Balochistan	Pishin	Irrigation Obs.	30.57	66.98
2	Balochistan	Chaman	Irrigation Obs.	30.91	66.44
3	Balochistan	Muslim Bagh	Irrigation Obs.	30.82	67.74
4	Balochistan	Lora Lai	Irrigation Obs.	30.37	68.59
5	Balochistan	Mastung	Irrigation Obs.	29.79	66.87
6	Balochistan	Ziarat	Irrigation Obs.	30.38	67.73
7	Balochistan	Dalbandin	FC H/Q	28.9	64.43
8	Balochistan	Kharan	FC H/Q	28.59	65.41

Table: 1.11 - PMD Weather Network (Observatories)

Sr. No.	Provice	Name of Station	Index No.	Elevation/Height a.m.s.l.(meters)	Latitude	Longitude
1	Balochistan	A.M. Tandojam	--	19.50	25.667	68.717
2	Balochistan	M.O Dadu	41743	38.00	26.717	67.783
3	Balochistan	M.O Mirpur Khas	41767	15.00	25.517	69.000
4	Balochistan	M.O. Thatta	41783	---	24.750	67.900
5	Balochistan	A.M. Uthal	--	40.00	25.817	66.617
6	Balochistan	A.M. Sakrand	--	37.00	26.133	68.267
7	Balochistan	PBO. Jiwani	41756	56.00	25.067	61.800
8	Balochistan	PBO. Panjgur	41739	968.00	26.967	64.100

9	Balochistan	PBO. Pasni	41759	09.00	25.267	63.483
10	Balochistan	M.O. Gwadar	OPGD	29.86	25.133	62.333
11	Balochistan	M.O. Lasbella	41742	87.00	26.233	66.167
12	Balochistan	A.M. Ormara	41760	02.00	25.200	64.400
13	Balochistan	A.M. Turbat	41738	155.00	25.983	63.067
14	Balochistan	A.M. Uthal	--	40.00	25.817	66.617
15	Balochistan	P.B.O. , Sheikhmanda (Quetta)	41661	1626.00	30.183	66.950
16	Balochistan	R.A.M.C., SariabQuetta	-	1719.00	30.083	66.967
17	Balochistan	P.B.O., Kalat	41696	2015.00	29.033	66.583
18	Balochistan	P.B.O., Khuzdar	41744	1231.00	27.833	66.633
19	Balochistan	M.O., Sibbi	41697	133.00	29.550	67.883
20	Balochistan	P.B.O., Zhob	41620	1405.00	31.350	69.467
21	Balochistan	P.B.O., Barkhan	41685	1097.00	29.883	69.717
22	Balochistan	P.B.O., Dalbandin	41712	848.00	28.883	64.400
23	Balochistan	P.B.O., Nokkundi	41710	682.00	28.817	62.750

Figure 1.4: PMD Weather Network in Balochistan

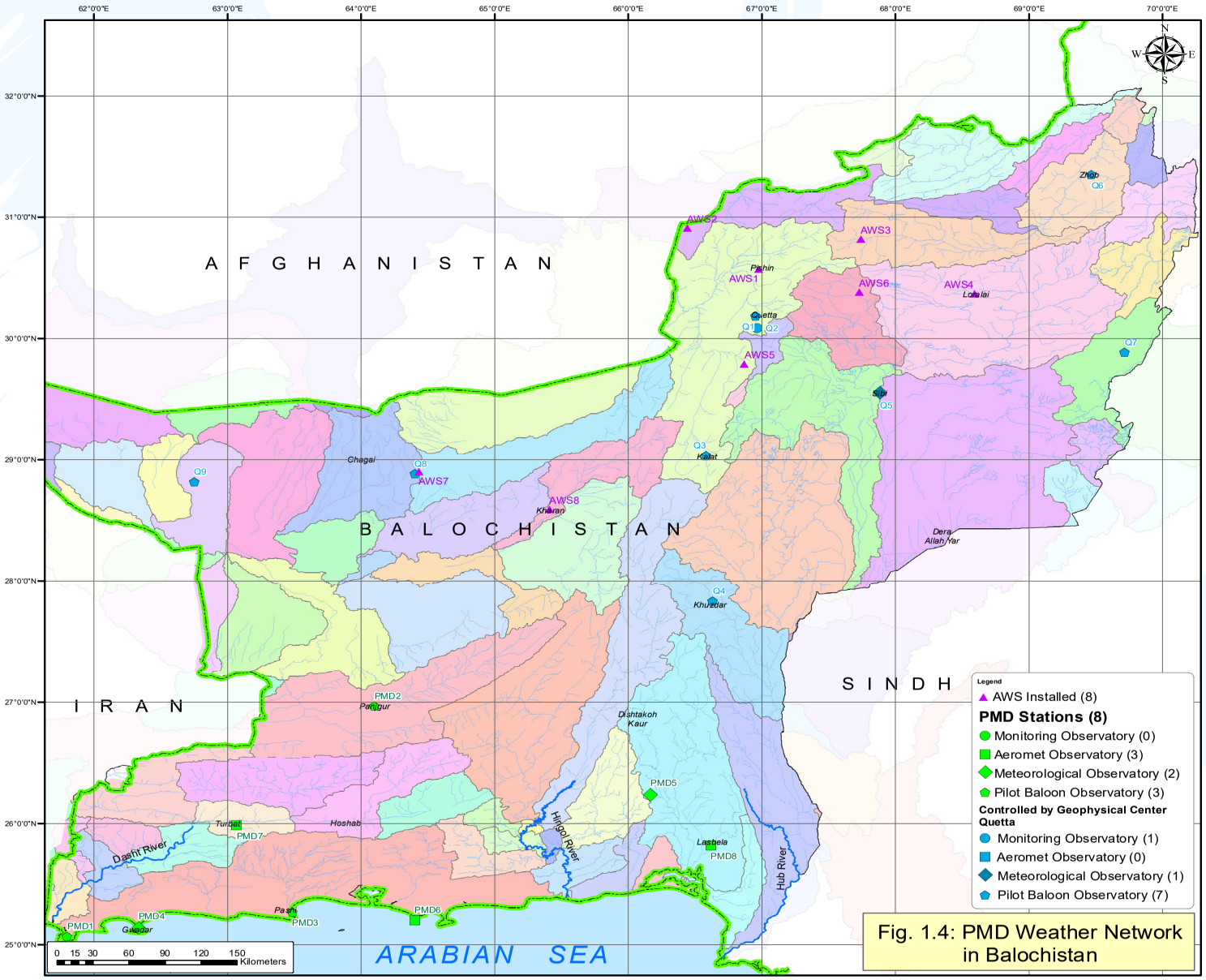


Fig. 1.4: PMD Weather Network in Balochistan

AWS Stations	
Map Reference	Description
AWS1	Pishin
AWS2	Chaman
AWS3	Muslim Bagh
AWS4	Lora Lai
AWS5	Mastung
AWS6	Ziarat
AWS7	Dalbandin
AWS8	Kharan

PMD Stations	
Map Reference	Description
PMD1	PBO. Jiwani
PMD2	PBO. Panjgur
PMD3	PBO. Pasni
PMD4	M.O. Gwadar
PMD5	M.O. Lasbella
PMD6	A.M. Ormara
PMD7	A.M. Turbat
PMD8	A.M. Uthal
Stations Controlled by Geophysical Center Quetta	
Map Reference	Description
Q1	P.B.O. , Sheikhmanda (Quetta)
Q2	R.A.M.C., SariabQuetta
Q3	P.B.O., Kalat
Q4	P.B.O., Khuzdar
Q5	M.O., Sibbi
Q6	P.B.O., Zhob
Q7	P.B.O., Barkhan
Q8	P.B.O., Dalbandin
Q9	P.B.O., Nokkundi

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AZAD JAMMU & KASHMIR (AJK)

Table: 1.12 - PMD Weather Network (AWS)

Sr. No	Province	Station Name	Location / Address	Latitude	Longitude
1	AJK	Barnala	SCOM exchange	32.86	74.26
2	AJK	Bararkot	Forecast Check post	34.37	73.39
3	AJK	Bandi AbbassPur	Agriculture Office	33.81	73.97
4	AJK	Chakothi	Agriculture Office	34.11	73.87
5	AJK	Haraman	Agriculture Office	34.44	73.52
6	AJK	Hajira	Agriculture Office	33.75	73.91
7	AJK	Chattarkalas	Agriculture Office	34.2	73.5
8	AJK	Tandali	Forrest office	34.29	73.54
9	AJK	Panjera	Forrest office	33.57	73.81
10	AJK	PBO GarhiDupatta	PMD obs.	34.22	73.61
11	AJK	Dhulli	Army Unit	33.93	73.91
12	AJK	Deolian	Army Unit	34.43	73.63

Table: 1.13 - PMD Weather Network (Observatories)

Sr.No.	Provice	Name of Station	Index No.	Elevation/Height a.m.s.l. (meters)	Latitude	Longitude
1	AJK	Garhi Dupatta	43533	813.50	34.217	73.617
2	AJK	Kotli	43563	614.00	33.517	73.900
3	AJK	Rawalakot	NIL	1677.00	33.867	73.683
4	AJK	Muzaffarabad (P.B.O)	43532	702.00	34.367	73.483
5	AJK	Muzaffarabad (Aeromet)	NIL	838.00	34.367	73.483

Figure 1.5: PMD Weather Network in Azad Jammu & Kashmir (AJ&K)

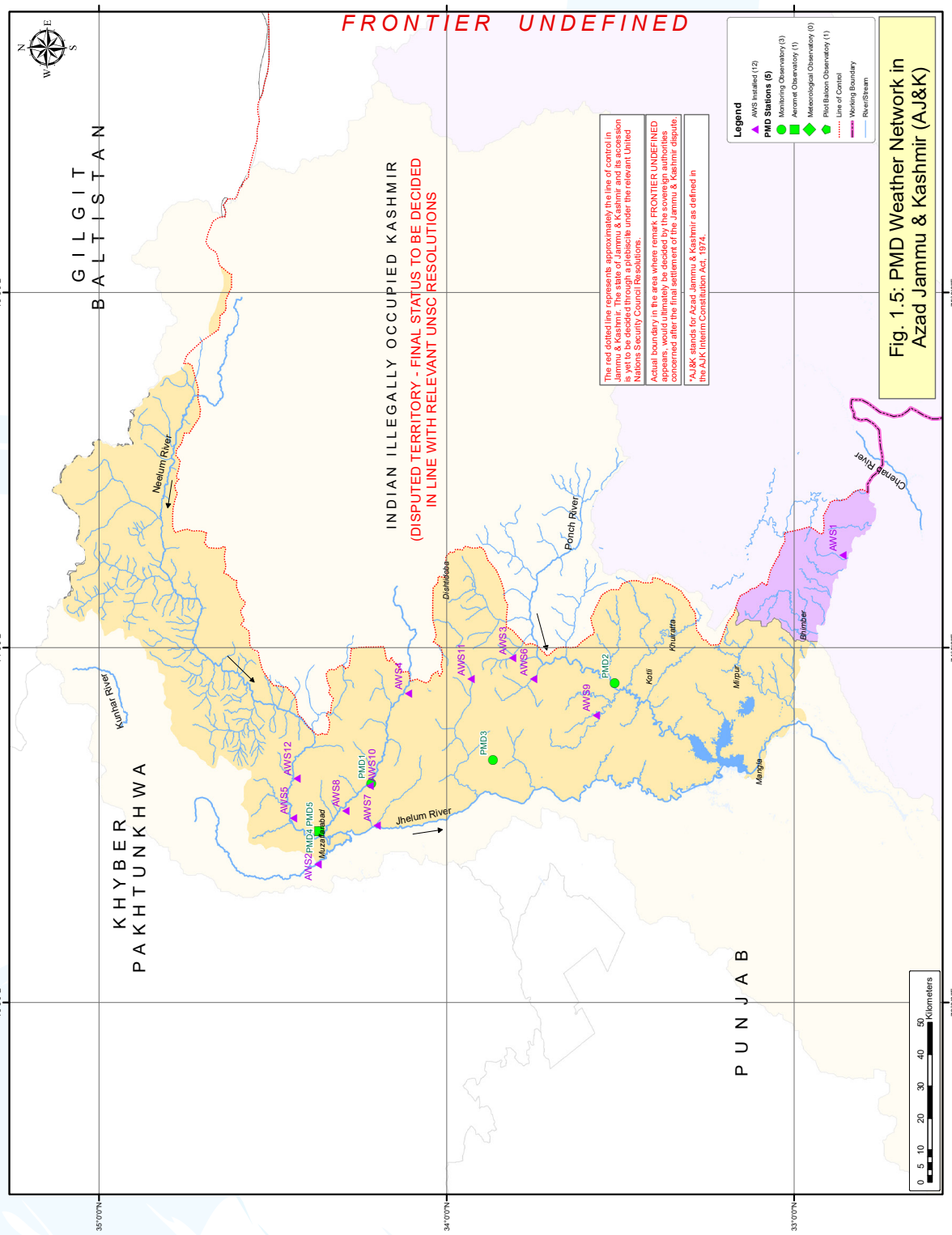


Fig. 1.5: PMD Weather Network in Azad Jammu & Kashmir (AJ&K)

AWS Stations	
Map Reference	Description
AWS1	Bernala
AWS2	Bararkot
AWS3	Bandi AbbasiPur
AWS4	Chakothi
AWS5	Haraman
AWS6	Hajira
AWS7	Chattarkalas
AWS8	Tandali
AWS9	Panjera
AWS10	PBO Garhi Dupatta
AWS11	Dhulli
AWS12	Deolian

PMD Stations	
Map Reference	Description
PMD1	Garhi Dupatta
PMD2	Kotli
PMD3	Rawalakot
PMD4	Muzaffarabad (P.B.O)
PMD5	Muzaffarabad (Aeromet)

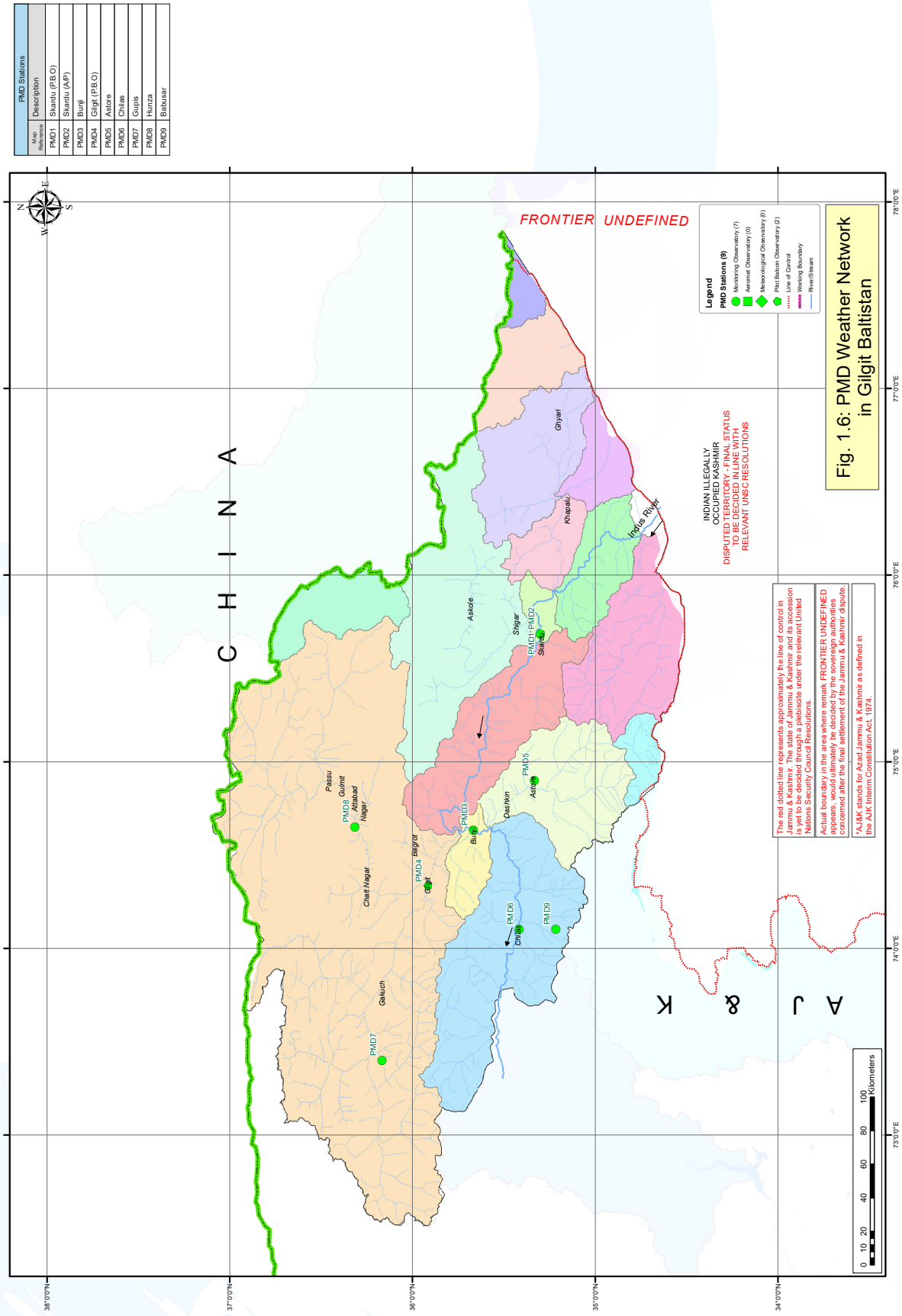
View Enlarge Map in Atlas Page Number: 8

GILGIT-BALTISTAN PROVINCE

Table: 1.14 - PMD Weather Network (Observatories)

Sr. No.	Provice	Name of Station	Index No.	Elevation/Height a.m.s.l.(meters)	Latitude	Longitude
1	Gilgit Baltistan	Skardu (P.B.O)	41517	2317'00	35.300	75.683
2	Gilgit Baltistan	Skardu (A/P)	NIL	2317.00	35.300	75.683
3	Gilgit Baltistan	Bunji	41518	1372.00	35.667	74.633
4	Gilgit Baltistan	Gilgit (P.B.O)	41516	1460.00	35.917	74.333
5	Gilgit Baltistan	Astore	41520	2168.00	35.333	74.900
6	Gilgit Baltistan	Chilas	41519	1250.00	35.417	74.100
7	Gilgit Baltistan	Gupis	41504	2156.00	36.167	73.400
8	Gilgit Baltistan	Hunza	41504	2156.00	36.317	74.650
9	Gilgit Baltistan	Babusar	NIL	-	35.217	74.100

Figure 1.6: PMD Weather Network in Gilgit Baltistan



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1.5.3 INDUS RIVER SYSTEM AUTHORITY (IRSA)

Indus River System Authority (IRSA) installed the Telemetry System for flows of Indus River system through WAPDA that remained operational for more than a decade. However, owing to various reasons including non-availability of spares and O&M funds, and most importantly due to lack of ownership by the stakeholders, the telemetry system became non-functional. IRSA conducted a comprehensive study on existing telemetry system through NESPAK Consultants in 2015. The major recommendations included;

- The existing telemetry system commissioned in 2004-5 has outlived its useful life. While the data acquisition and processing hardware and software have become obsolete therefore the water level and gate position sensors are salvageable.
- A completely new system shall need to be designed, procured and commissioned from the scratch.

Accordingly, in line with the decisions by the GOP, installation of the Indus telemetry system for flow of the Indus River system has been taken up and WAPDA is assigned to implement the task.

1.5.4 PROVINCIAL IRRIGATION DEPARTMENTS (PIDS)

Irrigation Departments of all the Provinces measure river flows at all barrages at locations in areas below rim stations. PID Punjab under Programme Monitoring Implementation Unit (PMIU) is performing the following activities;

- Development of modern tools like Irrigation Management Information System (IMIS) including Database Management System (DBMS) and Decision Support System (DSS) in order to ensure transparency in getting reliable data available to all the stakeholders and also to facilitate the high-level management in decision making;
- Development of Real Time Flow Monitoring System (RTFMS) for transfer of data in real time from field to the irrigation database and its integration with the Decision Support System (DSS). The whole system will contribute towards development of a Water Resource Management Information System (WRMIS) for efficient irrigation water management.
- Publication of daily discharge data of all the channels of Punjab on Irrigation website (http://irrigation.punjab.gov.pk) to facilitate rapid monitoring of water distribution in the canal system especially in between Headworks and tail off takes/outlets.

The PID KP has also installed 12 Nos. automated gauging stations on various rivers/nullahs and has also installed 08 Nos. rainfall monitoring stations for the real time data of catchment rainfall. Similarly, in Balochistan few automate stations are also proposed through ADB funding.

1.6 EXISTING HYDRO-METEOROLOGICAL DATA COMMUNICATION SYSTEMS

For providing reliable flood forecasts with longest possible lead times, it is essential that the information of rainfall and discharges observed at various locations in the river basins and on the rivers is immediately transmitted to the location where it is to be analyzed for determining the flood conditions in the rivers. WAPDA database centers under H&R Dte/GMRC of Hydro Resource Management Division established in Lahore receive and analyses all the hydro-meteorological data/information and transmits to Food Forecasting Division (FFD) of Pakistan Meteorological Department located at Jail Road Lahore FFD (PMD) for issuance of Flood

forecast. At present the following communication networks are used for transmission of Flood and rainfall data / information.

a) High Frequency radio-based network

b) VHF Real-Time Telemetry System

c) Meteor-burst telemetry system

d) GSM/Satellite communication-based telemetry system

The important systems are briefly described below;

High Frequency Radio Based Network system is operated by WRMD of WAPDA and PID, and transmits the stage and flow data at the barrages and a few other key-stations at every 6 hours. Under FPSP-I, 69 HF radios were provided to WAPDA, PID, PMD and civil administration. To upgrade and strengthen the network, 21 more HF radios were provided under FPSP-II.

Meteor-burst Based Communication System (MBCS) was installed as a replacement of VHF telemetry system under FPSP-1 in 1998. Presently this system is operated by Glacier Monitoring & Research Centre (GMRC). This system consists of remote terminal units at hydrometeorological stations of GMRC installed in the Upper Indus Basin. The System transmits real time data of different parameters using MBCS to Master Station at Buddoki, near Lahore. The data after processing is delivered to FFD for making flood forecasts. The weather stations data is used by GMRC for making forecasts on 10-daily basis and seasonal basis for availability of water in Indus at Tarbela, Jhelum at Mangla and Kabul at Nowshera.

A cellular network or mobile network is a type of wireless connection facilitated through cellular towers by service providers. Cellular was the chosen term because each tower and its coverage map looked like a biological cell. Eventually, phones that operated on this type of wireless network were called cell phone. The cellular system is the division of an area into small geographical cells. This allows extensive frequency reuse across that area, so that many people can use cell phones simultaneously. Cellular networks have a number of advantages like increased capacity, reduced power usage, larger coverage area, reduced interference from other signals etc. Communication is done through Mobile phone. In addition to the standard voice function, new generation mobile phones support many additional services, and accessories, such as SMS for text messaging, email, packet switching for access to the Internet, gaming, Bluetooth, camera with video recorder and MMS for sending and receiving photos and video, MP3 player, radio and GPS.

Satellite communication uses radio waves to send signals to the antennas on the Earth. The antennas then capture those signals and process the information coming from those signals. A communications satellite is an artificial satellite that relays and amplifies radio telecommunications signals through a transponder. It basically creates a communication channel between a source transmitter and a receiver at different locations on earth. Communications satellites are used for television, telephone, radio, internet, and military applications.

CHAPTER - 2

PROPOSED NATIONAL MASTER PLAN FOR FLOOD TELEMETRY NETWORK

2. PROPOSED NATIONAL MASTER PLAN FOR FLOOD TELEMETRY NETWORK

All the relevant departments and provinces have suggested the need for improvement and enhancement in their respective monitoring networks to be included in NFPP IV and have come up with respective proposals. To review the investment plan of Proposed Flood Protection Sector Project-III (FPSP-III) of NFPP-IV a joint meeting of all the stakeholders was held on Feb 25, 2020 chaired by Chairman Federal Flood Commission, wherein the following were unanimously agreed **(Annex-1).**

- The cost of WAPDA's Component regarding strengthening/ up-gradation of Water/ Flood Telemetry System in the country, be increased from Rs. 2.00 billion to Rs. 6.00 billion. This Flood Telemetry Master Plan for the country will be developed to meet the federal monitoring requirements as well as the Provincial requirements for each province. Subsequently the implementation could be carried out in phases as per available investments. However, the first phase comprising essential telemetry sites would be implemented through the approved provision of Rs. 6 Billion and WAPDA will submit a proposal to FFC for inclusion in the Umbrella PC-I of FPSP-III of NFPP-IV.

- PIDs & Federal Line Areas (FLAs) will bear/ provide the O&M cost of the Flood Telemetry Network installed in their area of jurisdiction. WAPDA will provide technical support on O&M to ensure fault free operation after installation.

Afterwards, a progress review meeting on the preparation of Master Plan for Telemetry Network in Pakistan was held under the Chairmanship of Chairman FFC on 15th June 2020. The meeting was attended by all the stakeholders (Provinces/FLA's) and ADB/NDMRF representative.

The decisions taken mainly include that all the stakeholders shall furnished the desired information for early finalization of the National Master Plan. WAPDA will be responsible for the implementation / execution of this proposed system. Provinces & FLA's shall ensure annual O&M cost in their respective provincial ADP for the Flood Telemetric Stations under the National Master Plan.

2.1 INVENTORYING FOR EXISTING TELEMETRY NETWORK AND APPROVED PLANS

It is important to prepare an inventory of the existing networks and the enhancement plans of the existing networks for the development of a national plan. To serve the purpose, WAPDA with the help of a 4-member consultant team engaged as resource persons by ADB, prepared a comprehensive implementation approach for the national master plan for flood telemetry network. It was planned to express the data in the master plan in a similar format for all the departments to maintain the uniformity in the document. Therefore, a Hydrological Data Proforma was developed to obtain as much information as available from all the stakeholders about the existing hydrological networks, ongoing installations and proposed network improvements/ enhancements (**Annex-2**).

2.2 IMPLEMENTATION APPROACH FOR NATIONAL FLOOD HYDRO-METEOROLOGICAL NETWORK

The Digital Hydro Data Centre (DHDC) will be an integrated, yet massively scale-able Flood telemetry

Hydrological network data centre. The real time flood data from the remotely telemetric stations of the provinces/FLA's will be transmitted to the DHDC and also to the Provincial/Regional data centers. The provinces can also utilize the facilities in the regional data centers for data sharing and receiving through DHDC services **(Fig 2.1).**

In addition to the above, National Disaster Risk Management Fund is undertaking the Natural Catastrophe (Nat-Cat) Modeling through SUPARCO. The Nat-Cat Model is designed to quantify the extent of primary natural hazards(Flood, Drought, Tropical Cyclone and Earthquake), vulnerability and risk assessment, and loss estimation. The model is intended to inform stakeholders about probability as well as intensity of future disaster events. Based on the estimated probability of losses, they can estimate a range of direct, indirect, and residual losses. The Nat-Cat model combines historical disasters information with current demography, building and physical infrastructure, scientific and financial data to determine the potential cost of catastrophes for specified geographic areas. The model uses this information as well as inputs from other similar databases to simulate the physical characteristics of potential catastrophes while projecting their effects on human settlements, agriculture and other critical lifeline infrastructure. The integration of DHDC and Nat-Cat Model shall bring substantial value addition whereby providing the real time and probabilistic scenarios.

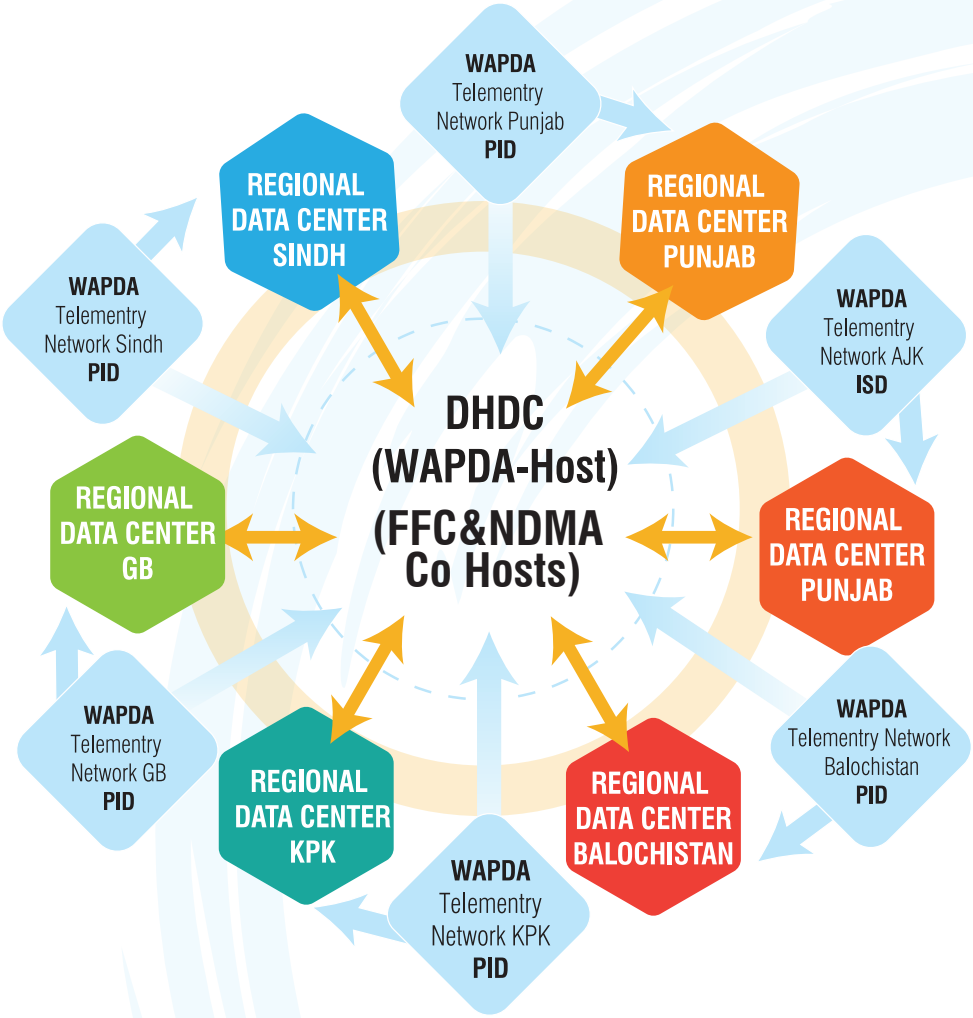


Figure 2.1: Schematic map of proposed inter-connected hydro-meteorological observation network and Data Centers

Recently, a series of consultative meetings were coordinated by FFC with all stakeholders to discuss and ensure stakeholder commitment and proposed/decided that WAPDA will be responsible for implementation/execution of the Telemetry Network under National Master Plan and its O&M afterwards. The proposed network will be established by utilizing;

a) **The current infrastructure already in-place with minimum-possible-modifications for compatibility.**
b) **Extension plans/projects of individual user/stakeholder organizations,**
c) **Identification of new requirements for data acquisition locations.**
d) **Ranking the sites on the basis of importance and priority for requirements.**
e) **Implementation in phases depending upon the available investments by the agreed agency.**

The figure 2.1 provides a conceptual schematic of the proposed interconnected hydro-meteorological observation network and the associated regional data centers. The individual components of the network are described in detail below:

The centralized repository of hydro-meteorological data is the backbone of the network which is operated and co-hosted by WAPDA and Federal Flood Commission (FFC) respectively. The DHDC consolidates hydro-meteorological data from all networked telemetry stations and regional data centers in near-real time. The consolidated data can subsequently be accessed by all concerned stakeholders, particularly the main beneficiary Pakistan Meteorological Department (PMD), for their operational use and forecasting via the Data Access Port proposed as a part of the national master plan. Regional Data Centers, operated by WAPDA, would be established at provincial and state level to provide support, maintenance and periodic calibration of the telemetry stations within their region and consolidate their data at the regional level. The Regional Data Centers also liaison with the provincial/state Irrigation departments to consolidate their data regionally and with the DHDC. The establishment of an integrated telemetry network for hydro-meteorological stations is proposed under this project, this is integrated with the regional data centers and the DHDC. The current network of PMD weather stations consist of numerous automatic weather stations and observatories that acquire meteorological information either manually and later transmit the information internally for use for weather monitoring, flood and drought forecasting etc. Since hydro-meteorology of different regions in Pakistan differ significantly, the integration of PMD weather observation network with the Regional Data Centers (and subsequently with the DHDCs) would be crucial for the improvement of hydro-meteorological forecast and early warning.

2.3 METHODOLOGY FOR IDENTIFICATION OF OBSERVATION LOCATIONS

The objectives of this assignment include creation of a holistic plan for the installation of hydrological observation stations within the ambit of the master plan. In selection of gauging stations requirements at the sub-catchment level, a nationwide need based hydrological assessment was done keeping in view the aspect of water resources management, development and flood risk management. These aspects will determine the locations of the gauging sites. The total number of gauge stations will depend on basin/sub-basin size and the potential for future land use requirements change. The analyses for new site identification will be based on international standards in practice i.e. WMO Manual on Stream Gauging (https://library.wmo.int/index.php?lvl=notice_display&id=539#.YRj71HzivZQ).

The methodology to identify the locations for the stream gauge stations across the country is broadly summarized below:

1. Hydrological conditioning of the satellite based Digital Elevation Model DEM.
2. Development of Flow Direction, Flow Accumulation and Slope Grids.

3. Identification of stream network.
4. Identification of sub-catchments using Pfafstetter tracing.
5. Site-identification for stream gauge stations in each sub-catchment.

The Pfafstetter Coding system, developed by Otto Pfafstetter in 1989, is a methodology for assigning watershed IDs based on the topology of the land surface (Pfafstetter, 1989; Verdin, 1997, Verdin and Verdin, 1999). The system is hierarchal, and watersheds are delineated from junctions on a river network. Level 1 water sheds correspond to continental scale watersheds. Higher levels (levels 2, 3, 4, etc.) represent ever-finer tessellations of the land surface into smaller watersheds, which are sub-watersheds of lower-level watersheds. Each watershed is assigned a specific Pfafstetter Code based on its location within the overall drainage system and on the total drainage area upstream of the watersheds outlet.

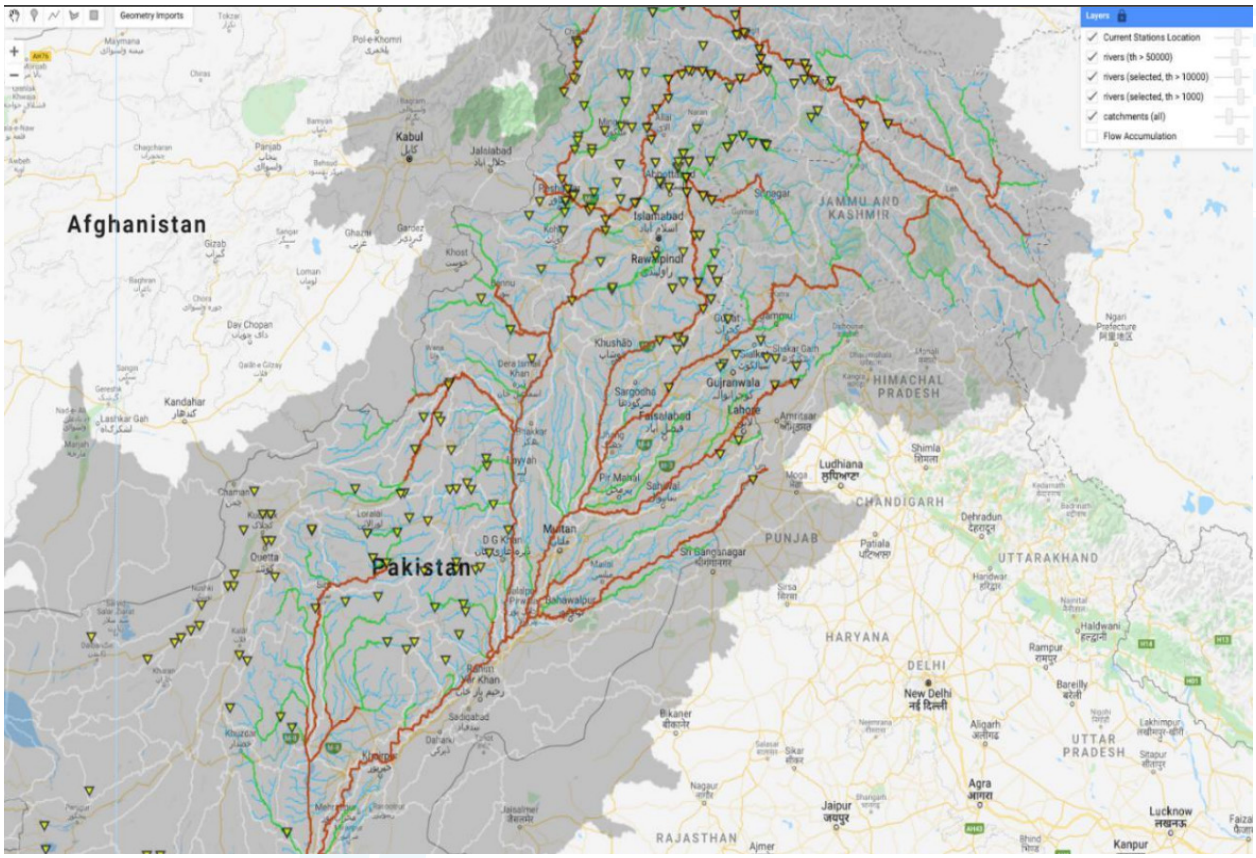


Figure 2.2: Map view of spatial hydrological analysis being carried out along with inventorying of data being received.

2.4 REMOVAL OF DUPLICATION AND REDUNDANCY BASED ON EXISTING STATIONS AND APPROVED PLANS

The aforementioned methodology for the standardized hydrological assessment and locations identification is carried out for the entire country. In order to remove any duplication of the proposed observation network with the existing networks it is important to compare with the current inventory of the observation network.

2.5 TRANSFORMATION FROM MANUAL TO AUTOMATIC SYSTEM

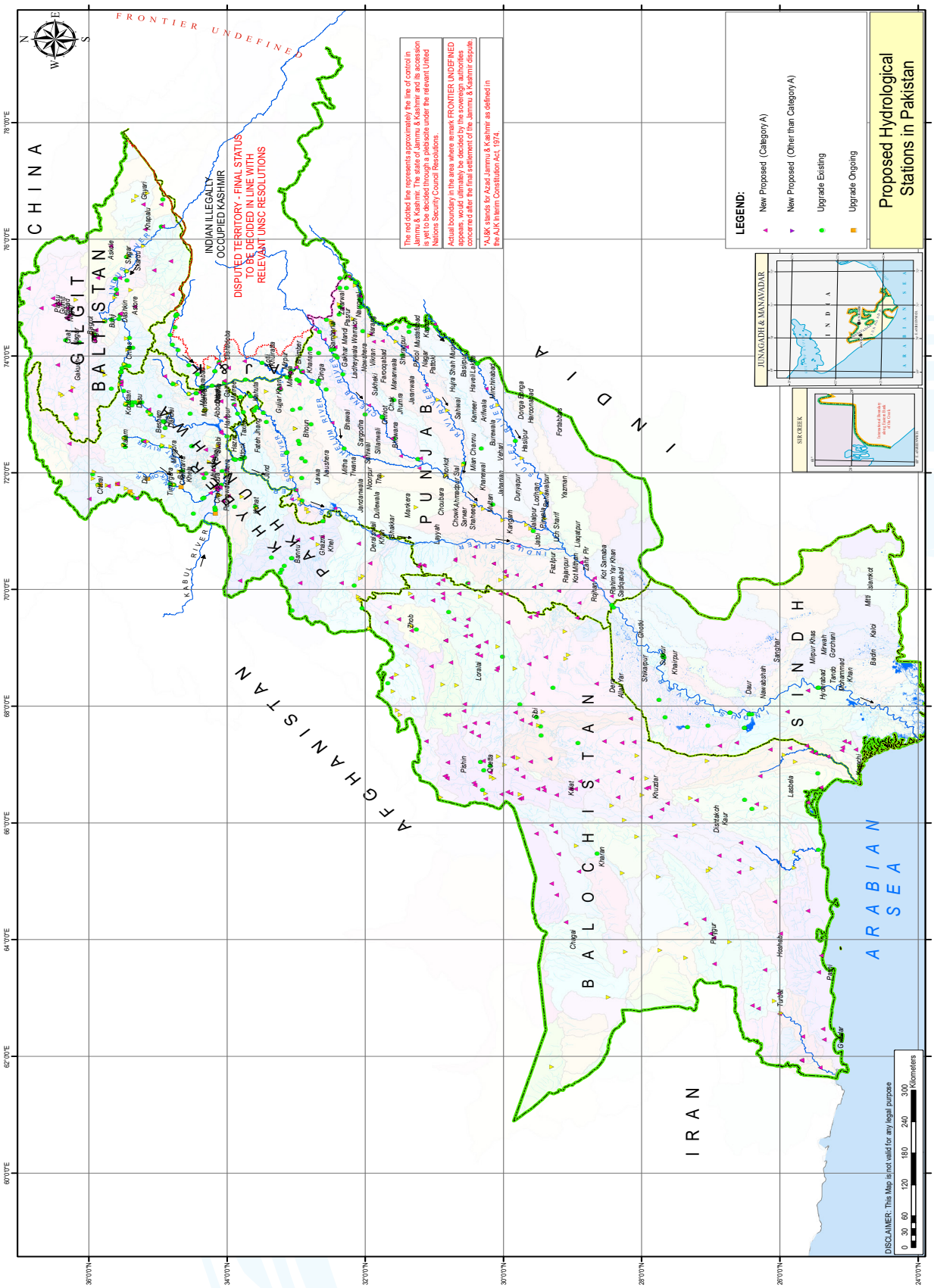
The Proposed Flood Telemetry Master Plan includes data acquisition through telemetry and Data Management through establishing Central Data Center at Lahore. Therefore, already installed manual stations are being recommended to be upgraded to new telemetry station network. Each station will also monitor some important weather parameters as snow / rain, Temperature and Relative Humidity for additional information.

2.6 FINAL MASTER PLAN FOR FLOOD TELEMETRY NETWORK OF PAKISTAN

Final Master Plan showing all the Existing Networks inventory and Proposed Telemetry Networks for all the Provinces / areas i.e Punjab, Sind, KP, Baluchistan, GB and AJK is attached as Annex (3 to 5). It contains summary of hydrological Network Status of each province followed by Maps showing Hydrological stations for each area and respective tables with details of the stations.

As implementation of the complete Master Plan would be a huge task, therefore Proposed Stations have been further categorized according to their importance with regard to floods into category A, B and C for implementation purpose and accordingly would be established as per funds available. The Proposal of upgrading the existing manual stations and establishing the new proposed stations under category "A" has been prepared and given in **Chapter – 6**

The map given on the next page shows complete Masterplan installations in all provinces/FLAs.


Proposed Hydrological Stations in Pakistan
LEGEND:
New Proposed (Category A)
New Proposed (Other than Category A)
Upgrade Existing
Upgrade Ongoing
The red dotted line represents approximately the line of control in Jammu & Kashmir. The state of Jammu & Kashmir and its accession is yet to be decided through a plebiscite under the relevant United Nations Security Council Resolutions.
Actual boundary in the area where remark FRONTIER UNDEFINED appears, would ultimately be decided by the sovereign authorities concerned after the final settlement of the Jammu & Kashmir dispute.
"AJ&K" stands for Azad Jammu & Kashmir as defined in the AJK Interim Constitution Act, 1974.
FRONTIER UNDEFINED
DISPUTED TERRITORY - FINAL STATUS TO BE DECIDED IN LINE WITH RELEVANT UNSC RESOLUTIONS
INDIAN ILLEGALLY OCCUPIED KASHMIR
CHINA
GILGIT BALTISTAN
AFGHANISTAN
IRAN
ARABIAN SEA
PUNJAB
SINDH
BALOCHISTAN
KHYBER PAKHTUNKHWA
JUNAGADH & MANAVADAR
SIR CREEK
DISCLAIMER: This Map is not valid for any legal purpose
0 30 60 120 180 240 300 Kilometers

CHAPTER - 3

COMMUNICATION SYSTEMS AND DATA MANAGEMENT

3. COMMUNICATION SYSTEMS AND DATA MANAGEMENT

3.1 DATA FLOW

Data transmission protocol will depend upon the telemetry system selected for the Project. However, a general overview of the data flow is shown in Figure 3.1, All ARL would be transmitting the observed data through Remote Control Units (RTU) to the data receiving station/ Master station, through selected telemetric communication system.

The raw data would then be forwarded to computers in Digital Hydro Data Centre (DHDC) where the raw data will be decoded to measurement data. The raw data as well as the decoded data will be stored in log files. This decoded data will then be processed and disseminated to stake holders via internet for their use.

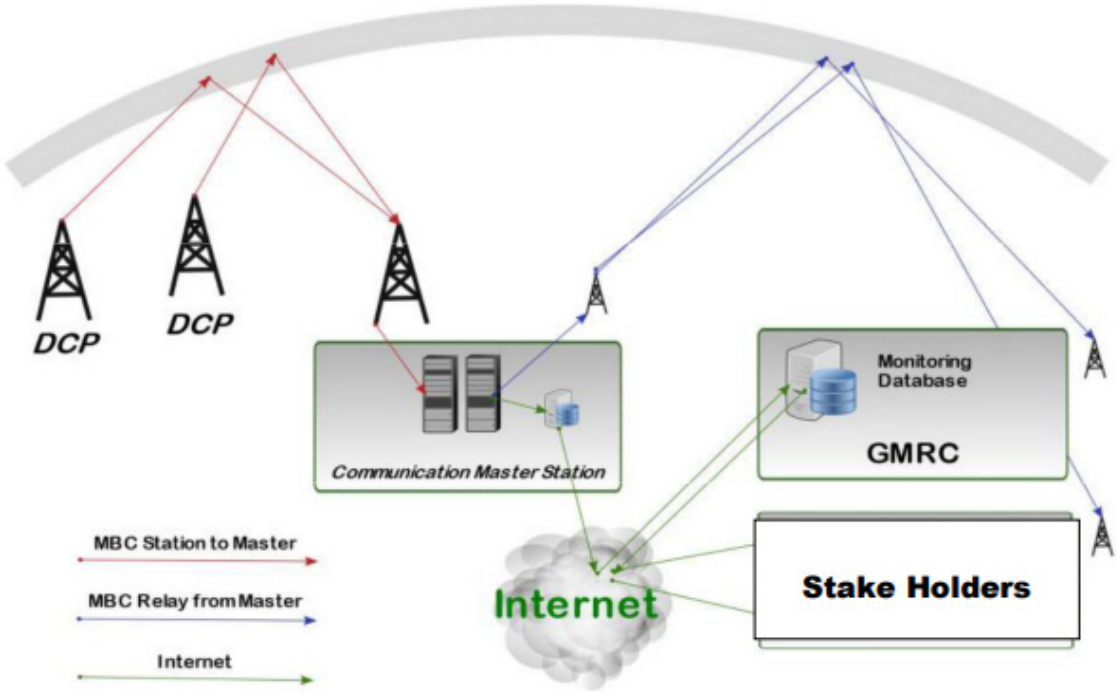


Figure 3.1: Meteor Burst Data Flow Diagram

It is expected that suppliers (of both the sensor equipment and the data loggers) will provide their own relevant software, compatible to selected communication system for the Project.

3.2 MONITORING DATABASE

The appropriate **Monitoring Database** (MD) will be required at Digital Hydro Data Centre for storing and retrieving all monitoring data, with the concept that incoming data are organized in a time-series.

Advantages of these databases over a file-based storage are the following;

- Data is stored at a central place (and not distributed over multiple files)
- Backup and Restore possible for the complete data
- Representation of data easily possible for different criteria (e,g, data (time-series) of several stations for a specified interval and data type.

The access to the monitoring database via Internet will have several security features;

- Data communication is encrypted (using SSL certificate)
- Users need to be authenticated (using password) and are then authorized to download the data

3.3 COMPONENTS OF STATIONS WITH COMMUNICATION DEVICES

There are 5 major components for the Telemetry based Hydrological Station;

- Energy
- Sensors
- Scaffold
- Data logger
- Communication unit (radio and antennas)

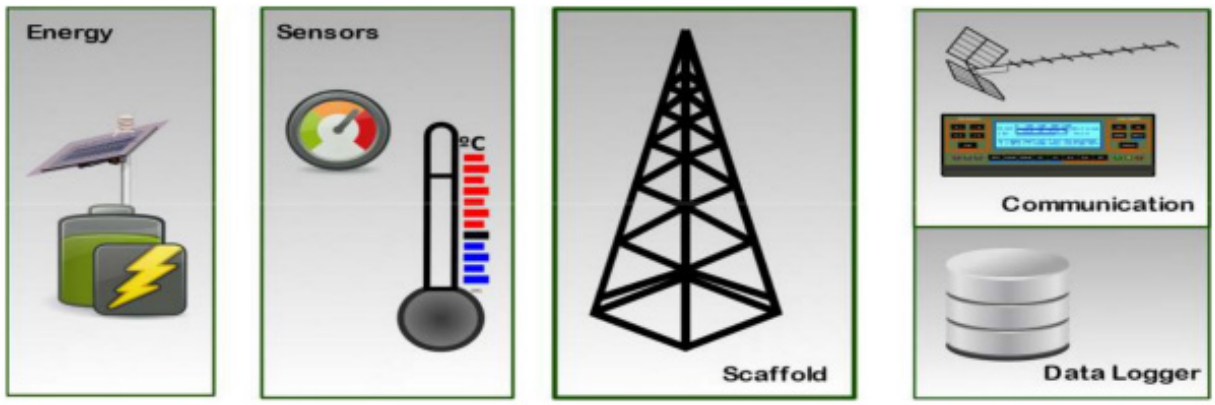
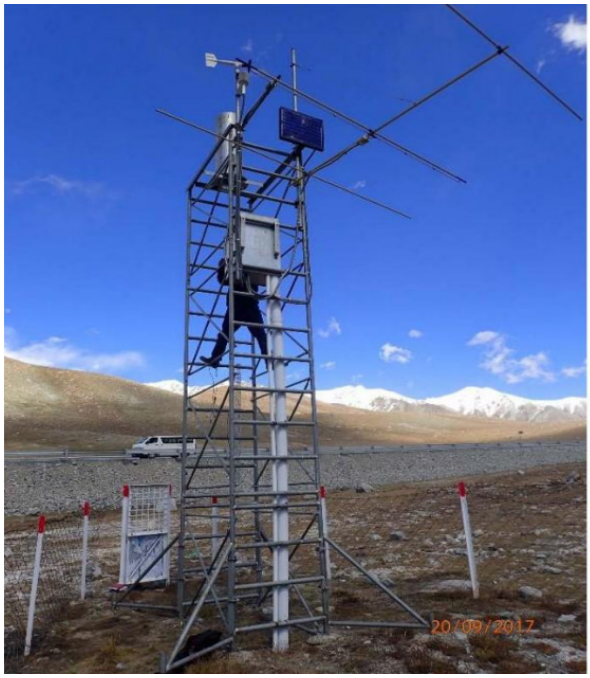


Figure 3.2: Components of an Automated Station

The different options of scaffold or mast are illustrated in Figure 3.3, While the mast is certainly the cheaper solution whereas the traditional scaffold option facilitates the work of maintenance personnel,



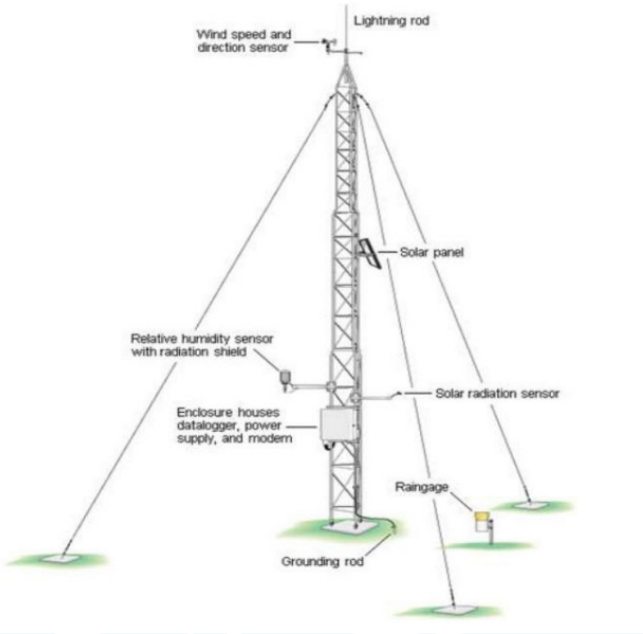


Figure 3.3: Comparison of scaffold and triangular lattice mast

3.4 AVAILABILITY OF COMMUNICATION SYSTEMS

At present telemetry communication is available through three types of system as elaborated below. Each has its own merits and demerits therefore will have to be carefully opted by the stake holders for operation of their network. Fortunately, all the three systems are already under use by WAPDA, the proposed implementing agency for installation of flood telemetry Master Plan.

3.4.1 METEOR BURST COMMUNICATION SYSTEMS (MBCS)

Presently, the commercial support for MBCS systems is quite limited. Several companies that were on the market 20 years ago are no longer existent or do not have these devices any more in their portfolio. **Maiden Rock Communications / PDataComm (USA)** is the only company available for supply of this system. They were already involved in MBCS installations in Pakistan and are still offering their products and services.

Currently, Glacier Monitoring Research Centre (GMRC) of WAPDA uses MBC system for a number of their stations mostly at high altitude. The data of the two networks are received by the same master station in Baddoki, Lahore. The system is operational for the last 25 years without any major breakdown.

3.4.2 MOBILE COMMUNICATION NETWORKS (GSM)

There are four providers for mobile communication, Zong, Jazz, Telenor and Ufone and hopefully most of the proposed network stations would be covered by their networks. Considering the lower hardware costs (a GSM-module is almost a standard component of modern data loggers), the option of GSM communication might be cost effective, simple and reliable as most of the stations could be connected through it at a very cheap operational cost. For remaining stations, other communication system will have to be considered. This demands to in place a hybrid communication system that

would need a detailed survey of the sites involved to find suitability of communication system for each site.

Table - 3.1: Comparison of monthly operational fee for different service providers

Service Provider	JAZZ	ZONG	TELNOR	U-PHONE
Monthly Bill (Rs.)	800	800	800	500

3.4.3 IRIDIUM SATELLITE COMMUNICATION SYSTEM

The Iridium satellite network includes three principal components which include the satellite network, the ground stations and the satellite phones and data units. Voice and data messages can be routed anywhere in the world by the Iridium network. Calls are relayed from the satellite phone or data unit on the ground to one of the Iridium satellites. It is then relayed from one satellite to another then down to an appropriate ground station. The call is then transferred to the public voice network or Internet to reach the recipient.

3.4.4 ANALYSIS OF OPTIONS AND COSTS FOR SATELLITE DATA COMMUNICATIONS

The selection of the communication system (for transferring real time recorded data from the remote stations to a central station) is of vital importance.

The satellite communications system, like mobile networks, have very low investment costs for the communication unit and the antenna, many data loggers even have options of integrated satellite communication modules.

Iridium Satellite was found most suitable for the required communications in Flood Telemetry Master Plan. The commercial Iridium network consists of more than 50 satellites, which improves the quality of communication, even for difficult sites like narrow mountain valleys. Communication is bidirectional and would work from a central station: a small server hosted at any building, just with a small antenna on the roof. This is a similar setup like used with MBC, but without the requirement of a costly master station.

Iridium is technically the superior solution but the problem is its high communication charges to be paid to this commercial service provider (around Rs.2,40,000 annually per station) for hourly data communication. This is a very high recurring cost on part of govt. of Pakistan. Past experiences have shown that these payments could not be ensured and resulted in the failure of the project based on satellite communication system.

In that case, the choice would go back to MBC, which involves much higher investment costs but afterwards no annual fees except a small annual license fee to the state, If the decision is made for MBC, the most urgent action would be to rebuild the master station, which is at the brink of complete failure, In this case, an exchange of existing data loggers and radios at the field stations would not be required, as they would be compatible with the new electronics at the master station.

On the other hand, if the decision is made to opt transmission through Iridium satellite, the data loggers and communication hardware (radios, antennas) of any existing telemetry network stations would need to be changed or both the networks will have to be maintained in parallel. A comparison of the available communication system is given below:

Table - 3.2: Comparison of available Communication Systems

	Meteor Burst	TDM/TDMA – VSAT	Microwave Radio Links	GSM
Reliability	Probabilistic - 90%	Reliable – 99.99% availability	Reliable 99.0%	Reliable 99.0%
Mode of data acquisition	Quasi-real-time	Real-time	Real-time	Real-time
Voice provision	No	Yes	Yes	Yes
Fax provision	No	Yes	Yes	Yes
Time lag	5 – 50 minutes depending on distance and terrain	Max 3 seconds; independent of distance and terrain	1-2 seconds depending on the distance	1-2 seconds
Two-way communication	No	Yes	Yes	Yes
Space required for installation	Flat terrain for at least one km in the direction of transmission	Small space of approx. 7x7 ft2 for the dish antenna	Small space of approx. 15x15 ft2 for tower	Very small, antenna only
Impact of the distance between remote and base stations	Shorter distances reduce the change of catching Meteor, thus affecting reliability	The quality of service remains constant, independent of distance	Chain of towers and pairs of radios every 50 km	Good coverage in urban areas
Link availability, data rate	Varies during day and night	Very constant	Constant	Good coverage in urban areas
Scalability	The increasing number of stations leads to more data traffic and delays at the base station	Very simple and no reduction in performance	Very expensive	Very cheap
Multi-point communication	No Not suitable for mesh networks; sites cannot communicate simultaneously	Yes Most suitable for mesh networks	No communication; requires a separate point to point links; repeater required for distance > 50 km	Yes
Maximum communication range	1600 km +/- 200 km	Depending on the satellite footprint; a single satellite covers 40% of the globe	Requires line of sight; may require multiple links for distances of 2 to 3	Full coverage in urban areas
Providers	Only one	Many	Many	Many
Competitive bidding	No – only one provider	Yes – Numerous data network providers available	Yes – Numerous suppliers available	Yes – Numerous suppliers available

skills required	Yes – trained personnel	No – O&M responsibility at a data network provider	Yes – trained personnel	The network is the provider's responsibility
Number of transmission units	2 – (Meteor + PTC Lines)	1 – (Satellite only)	1 – Chain of towers and pairs of radios every 50 km	1 – (Cell tower only)
Operating costs	Low O&M cost of the System plus cost of PTCL lines	High O&M payable to data network provider	Medium O&M cost of each point of installation	Very low
Data packet Size	Very limited	Large	Large	Very Large
Transmission frequency	Very low; prone to noise and attenuation	Very stable	Stable	Very stable
Transmission protocols	Unspecified	All major protocols supported	All major protocols supported	All major protocols supported
Overall Evaluation	Does not meet the requirements for simultaneous data transmission particularly keeping in mind that it is probabilistic, has a time delay up to 50 minutes and is less reliability on short distances. The requirement of a clear 1-km terrain may not be adequate at certain locations. Tow way communication not possible if required in the future. Competitive bidding is not possible.	Most suitable for mesh network and simultaneous data transmission. offering 99.99% reliability and no distance constraint. Voice, Fax, E-mail possible Easy installation	Technically not viable Very high initial capital cost Difficult network management Simultaneous data transmission theoretically possible but costs are very high and management of links is nearly impossible. Frequency allocation of many links is very tedious Signal strength deteriorates under bad weather conditions.	Very good coverage in urban areas Easy to use Low cost Very reliable Voice, Fax, Email available Easy installation 2-way communication Unlimited data use

CHAPTER - 4

AUTOMATIC OBSERVATION HARDWARE

4. AUTOMATIC OBSERVATION HARDWARE

4.1 WEATHER PARAMETERS OBSERVATION

The following analyses for the different equipment categories should be understood to give overviews of the different types of technologies. Selection of appropriate sensors will depend upon the conditions at site of installations. WAPDA intends to add weather parameters such as Precipitation, Temperature, and Relative Humidity to the Hydrological Stations to get additional information as under;

DETAILS OF FFT STATION's PARAMETERS

The following parameters are required from the sensors interfaced with the data logger through GSM/GPRS/Satellite/Meteosat transmission.

i. Instantaneous sampled value of air temperature in deg C at every 10 minute interval.
ii. Max. air temperature of the hour (samples taken every minute)
iii. Minimum air temperature of the hour (samples taken every minute)
iv. Daily maximum and minimum
v. Wind speed in knots at every 10 minute interval with 3 minute vector averaging.
vi. Wind direction in degrees at every 10 minute interval with 3 minute vector averaging.
vii. Daily minimum and maximum wind speed
viii. Daily maximum wind gust.
ix. Instantaneous value of RH(Relative Humidity) at the end of every 10 minutes.
x. Daily maximum and minimum value of Relative Humidity
xi. Dew Point temperature at every 10 minute interval.
xii. Cumulative rainfall since last reset (reset at 03 UTC everyday)
xiii. Hourly rainfall (reset every full hour UTC)
xiv. River Level & Flow at every 15 minutes interval
xv. Battery voltage (hourly)

Below are enlisted the potential Manufacturers / Suppliers of sensors worldwide, for establishment of desired Hydrological Network.

Table - 4.1:List of potential Manufacturers / suppliers of Hydrological equipment

Sr. No.	Company Name	Country of Origin
1.	Hyquest Solutions	New Zealand
2.	Sommer	Austria
3.	Siap Micros	Italy
4.	OTT Hydromet Group	USA/Austria Germany
5.	Campbell Scientific	USA

6.	Microstep	USA
7.	Seba	Germany
8.	General Acoustics	Germany
9.	Rickly	USA

4.1.1 PRECIPITATION

Generally, snow takes place at high altitudes and rain occurs at low altitude. There are several types of sensors to measure precipitation: tipping bucket rain gages, siphoning tipping bucket rain gages, heated rain gages, and snowfall adapters. Users often select their precipitation sensors based on the type of precipitation to be measured (rain or snow), as well as the needed orifice diameter, measurement range, and accuracy level.

Followings are the several precipitation gauges, including: Geonor T200B, OTT Pluvio2, RM Young 52202, Texas Electronics TR525, Meteoservis MR2/2H:

- The Geonor T200B precipitation gauge can be reported in real-time at any interval to calculate the intensity. The precipitation rain gauge is simple to configure for use with automatic data acquisition systems. The original T-200B has a 600 mm (24 in) capacity and incorporated one vibrating wire sensor. Geonor now offers 1000 mm (40 in), 1500 mm (60 in), & 3000 mm (120 in) capacity precipitation – rain gauge(s) and the ability to incorporate three sensors as an option. The gauge has a protective housing with a WMO standard 200 cm^2 inlet. The amount of precipitation is measured by using vibrating wire load sensors. The instrument as well as a wind shield is mounted to the pedestal. With the use of antifreeze any solid precipitation is melted in the container. No electrical heating is therefore required, thus eliminating a common source of error. A thin layer of oil is added to impede any evaporation.

- The OTT Pluvio2 is an all-weather precipitation gauge that uses superior weight-based technology to measure the amount and intensity of rain, snow, and hail. Developed in conjunction with industry-leading meteorological services, the OTT Pluvio2 employs a high-precision load cell and algorithms that compensate for wind, temperature, and evaporation, ensuring the highest accuracy precipitation measurements over time.

- The YOUNG Tipping Bucket Rain Gauge meets the specifications of the World Meteorological Organization (WMO). The design uses a proven tipping bucket mechanism for simple and effective rainfall measurement. The bucket geometry and material are specially selected for maximum water release, thereby reducing contamination and errors. Catchment area of 200 cm^2 and measurement resolution of 0.1 mm meets the recommendations of the WMO. Leveling screws and bull's eye level are built in for easy and precise adjustment in the field. Measured precipitation is discharged through a collection tube for verification of total rainfall. Model 52202 is heated for operation in cold temperatures. To discourage birds from perching on the funnel rim, accessory bird wire assembly may be attached to the gauge.

- The Texas Electronics, Inc. TR-525USW Rainfall Sensor with 8" diameter funnel is a remote tipping bucket style rain gauge that measures liquid precipitation. The Rain Gauge is a freestanding receptacle for measuring precipitation. Through an opening at the top of the device, rain is collected and then funneled to a mechanical device, called a tipping bucket. As water is collected, the tipping bucket fills to the point that it tips over, causing a momentary closure of a switch to incrementally measure rainfall accumulation. This action empties the bucket in preparation for

additional measurement. Water discharged by the tipping bucket passes out of the rain gauge with no need for emptying.

- A principle of the rain gauges' function lies in a utilization of "tipping bucket" mechanism to get electrical pulses in dependence on a precipitation quantity. The MR2 is non-heated rain gauge intended for a liquid precipitation measurement and the MR2H is heated rain gauge intended for a liquid and solid precipitation measurement.

RECOMMENDED:

It is concluded that Tipping Bucket Rain Gauges (TBRG) from manufacturers like RM Young, Casella and Vaisala, TBRG are relative cheap and in production since several decades, Weighing Rain Gauges (WRG) are a newer development, They are more accurate and particularly suited for cold regions with lots of snow and freezing temperatures, TBRG are not natively 'all-weather', and do not tend to be well suited to cold environments (they can be heated, but this requires power and does not tend to work well). Or an equivalent sensor could be considered.

Table - 4.2: Precipitation Sensor

Sensor	Specification	
Rain Gauge (All Weather)	Precipitation (All Weather) Measuring Range: 1500 mm Accuracy: 0.1% Resolution: 0.001 mm Operating Temperature: -40 to 70 °C	Type: Weighting Type
Rain Gauge (Tipping Bucket)	Sensor Type Measurement Range Accuracy ±3% Supply voltage range Operating Temperature Resolution Humidity Range 0 to 100% Material	Tipping Bucket Infinity. 10-30 V DC -40 to 70 deg C 0.2 mm to 0.5mm Stainless Steel or anodized anticorodal aluminum and white painted, with stainless steel measuring system (tilting bucket).

Geonor T200B

RM Young 52202

FIG: 4.1 Devices for measuring Precipitation

4.1.2 SNOW (SNOW WATER EQUIVALENT & SNOW DEPTH)

Devices for measuring Snow Water Equivalent (SWE) are analyzed separately from the other meteorological instruments, because they are not part of the standard equipment and there are only very few manufacturers in the market.

Following are the several sensors, including: the Vista Snowsense, Sommer SSG, Sommer SPA-2, Campbell Scientific CS725, Hydroinnova CRS-1000, and University of Saskatchewan's SAS2.

- The Vista Snowsense measures the attenuation of GPS signals through snowpack. It is very inexpensive, light, and packs to a small size. It can measure expected SWE, snow depth, and liquid water content in the Project Area. Although it is a new product, it appears to be well tested. Its main drawback is that manufacturer-integration into MBC telemetry is an open question.

- The Sommer SSG is a snow scale. It is moderately priced, has undergone third-party peer-reviewed testing, and has been widely deployed in remote areas. It does not contain antifreeze like a traditional snow pillow. It is a relatively large and heavy instrument but breaks down to small pieces for transport and shipping. Overall, the SSG appears to be a very appropriate instrument for the Project.

- The Sommer SPA-2 senses differences in the dielectric constant between snow, ice, and air. It appears appropriate in terms of measurement range. Its advantage over the SSG is that it not only measures SWE, but also liquid water in snowpack, which can help with prediction of the start date of runoff. It works in conjunction with a snow depth sensor, which is included. However, it is very expensive, and wet snow could stick to the tape, or ice could freeze to it.

- The Campbell Scientific CS725 measures gamma radiation from the ground surface, which is attenuated by snow and ice. It is a well-tested instrument with a long history. However, it cannot be deployed in high snowpack environments (SWE >600 mm), which may be of critical importance for flood prediction. Information on ground cover should be collected, or gamma radiation should be measured at each site to determine whether each site is appropriate.
- The USH-8 sensor's principle of measurement deals with the transit-time measurement of

an ultrasonic pulse. The sensor transmits several energy-charged pulses to the snow cover and subsequently receives its reflected signals. Based upon the required transit time of the ultrasonic signals, the USH-8 sensor calculates the current snow depth. The processing time of the ultrasonic pulses here is enormously influenced by the air temperature. For this reason, the snow depth sensor also possesses integrated temperature compensation. This takes into account the influence of the air temperature on the processing time of the ultrasonic signals, in the calculation of the snow depth. The calculation takes place in the sensor, so that the output signal provides the already converted snow depth. In this manner, optimum measuring results are achieved, with an accuracy of 0.1 % (FS).

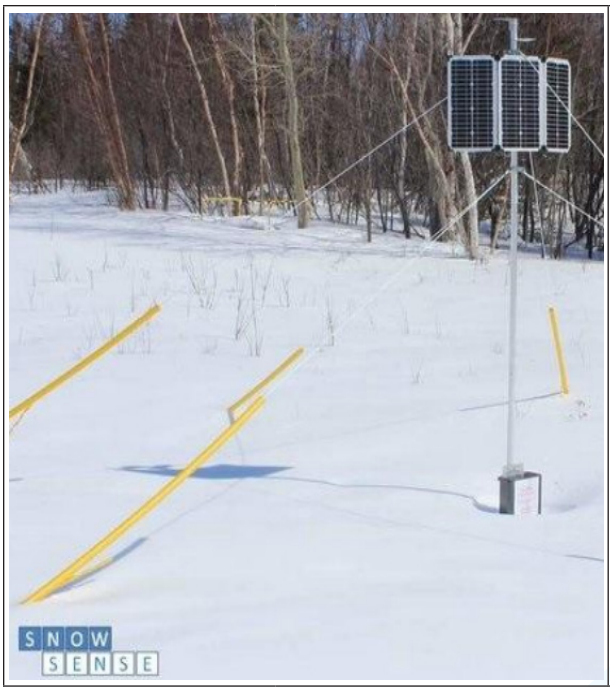
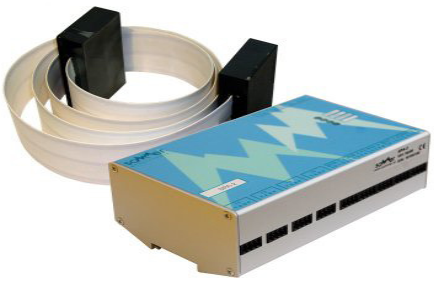
- The SR50A Sonic Distance Sensor provides a non-contact method for determining snow depth. It determines depth by emitting an ultrasonic pulse and then measuring the elapsed time between the emission and return of the pulse. An air temperature measurement is required to correct for variations of the speed of sound in air. It is rugged enough for harsh environments. It uses a multiple echo processing algorithm to help ensure measurement reliability.

RECOMMENDED:

It is concluded, that Sommer Snow Scale SSG shows the most optimal trade-off between (1) Measurement quality and extensive range of operating conditions, (2) price, and (3) limited calibration and field supervision needed. If price or ease of transport are primary concerns, then the Vista Snowsense might be considered. Given that the Snowsense is a relatively new system. Or an equivalent sensor could be considered.

Table - 4.3: Snow Depth and Snow Water Equivalent Sensors

Sensor	Specification
Snow Depth	Type: Sonic Measuring Range:0.7÷ 10 m Accuracy: typical 0.1 % FS Resolution: 1mm Operating Temperature: -40 to 60 °C
Snow Water Equivalent	Type: Weight Measuring Range: up to 3000mm Accuracy: typical 0.3 % FS Resolution: 0.1kg/m sq Operating Temperature: -40 to 80 °C

	
Vista Snowsense	Sommer SSG
	
Sommer SPA-2	Campbell Scientific CS725
Hydroinnova CRS-1000	Sommer USH-8

SR50A

FIG: 4.2 Snow Depth & Snow Water Equivalent Sensors

4.1.3 TEMPERATURE & RELATIVE HUMIDITY

A temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record, monitor, or signal temperature changes. A hygrometer is a weather instrument used to measure the amount of humidity in the atmosphere. There are two main types of hygrometers a dry and wet bulb psychrometer and a mechanical hygrometer. Wet and dry bulb psychrometers are the simplest and common way of measuring humidity. This type of hygrometer uses two basic mercury thermometers, one with a wet bulb one with a dry bulb. Evaporation from the water on the wet bulb causes its temperature reading to drop, causing it to show a lower temperature than the dry bulb. Relative humidity is calculated by comparing the readings using a calculation table that compares the ambient temperature (the temperature given by the dry bulb) to the difference in temperatures between the two thermometers.

General Specification

Storage-/Operating Temperature	-40°C to 70 °C
Cable coating	PUR
Housing Classification	IP65 or Better
Housing Material	Stainless Steel or POM-C or TECAPET Low or Painted anodized anticorrodal aluminium
Power consumption	5-30 V DC
Sensor protection	Stainless steel sinter filter cap, pore size 10µm or better
Communication Standards	SDI-12
Analog output	RS-485
EMC compliance	EN61326-2-3

Air Temperature

Measurement Range	-40 °C to +70 °C
Accuracy	± 0.2 Deg C or better (with radiation shield)
Resolution	± 0.1 Deg C
Response Time	10 sec or better
Sensor element	pt1000 DIN A

Relative Humidity

Measurement Range	0 to 100% Rh
Accuracy	± 3% or better

Resolution	± 1%
Response Time	10 sec or better
Sensor element	Capacitive, with protective HC01 coating

AT/RH Radiation Shield

Construction	UV stabilized white thermoplastic plates, aluminum mounting bracket, white stainless steel u-bolt clamp
Mounting	U-bolt fit vertical pipe 1 in.-2 in. (25mm to 50mm) dia.
Radiation Error	@1080 W/m^2 intensity (dependent on wind speed) 0.4°C (0.7°F) RMS @ 3 m/s (6.7 mph) 0.7°C (1.3°F) RMS @ 2 m/s (4.5 mph) 1.5°C (2.7°F) RMS @ 1 m/s (2.2 mph)

Following are the several sensors, including: Rotronic HC2-S3, Vaisala MP-408A.

- Rotronic HC2-S3 is a highly accurate relative humidity measurement probe capable of measuring both humidity and temperature as well as calculating dew/frost point. Designed specifically for use with the Rotronic HygroClip 2 range of humidity measurement instruments. With integrated data acquisition and calibration history, the Rotronic HC2-S3 probe is easily programmable with alarm functions and features advanced, easy to use calibration features. Based on Airchip 3000 technology, the unique features of the Rotronic HC2-S3 such as the advanced sensor technology and integration provide superb precision and state-of-the-art functionality.

- Humidity and Temperature Probe Vaisala MP-408A is designed for high-pressure applications such as compressed air systems in maritime, breathing air, and industrial applications, where measurement performance and chemical tolerance are essential. The HMP4 is part of the Indigo product family and compatible with Indigo500 and Indigo 200 series transmitters and free Insight PC Software. Plug & play compatible with Indigo™ series of transmitters. Its accuracy for RH up to 0.8 % RH and Temperature accuracy up to 0.1 °C (0.18 °F). It measures Temperature measurement range -70 to +180 °C (-94 to +356 °F).

Table - 4.4: Temperature and Relative Humidity Sensor

Sensor	Specification
Temperature and Relative Humidity	Type: Capacitive Measuring Range: -40 to 60°C Resolution: 0.03 °C Accuracy: +- 0.1 °C

Rotronic HC2-S3	Vaisala MP-408A

FIG: 4.3 Temperature & Relative Humidity sensors

4.2 AUTO RIVER STAGE OBSERVATION HARDWARE

Sommer provides multiple highly accurate measuring devices to measure the surface water level without direct contact to the medium. The pulse procedure sends a short micro wave impulse to the water surface. Afterword the sensor remains in stand by for a short time and within this time the water reflects the pulses to the integrated evaluation system. The run time of the impulses corresponds directly to the distance to the current surface water level. Measuring ranges are different for different sensors such as Water Level Radar Sensor, RQ - 30 and Ultra Sonic Level Sensor USH -9

RECOMMENDED:

Table - 4.5: Water Level and Discharge Measurement Sensor

Sensor	Specification
Water Level Discharge Measurement RQ-30	**WATERLEVEL MEASUREMENT** • **Measurement range:** 0 ... 15 m standard version / 0 ... 35 m extended version • **Resolution:** 1 mm • **Radar frequency** :26 GHz (K-Band) • **Radar opening angle :**10°

4.3 AUTOMATIC FLOW MEASUREMENT TECHNOLOGIES

Discharge measurements by Tracer technology:

The suggested tracer equipment includes the devices to calculate discharges directly in the field, so that no separate laboratory would be required, The Sommer tracer systems and QiQuac measure the tracer in the field - either salt, fluorescein (green) or rhodamine (red) dye, The discharge is determined shortly after the tracer has been introduced, The magnitude of discharge affects which (if any) tracer is best to use, Salt is limited to discharges up to 10/m^3/s, requiring 5 kg /m^3/s, Fluorescents can be applied for the whole range of discharges and require only 0,5 g/m^3/s, Another criterion is the availability of the tracers in the local market (pharmacies) and possible legal regulations which differ from country to country, In Germany both dyes are freely available in the market.

Table - 4.6: Discharge Measurement by Tracer Technology

Sensor	Specification
Discharge by Tracer Technology Salt Tracer TQ-S (Or Equivalent)	Salt Tracer TQ-S: Conductivity prob Discharge up to 10 cum/sec Tracer Insertion: 0.5 kg per cum/s Fluorescence Tracer TQ-F Optical Fluorescence prob All Discharge Volumes Tracer Insertion: 0.5 kg per cum/s

FIG: 4.4 Tracer Systems for Discharge Measurement

Discharge measurements by Radar technology:

The advantage of non-contact velocity measurement is their suitability for extreme flood events, where all other methods would cause loss of instruments or even endanger of life of the measuring personnel, Tests of the instruments made by Sommer (which only operate together with their specific software) show the same level of accuracy as modern mechanical current meters. The RQ-0 measures both water level and surface velocity permanently, the latter may be useful to record hysteresis in the level/discharge relation, particularly at glacier streams with strong diurnal fluctuations. The RP can be used to measure surface velocity at more points, but even that makes only sense in case that cross-section is stable for a longer period, If the cross-section changes during each flood event, then the instrument is of limited use. Seba is also providing an equipment called discharge keeper that works on the same principal.

Table - 4.7: Discharge measurement by Radar Technology

Sensor	Specification
Discharge Through Radar RQ - 30 by Sommer (Or equivalent)	**VELOCITY MEASUREMENT** • **Measurement range** 0.10 ... 15m/s (depending on flow conditions) • **Accuracy** +/- 0.01 m/s; +/- 1 % FS • **Resolution** 1 mm/s • **Measurement duration** 5 ... 240 sec. • **Measurement interval** 8 sec. ... 5h • **Measurement frequency** 24 GHz (K-Band) • **Radar opening angle** 12° • **Distance to water surface** 0.50 ... 35 m • Necessary minimum wave height 3 mm

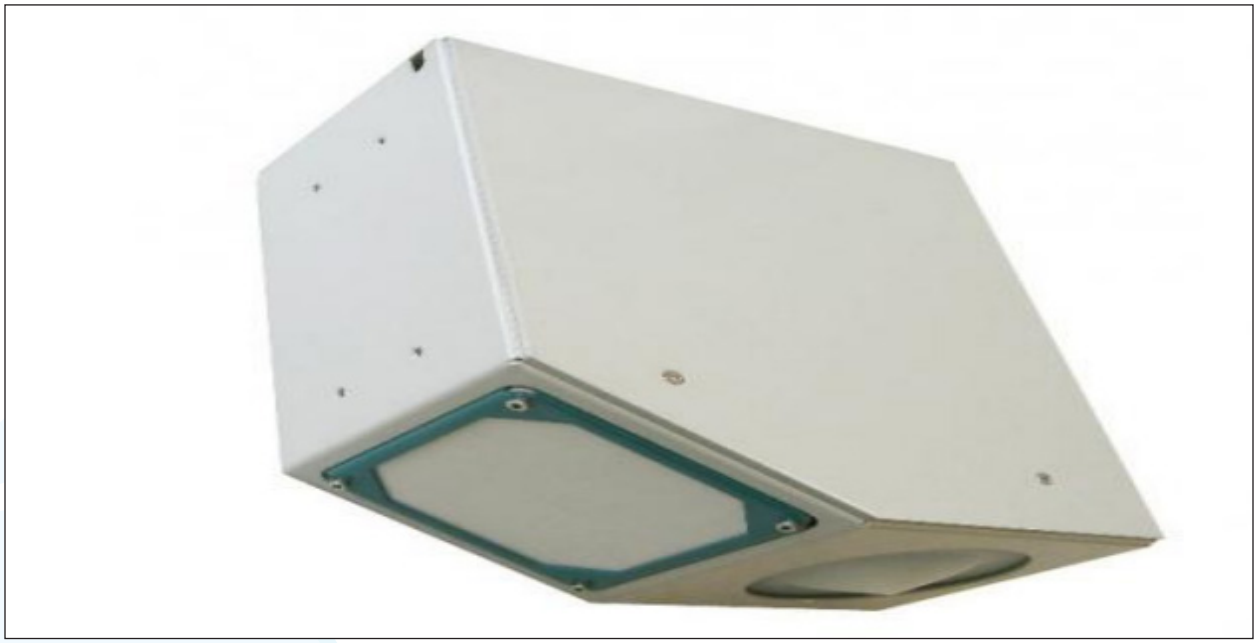


FIG: 4.5 Radar Sensor RQ-30 by Sommer for Discharge Measurement

Discharge measurements by ADCP

ADCPs contain piezoelectric transducers to transmit and receive sound signals. The traveling time of sound waves gives an estimate of the distance. The frequency shift of the echo is proportional to the water velocity along the acoustic path. To measure 3D velocities, at least three beams are required. In rivers, only the 2D velocity is relevant and ADCPs typically have two beams. In recent years, more functionality has been added to ADCPs (notably wave and turbulence measurements) and systems can be found with 2,3,4,5 or even 9 beams.

Further components of an ADCP are an electronic amplifier, a receiver, a clock to measure the traveling time, a temperature sensor, a compass to know the heading, and a pitch/roll sensor to know the orientation. An analog-to-digital converter and a digital signal processor are required to sample the returning signal in order to determine the Doppler shift. A temperature sensor is used to estimate the sound velocity at the instrument position using the seawater equation of state, and uses this to estimate scale the frequency shift to water velocities. This procedure assumes that the salinity has a preconfigured constant value. Finally, the results are saved to internal memory or output online to external display software.

Table - 4.8: Discharge Measurement by ADCP

Sensor	Specification		
ADCP; SonTek Surveyor - M9 (or equivalent) complete with Tablet PC and software with float suitable for strong currents		RiverSurveyor S5	RiverSurveyor M9
	Velocity Measurement		
	Profiling Range (Distance)	0.06m to 5m	0.06m to 40m
	Profiling Range[1] (Velocity)	+/- 20 m/s	+/- 20 m/s
	Accuracy[1]	Up to +/- 0.25% of measured velocity; +/- 0.2cm/s	Up to +/- 0.25% of measured velocity; +/- 0.2cm/s
	Resolution	0.001 m/s	0.001 m/s
	Number of Cells	Up to128	Up to128
	Cell Size	0.02m to 0.5m	0.02m to 4m
	Transducer Configuration	Five (5) Transducers;	Nine (9) Transducers;
		4-beam 3.0 MHz Janus at 25° Slant Angle;	Dual 4-Beam 3.0 MHz/1.0 MHz Janus at 25° Slant Angle;
		1.0 MHz Vertical Beam Echosounder	0.5 MHz Vertical Beam Echosounder
	Depth Measurement		
	Range	0.20m to 15m	0.20m to 80m
	Accuracy	1%	1%
	Resolution	0.001m	0.001m
	Discharge Measurement		
	Range with Bottom-Track	0.3m to 5m	0.3m to 40m
	Range with RTK GPS or DGPS	0.3m to 15m	0.3m to 80m
	Computations	Internal	Internal

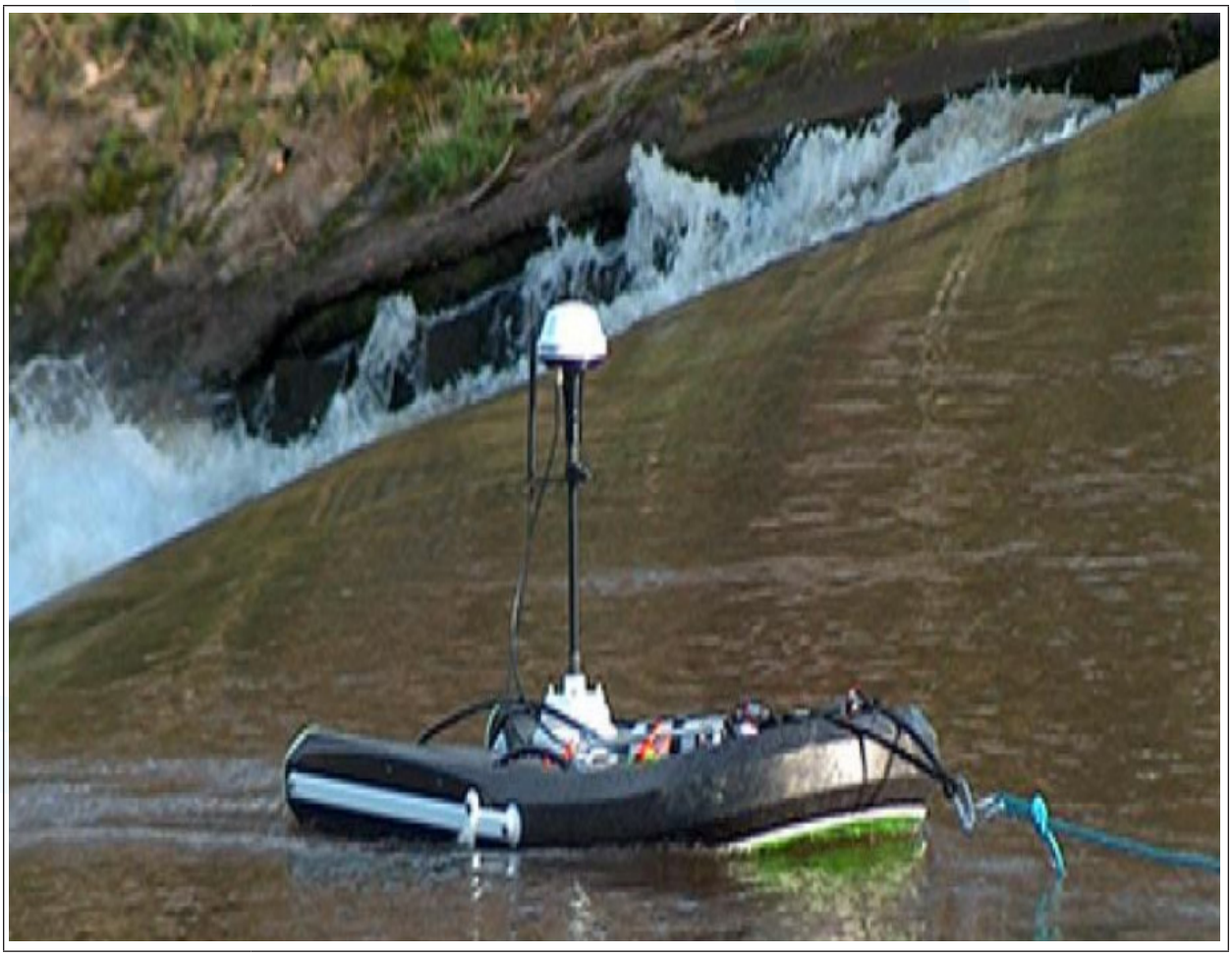


FIG: 4.6 Sontek River Survey - M9 ADCP

CHAPTER - 5

OPERATION, MAINTENANCE AND CALIBRATION

5. OPERATION, MAINTENANCE AND CALIBRATION

5.1 INTRODUCTION

In a Meeting held on 29.07.20 under the Chairmanship of Secretary MoWR, It was mutually decided and agreed by all the stake holders that:

- WAPDA will prepare National Master Plan for Flood Telemetry System comprising existing facilities with regard to gauging stations/telemetry Network within each province and Federal Line Agencies FLA. The plan shall include requirement of new flood telemetry stations to ensure registering of flood flows of all secondary tertiary rivers, small nullahs and streams besides the main Indus Basin River System with a view to augment PMD's forecasts with more precise water figures and:

- For regular & Annual O&M of the entire system under future O&M mechanism each of the province/FLA will ensure allocations of required O&M funds in its respective provincial/ FLA ADP for system's sustainable operation while WAPDA shall provide its support in the overall technical O&M of entire System along with each of the respective provincial irrigation departments.

5.2 STAKEHOLDERS

Participation of all water users is a key to success of critical water issues being faced. In order to ensure the ownership of the National Flood Telemetry Network and sustainability, following provinces/departments are envisaged as potential stakeholders of this project:-

i. Ministry of Water Resources
ii. Pakistan Metrological Department
iii. Federal Flood Commission
iv. WAPDA
v. Irrigation Department, Government of Punjab
vi. Irrigation Department, Government of Sindh
vii. Irrigation Department, Government of KP
viii. Irrigation Department, Government of Balochistan
ix. Irrigation & Small Dams, Government of AJ&K
x. Federal Public Works Department, Government of Gilgit-Baltistan
xi. Merged Areas, Irrigation Department, Government of KP

5.3 TOTAL COST OF MASTER PLAN & ANNUAL O&M COST

FLAs, Provincial Irrigation Departments of KP, Punjab, Baluchistan and Sindh will bear/ provide the O&M cost of the Flood Telemetry/hydrological stations installed in their area of jurisdiction. Item-wise detail of Principal Cost, O&M cost of estimates and Province wise share for complete Master Plan to be in place as well as proposal for establishment of high priority network is given as under;

Table - 5.1: Cost distribution for Complete Master Plan to be in place. (Total 707 sites)

PRINCIPAL COST	
Province/FLA	**Amount Rs. (million)**
Punjab (151)	**3,398**
KP (136)	**3,090**
Sind (46)	**1,160**
Balochistan (207)	**4,712**
AJK (83)	**1,931**
GB (84)	**1,931**
DHDC, (WAPDA) (Incl. Consultancy)	**487**
CO-HOST (FFC)	**29**
PMD and IRSA (Data Ports)	**6**
TOTAL	**16,744**

O & M COST	
Province/FLA	**Amount Rs. (million)**
Punjab	**156**
Kp	**148**
Sind	**64**
Balochistan	**224**
AJK	**84**
GB	**84**
DHDC, (WAPDA)	**26**
CO-HOST, (FFC)	**4**
TOTAL	**790**

Table - 5.2: Cost distribution for the proposal of high priority network (Category - A) - Total 443 Sites

PRINCIPAL COST	
Province/FLA	**Amount Rs. (million)**
Punjab (96)	**2,157**
KP (70)	**1,601**
Sind (39)	**936**
Balochistan (149)	**3,313**
AJK (41)	**936**
GB (48)	**1,126**
DHDC (WAPDA) (Incl. Consultancy)	**487**
CO-HOST (FFC)	**29**
PMD and IRSA (Data Ports)	**6**
TOTAL	**10,591**

O & M COST	
Province/FLA	**Amount Rs. (million)**
Punjab	**126**
KP	**76**
Sind	**59**
Balochistan	**120**
AJK	**59**
GB	**64**
DHDC, WAPDA	**26**
CO-HOST, FFC	**4**
TOTAL	**534**

Note: Details are appended with the respective detailed estimates.

5.4 PLACEMENT LOCATIONS OF OFFICES WITH TECHNICAL TEAM

Flood Telemetry Network, comprising 707 hydrological stations in total, requires placement of Technical Teams in different divisions/Districts/Regions on National level to carry out smooth & effective Operation and Maintenance of the Flood Telemetric Network in Pakistan. In this regard total ten (10) Nos. divisional offices are proposed to be established to carry out the operational and maintenance activities in the country. Each office would operate and maintain around 100 stations. However, seven No of offices with technical teams have been considered sufficient for implementation, continuous monitoring and up-keeping of the networks under Phase-1.

Table -5.3: Proposed Divisions for Placement of Regional Technical Teams

Name Of Area	No. of Stations	No. of Offices	Name of Divisions
Punjab	151	(02 Offices)	1. Lahore 2. Rawalpindi
Khyber Pakhtunkhwa	136	(02 Offices)	1. Peshwer 2. D.I Khan
Sindh	46	(01 Offices)	1. Sukkhar
Balochistan	207	(03 Offices)	1. Quetta 2. Khuzdar 3. Turbat
Azad Jammu & Kashmir	83	(01 Office)	1.Muzafferabad
Gilgit – Baltistan	84	(01 Offices)	1.Gilgit
Total	**707**	**10 Offices**	

5.5 COMPOSITION OF MANPOWER

Each Division should have the following Man Power under the administrative control of Project Director (DHDC) to meet with Operation and Maintenance requirements for the Flood Telemetry Network on National Level. Job descriptions are provided at **Annex - 6.**

Table - 5.4: Composition of regional teams for Operation and Maintenance

Sr. No.	Name of Post	Grade / BPS	Qty.
1	Executive Engineer (Telemetry)	18	1
2	Junior Engineer (Telecom/Electrical/ Electronics)	17	1
3	Junior Engineer (Civil)	17	1
4	Assistant Director (GIS) / IT	17	1
5	Assistant Budget & Accounts Officer	17	1

6	Accounts Assistant	16	1
7	Data Entry Operator	15	1
8	Sub Engineer (Civil)	14	1
9	Sub Engineer (Electronics/ Electrical)	14	1
10	Radio Technician Mechanic	14	1
11	Junior Clerk	9	1
12	Hydrographer	8	1
13	Gauge Observer	6	2
14	Driver	6	2
15	Naib Qasid	1	2
16	Chowkidar	1	2
	TOTAL		20

Table - 5.5: Composition of Digital Hydro Data Center Staff at Lahore

Sr. No.	Name of Post	Grade / BPS	Qty.
1	Project Director	19	1
2	Executive Engineer (Telemetry)	18	1
3	Junior Engineer (Telecom/Electrical/ Electronics)	17	2
4	Assistant Director (GIS) / IT	17	1
5	Assistant Budget & Accounts Officer	17	1
6	Accounts Assistant	16	1
7	Data Entry Operator	15	2
8	Sub Engineer (Electronics/Electrical)	14	1
9	Radio Technician Mechanic	14	1
10	Driver	6	1
11	Naib Qasid	1	2
12	Chowkidar	1	3
	TOTAL		17

5.6 EQUIPMENT REQUIREMENT

5.6.1 PORTABLE FLOW MEASUREMENT FIELD EQUIPMENT

- Hand held latest GPS.
- Hand held Latest Weather Meter.
- Automatic Sediment Sampler including all accessories.
- ADCP (9-Beam) sensor to be mounted on a Boat for Cross-Section/ Flow Measurement

along with complete accessories.

- Non-Contact Radar Profiler, Mobile Measuring System for Discharge Measurement along with complete accessories. Discharge calculation needs to be based on Hydraulic Models (several calculation factors).
- Boat
- Current Meter
- Wedding Rod
- Stop Watch
- Thermometer
- Total Station
- Cables
- Tag Lines
- Sounding Weights

5.6.2 TESTING & CALIBRATION EQUIPMENT

- Portable Professional 4-channel Oscilloscope 100 MHz bandwidth of standard brand.
- Portable Professional 4-channel Oscilloscope 200 MHz bandwidth of standard brand.
- Digital Latest Infrared Thermometer of standard brand.
- Digital Latest Insulation Multimeter of standard brand.
- Digital Latest Multimeter of standard brand.
- Digital Latest Clamp Meter (AC & DC both) of standard brand.
- Digital Latest Electrical Tester of standard brand.
- Digital Latest Multifunction Installation Tester of standard brand.
- Latest professional general purpose cable locator (underground and wall etc.) of standard brand.
- Digital Latest Battery Analyzer of standard brand.
- Tool kits.
- Laptops including all accessories & data cables to connect with data logger for communication / programming and site commissioning of standard brand 10th Generation Intel® Core™ i7.

5.7 FREQUENCY OF CALIBRATION

The standard periodicity of calibration of the measuring instrument is annual, except for the most critical instruments which, under normal operating conditions, should be recalibrated at least twice a year. However, Manufacturer Guideline to be followed for the equipment finally selected.

The main objective of Calibration services is to maintain quality control and quality assurance of the system in following aspects:

- To comply with requirements of the Flood Telemetric Network.
- For tracking back measurement results to the Standards set out during installation, and commissioning according to the manufacturer's recommendations.

5.8 ESTABLISHMENT OF HYDRO-MET EQUIPMENT TESTING, CALIBRATION AND ACCREDITATION LABORATORY

The setup of hydro metrological sites contains precious electronic equipment like water level/flow sensors for the measurement of water flow, water discharge, rain gauges, wind speed sensor etc. and

need calibration/testing with respect to their operational parameters after prescribed period (usually 2-3 years) to authenticate/verify operational efficiency of the said equipment as well as to optimize accurate results of forecasting data from these hydro metrological stations. It merits mentioning that no calibration/testing lab facility for Hydromet equipment is available in the country. Hence, there is a great need of establishment of high standard calibration, testing lab having full facilities of calibration, testing of new, repaired, used Hydromet sensors according to international Hydromet standards to mitigate problems of sudden non-functioning of installed equipment

Over the past years WAPDA has effectively positioned itself as a central source of data capture to and from adjunct agencies. In this way the WAPDA act as a central water data collaborator to support decision-making process for national water resources. As enhanced flood telemetry network as per National Flood Telemetry Master Plan is being planned, the need of a state-of-the-art calibration has become inevitable. Keeping in view this requirement, WAPDA being pivotal department dealing with forecasting, flood early warning and water management sector in Pakistan has already submitted a proposal to the Ministry of Water Resources **(Annex-7).**

5.9 TRAININGS

Switching over to advanced and state of the art technologies and procedures for flood monitoring through telemetry would also require to impart appropriate trainings to the monitoring staff both in the field and office. These training sessions are complementary extended by the suppliers and contractors for their respective equipment and relevant software. comprehensive plans should be prepared to hold these training sessions so that all stakeholder could attend. the training should generally cover the followings;

General Knowledge of Sensors (training session N° IS1)
Sensor Maintenance (training session N° IS2)
Measurement Interpretation (training session N° IS3)
Basic Knowledge of Data Loggers Training session N° AS1)
In-depth Knowledge of Data Loggers (Training session N° AS2)
Operator Management of Man/machine Interface (Training session N° AS3)
Man/machine Interface configuration (Training session N° AS4)
Telecommunication Equipment (Training session N° AS5)
Flood Early Warning System General Architecture (Training Session N° AS6)
Computer System General Architecture (Training session N° CS1)
Supervision System Configuration (Training session N° CS2)
System Maintenance (Training session N° CS3)
Hydrological database (Training session N° CS4)
Testing Equipment, ADCP, Oscilloscope etc.

CHAPTER - 6

PROPOSAL FOR HIGH PRIORITY STATIONS ONLY (PHASE-1)

(443 - STATIONS UNDER CATAGORY "A")

6. PROPOSAL FOR HIGH PRIORITY STATIONS ONLY (PHASE-1)

(443 - STATIONS UNDER CATAGORY "A

6.1 INTRODUCTION

Flood Telemetry Network Master Plan for Pakistan has been prepared following the need base assessment and comprised of 707 hydrological stations, covering all areas of Pakistan. This includes up-gradation of existing network and establishment of newly proposed stations. Total estimated Principal Cost for implementation of complete Master Plan in one go is worked out to be Rs. 16,744,965,052/- (16.744 billion). It includes provision of Rs. 450 million for consultancy Cost. The yearly operation and maintenance cost to run the monitoring networks is Rs. 789,841,360/- (0.790 billion), which is 4.7 % of the Principal Cost. Costing has been done with following considerations;

1. All the 707 telemetric hydro stations in different Provinces and FLA's with added weather parameters will be established.

2. Data communication through GSM, being most economical, has been opted. Areas where cellular service is not available the satellite communication will be used.

3. In all 10 Nos. independent Technical Offices equipped with data ports and specialized manpower to run the networks would be established, considering that each office would look after about 100 monitoring sites in the respective Province /FLA. Accordingly, offices establishment would be as under;

    - Balochistan (207 sites) - 03 offices
    - Punjab (151 sites) - 02 offices
    - KP (136 sites) - 02 offices
    - Sind (46 sites) - 01 office
    - G.B (84 sites) - 01 office
    - AJ&K (83 sites) - 01 office

4. A host central data management center will be established under WAPDA in Lahore named as Digital Hydro Data Center (DHDC).

5. A Co-Host data center will be established under FFC in Islamabad.

The detailed estimate for bringing complete Master Plan in place is attached as **Annex - 8** for ready reference.

6.2 PROPOSAL FOR HIGH PRIORITY STATIONS (CATEGORY - A ONLY) - 443 STATIONS

As discussed earlier, implementation of the complete Master Plan in one go would be a huge task that would need immense investment and would not be practically possible. Therefore, on the basis

of importance with regard to flood management, the proposed network and existing network to be upgraded are further classified in three major categories A, B and C. So, this would enable to implement / establish the networks in phases as per funds available.

Accordingly, a proposal has been prepared comprising implementation of Flood Telemetry Network Master Plan for High Priority Stations under Category "A" only, as given below. These 443 Hydro-Stations need to be established under Phase-1. Seven No of offices with technical teams have been considered sufficient for implementation, continuous monitoring and up-keeping of the networks under Phase-1.

Table - 6.1: Area wise distribution of Monitoring Stations for Category "A"

PROVINCE	PROPOSED FLOOD TELEMETRY NETWORK (PHASE -1) (CATAGORY "A" ONLY) - TOTAL: 443		
	UP-GRADATION EXISTING TOTAL: 134	NEWLY PROPOSED TOTAL: 309	GRAND TOTAL 443
PUNJAB	37	59	96
KPK	32	38	70
SINDH	20	19	39
BALOCHISTAN	16	133	149
AJK	14	27	41
GB	15	33	48

The tentative estimated Principal Cost of this proposal to be met through ADB funding is Rs. 10,591,47,104/- (10.591 billion) including provision of Rs 450 million for Consultancy Cost, against agreed funding of Rs. 6 billion. The Proposal could be implemented in one go as under;

- By provision of Additional Funds of Rs. 4.591 billion by ADB
- By further splitting the Phase-1 into sub-phases as per available investments from different agencies

In addition, an estimated cost of Rs.533,599,240/- (0.534 billion) has been framed for proposed setup on account of annual Operation and Maintenance cost for first year that would be funded by the respective Province/FLA's. This O&M cost, 05 % of the total proposal cost, will however be increased for subsequent years with enhancement of Flood Telemetry network by addition of category B and C stations. The detailed estimate is given hereafter.

6.3 PROPOSAL COST (PHASE - 1)

Establishment of High Priority Stations: (Category "A") Only.

Sr. No.	Description	Unit	Qty	Unit Rate		Foreign Currency Component (USD)	Local Currency Component (PKR)
				Foreign (USD)	Local (PKR)		
1	2	3	4	6	7	8	9
1.1	**RTU/Data Loggers**						
1.1.1	Data logger- With screen Display, Hydro-Met Software, with GSM/ GPRS(M2M) Modem supporting 02 no. SIMs including all accessories, antenna and cables etc., Serial Extension Board, Connection Terminals	No.	443	3,571		1,582,131	
	CCTV Camera including installation & all accessories	No.	443	653		289,237	
1.1.2	Satellite Modem (GOES/ Eumetsat/ Inmarsat/ Thuraya/ Iridium etc.)/ Radio (Meteor Burst) and Antenna alongwith accessories	No.	223	2,368		528,123	
1.1.3	Solar panels and Rechargeable Battery	No.	443	1,128		499,591	
	Power supply (solar with battery), 80W / 72Ah with mounting including all accessories						
1.1.4	Armor Plated National Electrical Manufacturers Association (NEMA) or equivalent Enclosure Stainless steel patch box (for data loggers, solar panel & battery powered station + Armor plating, must be IP66/IP67	No.	443	1,529		677,356	

1.1.5	Lightning Arrestor and Grounding Kit depending upon site requirements.	No.	443	630		279,090	
1.1.6	Sensor mast/pole with cross arms and suitable enclosure for housing the different sensors free from solar radiation etc.	No.	443	7,550		3,344,650	
	Sub-Total-ST 1.1 (RTU / Data Loggers):					**7,200,178**	
1.2	**SENSORS**						
1.2.1	Combined Temperature and Relative Humidity probe with protective cap & standard shaft including installation and all accessories	No.	443	725		321,284	
1.2.2	Tipping bucket rain gauge, MR2, non-heated alongwith Column, for rain gauge with tipping bucket, H=2m (85% gauges non heated))	No.	375	1,511		566,736	
1.2.3	Tipping bucket rain gauge, MR2, heated alongwith Filament transformer for the precipitation gauge (15% gauges heated)	No.	68	1,480		100,661	
1.2.4	Water Flow measuring Sensors non-contact radar based velocity and Water Level measuring Sensors [Master Sensor] (Combined or individual sensors as per site requirement) including accessories alongwith 01 additional Slave sensor	No.	443	21,195		9,389,335	
	01 no. Additional Slave Sensors per site (in addition to Master Velcoity and level Sensor) required for Level measurement being large/ wide streams/ rivers including installation material and accesories	No.	443	7,272		3,221,636	
	Sub-Total- ST 1.2 (Sensors):					**13,599,653**	

1.3	SPARES						
1.3.1	Data logger- With screen Display, Hydro-Met Software, with GSM/ GPRS(M2M) Modem supporting 02 no. SIMs including all accessories, antenna and cables etc., Serial Extension Board, Connection Terminals	No.	50	3,571		178,570	
	CCTV Camera including installation & all accessories	No.	50	653		32,645	
1.3.2	Satellite Modem (GOES/ Eumetsat/ Inmarsat/ Thuraya/ Iridium etc.)/ Radio (Meteor Burst) and Antenna alongwith accessories	No.	25	2,368		59,207	
1.3.3	Combined Temperature and Relative Humidity probe with protective cap & standard shaft including installation and all accessories	No.	50	725		36,262	
1.3.4	Tipping bucket rain gauge, MR2, non-heated alongwith Column, for rain gauge with tipping bucket, H=2m	No.	50	1,511		75,565	
1.3.5	Tipping bucket rain gauge, MR2, heated alongwith Filament transformer for the precipitation gauge	No.	10	1,480		14,803	

1.3.6	Water Flow measuring Sensors non-contact radar based velocity and Water Level measuring Sensors [Master Sensor] (Combined or individual sensors as per site requirement) including accessories alongwith 01 additional Slave sensor	No.	50	21,195		1,059,744	
	01 no. Additional Slave Sensors per site (in addition to Master Velcoity and level Sensor) required for Level measurement being large/ wide streams/ rivers including installation material and accesories	No.	50	7,272		363,616	
Sub-Total- ST 1.3 (Spares):						**1,820,413**	
Total - (ST 1.1 +ST 1.2+ST 1.3) - CIP Price of Equipment:						22,620,244	
Add 40% for Custom & Duties on CIP Price of Equipment						9,048,098	
TOTAL - T1 (Price of Equipment):						31,668,342	
TOTAL - T1 (Price of Equipment in PKR 1 USD = PKR225)							**7,125,376,950**

PART - 2: EQUIPMENT for maintenance - (for 07 Nos. Field offices, 01 No. Central Data Center and 01 No. Co-Host Data Centre)

Sr. No.	Description	Unit	Qty	Unit Rate		Foreign Currency Component (USD)	Local Currency Component (PKR)
				Foreign (USD)	Local (PKR)		
1	2	3	4	6	7	8	9
2.1	**Operational Equipment**						
2.1.1	Hand held latest GPS	No.	7	1,100		7,700	-
2.1.2	Hand held Latest weather Meter	No.	7	1,450		10,150	-

2.1.3	Rain Gauge Calibration Kit as per WMO standard and system requirement	No.	7	1,800		12,600	-
2.1.4	Standard Relative Humidity Indicator as per WMO standard and system requirement	No.	7	900		6,300	
2.1.5	Automatic Sedimatent Sampler including all accessories	No.	7	10,000		70,000	
2.1.6	ADCP (9-Beam) sensor to be mounted on a Boat for Cross-Section/ Flow Measurement along with complete accessories	No.	7	67,790		474,530	
2.1.7	Non-Contact Radar Profiler, Mobile Measuring System for Discharge Measurement along with complete accessories. Discharge calculation needs to be based on Hydraulic Models (several calculation factors)	No.	7	10,605		74,235	
2.1.8	Motorized towing system for mobile measuring water flow or discharge. Including mounting for Non-contact radar Profiler and ADCP boat and accessories	No.	7	15,944		111,608	
2.1.9	Autonomous Discharge measurement System (35 meter) for non-contact discharge measurement with integrated data logging and transmission	No.	7	17,330		121,310	

2.1.10	Digital Latest Standard Water Quality Monitoring Equipment as per WHO Standards including all accessories	No.	7	6,500		45,500	
2.1.11	Generator 10KVA (Auto-start Function) for DHDC& Co-data Center	No.	2	6,000		12,000	
2.1.12	Generator 2KVA(Self-start)	No.	7	1,500		10,500	
2.1.13	4-wheel Drive Double Cabins for field Activities by 7 Nos. Provincial Field Offices (@ 2 Nos. for each office)	No.	14		8,000,000		112,000,000
2.1.14	4-wheel Drive Double Cabins for Office Use by Central Data Centre at Lahore and Co-host at Islamabad (@ 2 Nos. for each office)	No.	4		8,000,000		32,000,000
2.1.15	Digital Camera of Standard Brand	No.	7	1,500		10,500	
Sub-Total- ST 2.1:						**966,933**	**144,000,000**
2.2	**Equipment for Testing and measurements**						
2.2.1	Digital Latest Multimeter of standard brand	No.	7	1,900		13,300	
2.2.2	Digital Latest Clamp Meter(AC & DC both) of standard brand	No.	7	1,200		8,400	
2.2.3	Digital Latest Battery Analyzer of standard brand	No.	7	8,000		56,000	
2.2.4	Tool kits	No.	7	9,900		69,300	

2.2.5	Latest LAPTOPS including all accessories, softs & data cables to connect with data logger for communication/ programming and site commissioning of standard brand	No.	7	4,160		29,120	
2.2.6	DUO Plus USB Type-C Flash Drive 256GB		7		8,000		56,000
2.2.7	Portable SSD USB 3.2 2TB with fingerprint and password security		7		16,000		112,000
2.2.8	Portable Oscilloscope 100 MHZ bandwidth of standard brand	No.	7	7,215		50,505	
Sub-Total- ST 2.2:						**226,625**	**168,000**
2.3	**Training & Documentation**						
2.3.1	Imparting Local Training to WAPDA personnels involved in the installation, configuration, Operational & Testing of Equipment	No.				Complimentary	
2.3.2	System Documentation (System circuit diagram, operation & maintenance, service manuals and any other documents of all the equipment installed (Hard copies) and CD's containing soft copies)	No.				Complimentary	
Sub-Total- ST 2.3:						-	
Total - (ST 2.1+ST 2.2+ ST 2.3) for O&M/Testing Equipment:						1,193,558	144,168,000

40% custom & duties on F.C - 17% Tax/Local Duties on O&M/Testing Equipment:	477,423	24,508,560
TOTAL -T2 (O&M/Testing Equipment with Taxes):	1,670,981	168,676,560
1USD = 225PKR	375,970,725	168,676,560
TOTAL - T2 (Estimated Cost in PKR) O&M/Testing Equipment):	**544,647,285**	

PART-3: Related Services

Sr. No.	Description	Unit	Qty	Unit Rate		Foreign Currency Component (USD)	Local Currency Component (PKR)
				Foreign (USD)	Local (PKR)		
1	2	3	4	6	7	8	9
3.1	**Installation, Testing & Commissioning**						
3.1.1	Cantilever Boom tower swivel type arm length 20 to 25 feet long or cable-way for sensors as per site requirement with base plates, anchor bolts, erection, installation, concreting work including transportation for installation.	No.	443		3,000,000		1,329,000,000
3.1.2	Galvanized chain link fence of site with gate and posts of G.I. 2" pipes heavy duty complete with posts U Bolts, anchor bars, concrete work, installation & transportation and levelling of site as per site requirement.	No.	443		400,000		177,200,000

3.1.3	Installation of Sites enclosure box, sensors and testing including all necessary installation material like GI Pipes, power cables, screws and bolts etc..	No.	443		350,000		155,050,000
3.1.4	Installation of Staff Gauge at site for measurement of Water Level	No.	443		147,864		65,503,752
3.1.5	Flow/Cross-Section measurement of River for incorporating in the software for calibration as per requirement	No.	443		300,000		132,900,000
3.1.6	Integration of New stations with Database management system	No.	443	1500		664,500	
(Related Services) - Sub-Total- ST 3.1:						**664,500**	**1,859,653,752**
Total - (Related Services):						664,500	1,859,653,752
17% Tax/Local Duties on Related Services:							316,141,138
TOTAL -T 3 (Related Services with Taxes):						664,500	2,175,794,890
(1 USD = PKR225)						149,512,500	2,175,794,890
TOTAL - T3 (Related Services in Pak Rs.):						**2,325,307,390**	

PART - 4: Establishment of Data Centers and official set-up for regional data centers							
Sr. No.	Description	Unit	Qty	Unit Rate		Foreign Currency Component (USD)	Local Currency Component (PKR)
				Foreign (USD)	Local (PKR)		
1	2	3	4	6	7	8	9
4.1	**Establishment of Data Centre**						
4.1.1	Central Data Server Hardware	No.	1	10,250		10,250	
4.1.2	Hydro-Meteorological Software Web Based	No.	1	6,250		6,250	
4.1.3	KVM Console	No.	1	1,800		1,800	
4.1.4	TOR Switch for Networking	No.	1	6,900		6,900	
4.1.5	UPS 5KVA alongwith 05 no. Battery Modules.	No.	1	4,500		4,500	
4.1.6	Rack 42 U	No.	1	1,750		1,750	
4.1.7	DSL Internet Connection with static IP and one year charges	No.	1		191,974		191,974
4.1.8	Air Conditioner	No.	1		247,966		247,966
	Sub-Total- ST 4.1					**31,450**	**439,940**
4.2	**Client Workstation/ PC with 65" UHD display**						
4.2.1	Latest computer of standard brand including accesories and registered softs.	No.	8		1,000,000		8,000,000

4.2.1	Data ports with Latest computer of standard brand including accesories and registered softs for; PMD offices (04 Nos.) IRSA (01 No.)	No.	5		1,000,000		5,000,000
4.2.3	Provision of Equipment/ Allied Accessories for establishment of Data Centre/ Client Workstation Rooms	No.	8		1,000,000		8,000,000
Sub-Total- ST 4.2:							**21,000,000**
4.3	**Provision of office accessories for establishment of Master Station/ data processing rooms and office setups**						
4.3.1	Provision of office accessories for establishment of Master Station/data processing rooms and office setups (e.g. office Tables, Racks, computer chairs, Wall Paneling/ paint, sitting arrangements, tiling & other furnishing accessories like air conditioners, fans, lights etc.) for Central Data Centre at WAPDA Lahore, Co-Data centres at FFC Islamabad, H&R Dte. WAPDA and 7 Regional Centres	No.	9		5,000,000		45,000,000
Sub-Total- ST 4.3:							**45,000,000**
4.4	**Provision of Land Compensation Cost**						
4.4.1	Provision of Land Compensation Cost for acquiring of land for installation of Stream Gauaging Stations	No.	100		500,000		50,000,000

Sub-Total- ST 4.4:							**50,000,000**
4.5	**Provision of Consultancy Cost**						
4.5.1	Provision of Consultancy Cost, including Taxes, for implementation of the proposed flood Telemetry Network.	Job (Lump sum)	1		450,000,000		450,000,000
Sub-Total- ST 4.5:							**450,000,000**
Total- (ST 4.1 + ST 4.2 + ST4.3 + ST4.4+ST 4.5)						31,450	566,439,940
Add 40% for Custom & Duties on CIP Price of Equipment and 17% taxes on Local Equipment						12,580	19,794,790
TOTAL - T4 (Price of Equipment)						44,030	586,234,729
TOTAL - 4 (Price of Equipment in PKR 1 USD = PKR 225):							**596,141,479**
TOTAL - A , Tentative Principal Cost (T1+T2+T3+T4): Pak RS.							**10,591,473,104**

PART -B : ANNUAL O&M COST (Incremental Operating Charges)

Sr. No.	Description	Unit	Qty	Unit Rate		Foreign Currency Component (USD)	Local Currency Component (PKR)
				Foreign (USD)	Local (PKR)		
1	2	3	4	6	7	8	9
1	**Communication Services For Data Acquisition**						
1.1	Global System for Mobile Communication (GSM/ GPRS for M2M services) Sims Connection+Sim Charges. Per site/ per year	No.	222		20,000		4,440,000
1.2	Satellite Service Charges for 01 year /per site	No.	221		300,000		66,300,000
Sub-Total-ST1 Communication Services for Data Acquisition:							**70,740,000**
2	**Remuneration cost of Manpower per year**						

2.1	Deployment of security staff (One local area person) at each site for 01 year @Rs.1000/- per day per chowkidar.	No.	443		365,000		161,695,000
2.2	Deployment of office staff for Operational Activities with each provincial office as per (Table - 6.2)	No.	7		16,527,900		115,695,300
2.3	Deployment of office staff at Central Data Centre at WAPDA Lahore (Table - 6.3)	No.	1		13,442,100		13,442,100
2.4	Centralized Payments @ 60 % of 2.2 and 2.3						77,482,440
2.4	T.A/ D.A for staff for field activities of 7 Regional Offices (Team of Five Members for 10 days) (10000X5X10X12)	No.	7		6,000,000		42,000,000
2.5	T.A/ D.A for staff of Central Data Center and Co- Host (Team of Two Members for 5 days)(10000X2X5X12)	No.	2		1,200,000		2,400,000
Sub-Total-ST2 (Remuneration cost of Manpower) :							**412,714,840**
3	**Miscellaneous Expenses (Per Year)**						
3.1	Office space for Central Data Centre, Co- Data Centre and sub Data Centers in the provinces would be provided by respective stake holder	-		-	-	-	-
3.2	POL/R&M of Vehicles under 7 units for field Activities during implementation and operational phase of the Project (02 No. Vehicles for each Unit). (3000 Km / Vehicle /month)	No.	14		600,000		8,400,000

3.3	POL/R&M of Vehicles under Central Data Center and Co- Host. for official Activities during implementation and operational phase of the Project (02 No. Vehicles for each). (1500 Km / Vehicle / month)	No.	4		300,000		1,200,000
3.4	Utility Bills (100000 x 12 x 9)	Lumpsum			10,800,000		10,800,000
3.5	R&M Office (10000 x 12 x 9)	Lumpsum			1,080,000		1,080,000
3.6	R&M Field Equipment (100000 x 12 x 7)	Lumpsum			8,400,000		8,400,000
3.7	Stationary & Printing (25000 x 12 X9)	Lumpsum			2,700,000		2,700,000
Sub-Total-ST3 (Miscellaneous Expenses):							**32,580,000**
Total (ST1+ST2+ST3) Incremental Operating Charges:							**516,034,840**
17% Tax/Local Duties (Item No. 1 & 3 only):							17,564,400
TOTAL -B, Annual O&M Cost:							**533,599,240**

PROPOSAL PHASE - 1 (CATEGORY "A" ONLY) - 443 STATIONS

PRINCIPAL COST - (PK. RUPEES)

Sr. No.	ITEMS	TOTAL COST 443 sites-9 offices	PUNJAB (2) 96(21%)	KP (1) 70 (16%)	SIND (1) 39(9%)	BALOCH (1) 149 (34%)	AJK (1) 41 (9%)	G.B (1) 48 (11%)	DHDC	Co-DC	PMD Offices
1	EQUIPMENT (Monitoring) Duty and taxes inclusive	7,125,376,950	1,496,329,160	1,140,060,312	641,283,926	2,422,628,163	641,283,926	783,791,465	-	-	-
2	EQUIPMENT (O & M)								-	-	-
	Equipment (Operation)	361,559,925	93,388,550	46,694,275	46,694,275	46,694,275	46,694,275	46,694,275	17,350,000	17,350,000	-
	Equipment (Testing)	51,158,625	14,616,750	7,308,375	7,308,375	7,308,375	7,308,375	7,308,375	-	-	-
	Taxes and Duties	131,928,735	35,831,067	17,915,534	17,915,534	17,915,534	17,915,534	17,915,534	3,260,000	3,260,000	
3	RELATED SERVICES										
	Install, Test, Comm	2,009,166,252	421,924,913	321,466,600	180,824,963	683,116,526	180,824,963	221,008,288	-	-	-
	Taxes	316,141,137	66,389,639	50,582,582	28,452,702	107,487,987	28,452,702	34,775,525	-	-	-
4	ESTAB. OF DATA CENTERS										
	Central Data Center	7,516,190	-	-	-	-	-	-	7,516,190	-	-
	Regional Data centers+PMD +IRSA	21,000,000	4,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	-	2,000,000	5,000,000
	Office Furniture etc (09 Units)	45,000,000	10,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	
	Land Compens. (100 Sites)	50,000,000	10,500,000	8,000,000	4,500,000	17,000,000	4,500,000	5,500,000	-	-	-
	Consultancy Cost	450,000,000	-	-	-	-	-	-	450,000,000	-	-
	Duties & Taxes	22,625,290	4,165,000	2,550,000	1,955,000	4,080,000	1,955,000	2,125,000	3,755,290	1,190,000	850,000
	TOTAL	**10,591,473,104**	**2,157,145,078**	**1,601,577,678**	**935,934,774**	**3,313,230,859**	**935,934,774**	**1,126,118,461**	**486,881,480**	**28,800,000**	**5,850,000**
	TOTAL (Million)	**10,591**	**2,157**	**1,601**	**936**	**3,313**	**936**	**1,126**	**487**	**29**	**6**

PROPOSAL PHASE - 1 (CATEGORY -A ONLY) - 443 STATIONS OPERATION & MAINTENANCE COST (PK. RUPEES)										
Sr. No	ITEMS	TOTAL COST 443 SITES-9 OFFICES	PUNJAB (2) 96 (21%)	KP (1) 70 (16%)	SIND (1) 39(9%)	BALOCH (1) 149 (34%)	AJK (1) 41 (9%)	G.B (1) 48(11%)	DHDC (1)	Co-DC (1)
1	COMMUNICATION SERVICES FOR DATA ACQUISITION									
	GSM & Satellite Fee Charges	70,740,000	14,855,400	11,318,400	6,366,600	24,051,600	6,366,600	7,781,400	-	-
2	REMUNERATION COST									
	Staff (Security) (443sites)	161,695,000	33,955,950	25,871,200	14,552,550	54,976,300	14,552,550	17,786,450	-	-
	Staff (Regional Offices) (07 Nos)	115,695,300	33,055,800	16,527,900	16,527,900	16,527,900	16,527,900	16,527,900	-	-
	Staff (CHDC Lahore)	13,442,100	-	-	-	-	-	-	13,442,100	-
	Centralized Payment @ 60%	77,482,440	19,833,480	9,916,740	9,916,740	9,916,740	9,916,740	9,916,740	8,065,260	-
3	T.A / D.A									
	Regional Offices Staff	42,000,000	12,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	-	-
	CHDC & Co- Data Center	2,400,000	-	-	-	-	-	-	1,200,000	1,200,000
4	Miscellaneous Expenses									
	POL/R&M Vehicles Regional Office	8,400,000	2,400,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000		
	POL/R&M Veh. CHDC & Co Center	1,200,000	-	-	-	-	-	-	600,000	600,000
	Utility Bills	10,800,000	2,400,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
	R&M Office	1,080,000	240,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000
	R&M Field Equipment	8,400,000	2,400,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	-	-
	Stationary & Printing	2,700,000	600,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
5	TAXES	17,564,400	3,892,218	2,607,528	1,765,722	4,772,172	1,765,722	2,006,238	377,400	377,400
	TOTAL	533,599,240	125,632,848	76,261,768	59,149,512	120,264,712	59,149,512	64,038,728	25,304,760	3,797,400
	TOTAL (Million)	534	126	76	59	120	59	64	26	4

Table – 6.2

SALARY COST OF STAFF AT EACH REGIONAL DATA CENTER						
(12 Months)						
Sr.No	Name of Post	Grade	Qty.	Total Man Months	Monthly Rate (Rs.)	Total Amount (Rs.)
1	Executive Engineer (Telemetry)	18	1	12	134,838	1,618,056
2	Junior Engineer (Telecom/Electrical/ Electronics)	17	1	12	110,079	1,320,948
3	Assistant Director (GIS) / IT	17	1	12	110,079	1,320,948
4	Junior Engineer (Civil)	17	1	12	110,079	1,320,948
5	Assistant Budget & Accounts Officer	17	1	12	110,079	1,320,948
6	Accounts Assistant	16	1	12	78,593	943,116
7	Data Entry Operator	15	1	12	69,008	828,096
8	Sub Engineer (Civil)	14	1	12	63,200	758,400
9	Sub Engineer (Electronics/ Electrical)	14	1	12	63,200	758,400
10	Radio Technician Mechanic	14	1	12	63,200	758,400
11	Junior Clerk	9	1	12	62,765	753,180
12	Hydrographer	8	1	12	60,493	725,916
13	Gauge Observer	6	2	12	56,282	1,350,768
14	Driver	6	2	12	56,282	1,350,768
15	Naib Qasid	1	2	12	29,146	699,504
16	Chowkidar	1	2	12	29,146	699,504
					Total Cost in PKR:	**16,527,900**

Table - 6.3

SALARY COST OF STAFF						
Digital Hydro Data Centre Lahore						
(12 Months)						
Sr. No.	Name of Post	Grade	Qty.	Total Man Months	Monthly Rate	Total Amount
					(Rs.)	(Rs.)
1	Project Director	19	1	12	177,741	2,132,892
2	Executive Engineer (Telemetry)	18	1	12	134,838	1,618,056
3	Junior Engineer (Telecom/Electrical/ Electronics)	17	2	12	110,079	2,641,896
4	Assistant Director (GIS)	17	1	12	110,079	1,320,948
5	Assistant B&AO	17	1	12	110,079	1,320,948
6	Account Assistant	16	1	12	78,593	943,116
7	Data Entry Operator	15	2	12	69,008	1,656,192
8	Radio Technician Mechanic	14	1	12	63,200	758,400
9	Sub Engineer (Electronics/ Electrical)	14	1	12	63,200	758,400
10	Driver	6	1	12	56,282	675,384
11	Naib Qasid	1	2	12	29,146	699,504
12	Chowkidar	1	3	12	29,146	1,049,256
					Total Cost in PKR:	13,442,100

ANNEXURES

NO.	DESCRIPTION
Annex - 1	Joint meeting of all the stakeholders held on Feb 25, 2020 chaired by Chairman Federal Flood Commission
Annex - 2	Hydrological Data Proforma developed to obtain hydrological networks and reference letters through which data received from different stakeholders.
Annex - 3	Inventory of Existing Hydrological Network of Pakistan
Annex - 4	IInventory of on-going Projects for Hydrological Network
Annex - 5	IInventory of Proposed Hydrological Network
Annex - 6	Job Descriptions of manpower to be inducted for Establishing regional offices, DHDC & Co-Data Center
Annex - 7	Proposal for Establishment of Hydro-met Testing, Calibration and Accreditation Laboratory
Annex - 8	Detailed Estimate Regarding Complete Implementation of Flood Telemetry Master Plan.
Annex - 9	Supporting Documents / Quotations to provide basis of Estimates
Annex - 10	Replies to Comments from Federal Flood Commission

ANNEXURE - 1

JOINT MEETING HELD ON FEB 25, 2020 WITH ALL THE STAKEHOLDERS AND CHAIRED BY CHAIRMAN FFC

ANNEX- I

MOST IMMEDIATE
By Fax/ UMS

Government of Pakistan
Ministry of Water Resources
Office of Chief Engineering Advisor/
Chairman, Federal Flood Commission
*****

No. FC-1(23)/NFPP-IV/PC-I/19

6-Ataturk Avenue, G-5/1,
Islamabad, the February 28, 2020

Sub: **MINUTES OF MEETING TO REVIEW THE INVESTMENT PLAN AND EXPLORE SOURCE OF FINANCING OF PROPOSED FLOOD PROTECTION SECTOR PROJECT-III (FPSP-III) OF NFPP-IV HELD ON 25TH FEBRUARY 2020, IN OFFICE OF CEA & CFFC, ISLAMABAD**

A meeting to Review the Investment Plan and explore source of financing of proposed Flood Protection Sector Project-III (FPSP-III) of NFPP-IV was held on 25th February 2020 at 1100 hours, in Committee Room of office of Chief Engineering Advisor/ Chairman, Federal Flood Commission, Islamabad under the Chairmanship of CEA/CFFC. Minutes of the meeting are enclosed herewith for taking further action as per the stated time limit.

2. This issues with the approval of CEA/ CFFC, Islamabad.

Encl: **As above.**

28/02

(Dr. Muhammad Ejaz Tanveer)
Deputy Director (S&M-I)

Distribution:

1. Chief (Water Resources Section), M/o Planning, Development & Special Initiatives, Islamabad.
2. Director General, Pakistan Meteorological Department, H-8, Islamabad.
3. General Manager (HRM) WAPDA, WAPDA House, Lahore.
4. Director General (Env/ CC), M/o Climate Change, Islamabad.
5. Chief Executive Officer, Pakistan Railways, Lahore
6. Joint Commissioner for Indus Waters, Islamabad
7. Member (DRR), NDMA, Prime Minister's Office, Islamabad.
8. Deputy Secretary (Water), Ministry of Water Resources, Islamabad
9. Secretary, Irrigation Department, Government of the Punjab, Lahore.
10. Secretary, Irrigation Department, Government of Sindh, Karachi.
11. Secretary, Irrigation Department, Government of Khyber Pakhtunkhwa, Peshawar
12. Secretary, Irrigation Department, Government of Balochistan, Quetta.
13. Secretary (Works), G-B PWD, Gilgit.
14. Secretary, (Agriculture, Livestock, Irrigation & ESMA), Govt. of AJ&K, Muzaffarabad.
15. Director (Irrigation & Hydel Power), Merged Area Secretariat, Warsak Road, Peshawar.

CC: For information:

1. Director to Minister for Water Resources, Islamabad.
2. SP to Secretary, Ministry of Water Resources, Islamabad.
3. PS to CEA/CFFC, Islamabad.

C:\Users\User\Desktop\Usman. APS\Notice & Agenda of S.C meeting (18-02-2020).doc

Sub: MINUTES OF THE MEETING TO REVIEW THE INVESTMENT PLAN OF PROPOSED FLOOD PROTECTION SECTOR PROJECT-III (FPSP-III) OF NFPP-IV HELD ON 25TH FEBRUARY 2020 IN THE OFFICE OF CHIEF ENGINEERING ADVISOR CHAIRMAN FEDERAL FLOOD COMMISSION, ISLAMABAD

A joint meeting of Federal Flood Commission (FFC) with all stakeholders was held on 25th February 2020 at 1100 hours in the Committee Room of office of the Chief Engineering Advisor/ Chairman Federal Flood Commission (o/o CEA/ CFFC), Islamabad to review and consolidate opinion on the Investment Plan of proposed Flood Protection Sector Project-III (FPSP-III) of NFPP-IV in likely collaboration with Asian Development Bank (ADB). List of the participants is attached as **Annexure-I**.

2. Chief Engineering Advisor/ Chairman Federal Flood Commission chaired the meeting. The meeting started with recitation from the Holy Quran. The Chair welcomed the participants and highlighted the purpose of the meeting. He apprised the House that ADB was fielding a Loan Review Mission (the Mission) of the Project (National Disaster Risk Management Fund-NDRMF) from 2nd to 30th March 2020. During the period of NDRMF review, the ADB's Mission had also requested for a meeting on 4th & 5th March 2020 with FFC, Provincial Irrigation Departments (PIDs) and Federal Line Agencies (FLAs) including PMD & WAPDA to identify future portfolio Investment Plan using FPSP-III Umbrella PC-I as reference document.

3. The Chair then briefly explained the background regarding approval process of NFPP-IV and preparation of Umbrella PC-I. He informed that soon after approval of NFPP-IV by CCI in its 31st meeting held on 2nd May 2017 at an estimated cost of **Rs. 332.246 Billion,** Umbrella PC-I was prepared and submitted to Ministry of Planning, Development & Special Initiatives, Islamabad for approval and to explore financing through external donors. M/o P, D & Special Initiatives and M/o WR keeping in view the financial constraints opined that FFC may pick up only top priority emergent nature flood protection and river training works in consultation with all stakeholders and formulate Umbrella PC-I with firm scope of work at a realistic cost estimate, so that implementation of NFPP-IV may be commenced with. Accordingly, unanimously agreed Investment Plan costing Rs 95.980 billion based on the proposals received from four provinces (Punjab, Sindh, KP & Balochistan) and Federal Line Agencies (Merged Area KP, GB. AJ&K, WAPDA, PMD, M/o Climate Change & NDMA) was formulated entitled Flood Protection Sector Project-III (FPSP-III). The Chair informed that Concept Clearance Paper (CCP) for FPSP-III has already been prepared and submitted to M/o Planning Development & Special Initiatives, Islamabad through M/o WR for the approval of CDWP/ECNEC and for approaching EAD to explore external financing window (World Bank, ADB, NDRMF, IDB, JICA, EU, Kfw etc). He said that the CCP was likely to be considered in the forthcoming CDWP meeting scheduled on 3rd March 2020. He then invited Member (Technical), FFC to open discussion on the Agenda items.

Item: 1 **To review and agree on the portfolio of priority sub-projects proposed by the Provinces & Federal Line Agencies under FPSP-III of NFPP-IV**

4. Member (Technical), FFC, appraised the forum about the preparation and finalization of Investment Plan of FPSP-III under NFPP-IV. He said that Concept Clearance Paper of FPSP-III costing **Rs. 95.980 Billion** had been finalized after detailed consultations with all the stakeholders and accordingly on the basis of the proposals received from Irrigation Departments of Punjab, Sindh, KP, Balochistan besides FLAs (Merged Area KP, GB, AJ&K, PMD, WAPDA, M/o Climate Change & NDMA).

5. While explaining the detail of the projects submitted by PIDs & FLAs, Member (Technical) pointed out that the nomenclature of most of the schemes submitted by executing agencies was incomplete. He said that location, name of rivers/nullahs, districts, village & abadies etc to be protected were not mentioned which need to be indicated in all the lists of sub projects submitted by all PIDs & FLAs. He strictly advised representative of PIDs/FLAs to mention all the required details in each scheme and submit the final revised list of sub projects to FFC for inclusion in the PC-I of FPSP-III by **2nd March 2020**. The Executing Agencies were advised to certify the schemes proposed under FPSP-III Umbrella PC-I stating that they have not been executed under any other Federal/Provincial/Foreign Aided Programme. He advised representatives of PIDs & FLAs to include only new schemes under FPSP-III i.e. strengthening and up gradation works based on the bench mark of 2010 floods. All restoration/rehabilitation works may be carried out by the PIDs & FLAs through their respective Provincial/FLA related O&M funds.

6. The Chair pointed out that Rs. 2 billion had been proposed by Irrigation Department Government of Sindh under Umbrella FPSP-III for unallocated works without any detail. Special Secretary (Technical), Irrigation Department Sindh, assured to include the details of the schemes proposed to be taken up under this component.

7. Superintending Engineer (HQ/Director Hydrology) PID, KP, informed that the list of sub projects proposed for implementation under FPSP-III costing Rs. 11.400 billion had already been shared. Member (Technical), FFC, pointed out that generic types of work had been proposed by PID KP which need to be supported with further details like name of river/nullahs, location and village abadies to be protected. Representative of PID KP informed the House that a study was being carried out through Consultants (M/s NESPAK) to identify the vulnerable points/locations and as soon as the study is completed, PID KP would share the reach wise detail of works proposed under FPSP-III.

8. Chief Meteorologist, PMD shared the list of projects proposed for implementation under Umbrella FPSP-III. The Chair pointed out that the list of projects submitted by PMD is incomplete. He advised representative of PMD to share list of all the radars, twenty seven (27) observational network, names of radars to be upgraded/installed alongwith their locations. Regarding establishment of Flood Early Warning Centers at Gilgit and Quetta, representatives of GB and Balochistan proposed that these be established in Makran coastal belt at Gawadar and at Immet (Ghizer District, GB) instead of locations proposed by PMD at GB. Representative of Ministry of Climate Change stated that overall cost of the project namely "*Recharge Pakistan: Building Pakistan's Resilience to Climate Change through Ecosystem Based Adaptation for Integrated Flood Risk Management*" under FPSP-III is Rs 6.00 Billion. He assured sharing detailed breakup of the cost at the earliest.

9. The Chair strictly advised the representatives of PIDs (Punjab, Sindh, KP & Balochistan) & FLAs (Merged Area KP, GB, AJ&K, PMD, WAPDA, Ministry of Climate Change & NDMA) to submit their respective final revised list of projects alongwith complete detail for inclusion in Investment Plan of FPSP-III of NFPP-IV by/before **2nd March 2020.**

Item: II **To review and agree on the proposals of Strengthening/up-gradation of Water/Flood Telemetry System of WAPDA based on NFPP-IV and WAPDA's proposed Master Plan for Installation of Flood Telemetry/Hydromet Network and Flood Forecasting & Warning System of PMD based on NFPP-IV**

10. The Chair made a detailed power point presentation on envisaged National Master Plan for Flood Telemetry Network based on NFPP-IV. He stated that earlier FFC/WAPDA with the assistance of Asian Development Bank (ADB) had installed forty four (44) Flood Forecasting Telemetric (FFT) Stations during 1998 and 2006 under the FPSP-I & FPSP-II. The FFT stations installed at forty four (44) key locations twenty one (21) in Punjab, thirteen (13) in KPK and ten (10) in AJ&K, automatically collect the real time data of catchment rainfall and water levels and was being

2

transmitted through meteoburst communication system to the Master Station at Lahore and to the WAPDA's H&R Directorate in Lahore. The recorded values are analyzed, processed and further disseminated to Flood Forecasting Division (FFD) of PMD, Lahore, for the preparation and timely issuance of flood forecasts and warnings'.

11. The Chair further appraised the forum that comprehensive National Master Plan for Flood Telemetry Network is comprised of two hundred and twenty eight (228) Flood Telemetry Stations, amounting to **Rs 5.170 billion** including installation of one hundred and ninety (194) new Flood Telemetry Stations and up-gradation of thirty four (34) existing stations at country level (Sindh, Punjab, Balochistan, GB, AJ&K and Islamabad) in consultations/ feedback by the respective Provincial Irrigation Departments/ stakeholders. The Master Plan will cover the main river system, the secondary and tertiary rivers, all smalls streams/nullahs, hill torrents etc. having overall significance towards the natural calamities due to torrential/flash floods. He added that the Master Plan would yield to effective country-wide management of floods by all stakeholders and will also immensely support in issuance of most précised reservoir operation criteria by IRSA and forecasting by FFD/PMD.

12. The Chair while explaining the importance of the WAPDA's Master Plan, stated that keeping in view the continuous and visible climate change impacts including a number of extreme hydro-meteorological events, FFC/WAPDA had also approached various foreign funding agencies / donors (TIKA, JICA, World Bank and AFD) for supporting expansion / strengthening of the existing flood telemetry network which were under process for implementation/ approval.

13. He further informed that under Agency Française Development (AFD) funded project, eight (08) FFT Stations and one (01) weather forecasting Telemetric network besides four (04) number Automate Stream Gauging Station in AJ&K were also under way. Moreover, proposed eighteen (18) flood telemetric/ early flood warning stations (through expected TIKA grant), forty five (45) flood telemetric/early flood warning stations (through likely JICA Grant), twenty (20) new FFT stations (WCAP) and twenty (20) FFT stations (through China grant) were under approval process. He informed that 194 new FFT stations are planned to be installed through possible ADB/NDRMF financing window under FPSP-III. A total No. of **310** new stations will be added in the existing FFT Network after implementation of all the activities/projects planned to be funded through ADB, AFD, JICA, TIKA & WAPDA Resources respectively.

14. The Special Secretary (Tech), Irrigation Department Sindh, shared the list of thirteen (13) potential telemetry sites along Indus River for flood forecasting besides eight (08) sites on Hill Torrents for monitoring and recording the flash flooding in Kirther Range for incorporating in the Master Plan for Flood Telemetry Network. Regarding installation of telemetry equipment at major Barrages, of the country, Chair advised representative WAPDA to coordinate with IRSA in this regard.

15. Responding to the query by representative of PID KP about non-suitability of up-gradation of obsolete telemetry equipment installed since 1992, Project Director (H&R), WAPDA, responded that the up-gradation includes addition of new sensors/equipment in the existing stations so as to have availability of flows both during the lean and the high flood season. The major parts of the telemetry system would be installed as per new technology. However, some parts, if needed, would be replaced.

16. The forum unanimously agreed to increase the cost of WAPDA's component regarding strengthening /up-gradation of Water/Flood Telemetry System in the country, from Rs. 2.00 billion to Rs. 6.00 billion, keeping in view the decrease in the cost of project "*Recharge Pakistan: Building Pakistan's Resilience to Climate Change through Ecosystem Based Adaptation for Integrated Flood Risk Management*" to Rs 4.00 billion.

3

Item: III **Mode of Implementation/Implementation Mechanism for Agenda Item-II above including System's O&M after implementation in all the four provinces, GB, AJ&K etc.**

17. The Chair apprised the House that during joint meeting of WAPDA, PMD, FFC & ADB Team, held on 10th February 2020 in the office of CEA/CFFC, mode of Implementation/Implementation Mechanism for Installation of Water/Flood Telemetry System including System's O&M after implementation in all the four provinces, GB, AJ&K etc. was discussed in detail. He informed that ADB had shown its interest to support financing projects of those agencies who would ensure two major conditions of the Bank i.e; i) Who will bear O&M cost in future of the proposed interventions with regard to telemetry network once installed, ii) Capability or technical strength of the organization for execution and later operation & maintenance of the proposed network. He added that Bank needs firm assurance for O&M of the entire network.

18. Representatives of the four provinces and FLAs agreed to provide O & M cost of the telemetry system under their respective area of jurisdiction. WAPDA, however, will provide training to the professionals of provincial irrigation departments during the installation and on O&M of Flood Telemetry Network under technical assistance to the respective provinces. The representative of Balochistan province added that WAPDA may deploy local personal for the security and operational purposes and trainings should also be added in the Master Plan. After detailed discussions following decisions were taken:

i. The Provincial Irrigation Departments (Punjab, Sindh, KP & Balochistan) and FLAs (Merged Area KP, G-B, AJ&K, PMD & WAPDA) to revise the list of their sub-projects and include the name of rivers/ nullahs, village/ abadies to be protected, bank of river/ nullah and districts. Final revised list of schemes proposed shall be submitted to FFC by/before 2nd March 2020 for inclusion in the Umbrella PC-I FPSP-III of NFPP-IV.

ii. All the executing agencies will ensure that the schemes proposed under Umbrella PC-I of FPSP-III have not been included or executed under any other Federal/Provincial/Foreign Aided Programme. In this regard PIDs & FLAs shall provide a duly signed certificate by the HoD stating that the works proposed under FPSP-III of NFPP-IV are new and have not been accommodated through any Federal/Provincial and Foreign Added Programme.

iii. WAPDA shall finalize National Master Plan of Flood Telemetry Network costing Rs. 6.00 billion and submit to FFC for inclusion in the Umbrella PC-I of FPSP-III of NFPP-IV.

iv. PIDs & FLAs will bear/provide the O&M cost of the Flood Telemetry Network installed in their area of jurisdiction, WAPDA will provide technical support on O&M to ensure fault free operation after installation.

v. PID, Sindh to share the detailed list of projects costing Rs. 2.00 billion reflected under the component of un-allocated works in FPSP-III of NFPP-IV.

vi. FFC will write DO letter to PMD for provision to FFC of location of all 27 observational network, Expansion/up-gradation of radars as well as details regarding establishment of Flood Early Warning Centers for inclusion in the FPSP-III of NFPP-IV.

vii. NDMA to share the detailed list of the districts for carrying out Multi-Hazard Vulnerability and Risk Assessment and capacity building component.

19. The meeting ended with a vote of thanks by the Chair to the participants.

4

ANNEXURE - 2

HYDROLOGICAL DATA PROFORMA DEVELOPED TO OBTAIN HYDROLOGICAL NETWORKS DATA AND REFERENCE LETTERS THROUGH WHICH DATA RECEIVED FROM DIFFERENT STAKEHOLDERS

DATA PROFORMA

National Master Plan For Flood Telemetry
OWNERSHIP: Province(s) / FLA's Department(s) including PMD / WAPDA

Hydrological Stations

												Parameters Being Observed on FFT/Hydrological Stations									
Status of Network	No. of Stations	Unit Province Depatt	Basin/ District	Sub Basin	Nearest City/ Town/Settelment	Main River/ (Secondary/ tertiary/ Nullah)	Name	Monitoring Station Ref. No.	Coordinates	Nearby Imp. Establishment Dam/H.works/ Military camp/ Grid Station	Type Auto/ Manual	Water Stage Recording Equipment (Manual/Automatic) (Staff Gauges /Radar/recorder)	Flow /Velocity Measurement (Manual/Auto)	Additional Equipment (Manual/Auto), (Turbidity/ Sadimentation/ Rain/Temp. or any other parameter being observed.	Type of Communication (Manually or real time through Settelite/GSM/MBC / from Data Loggers)	Equipment Type used for Flow Measurement (Current Meter /ADCP/Dye /Radar)		Frequency (Hourly/ Daily / Fortnightly)	Name/ Contact of site Incharge	Organization responsible for O & M	Remarks
Existing	1																				GIS Map s with stations (If Available)
	2																				
	3																				
	.																				
	.																				
	.																				
Proposed	1																				
	2																				
	3																				
	.																				
	.																				
	.																				

OFFICE OF THE EXECUTIVE ENGINEER
HYDROLOGY IRRIGATION DIVISION
PESHAWAR

Email: Hydrology1234@gmail.com PHN: 091-9212114

No. 2147 /38-M, Dated Peshawar 27 .02.2020

To,

The Section Officer (Dev),
Dto the Secretary Irrigation,
Department Peshawar

Subject:- REQUIREMENT OF FLOOD TELEMETERY NETWORK FOR KHYBER PAKHTUNKHWA

Ref:- Your letter No. SO(Dev)/Irr/4-28/Monsoon/2019 Dated: 26.02.2020

Kindly refer to the subject mentioned above, the information regarding requirement of telemetry system in Khyber Pakhtunkhwa is enclosed herewith for favour of further necessary action please. The same is also forwarded to ministry of Water Resource Islamabad trough Email Charmaf@fb.gov.pk please.

Encl: As Above.

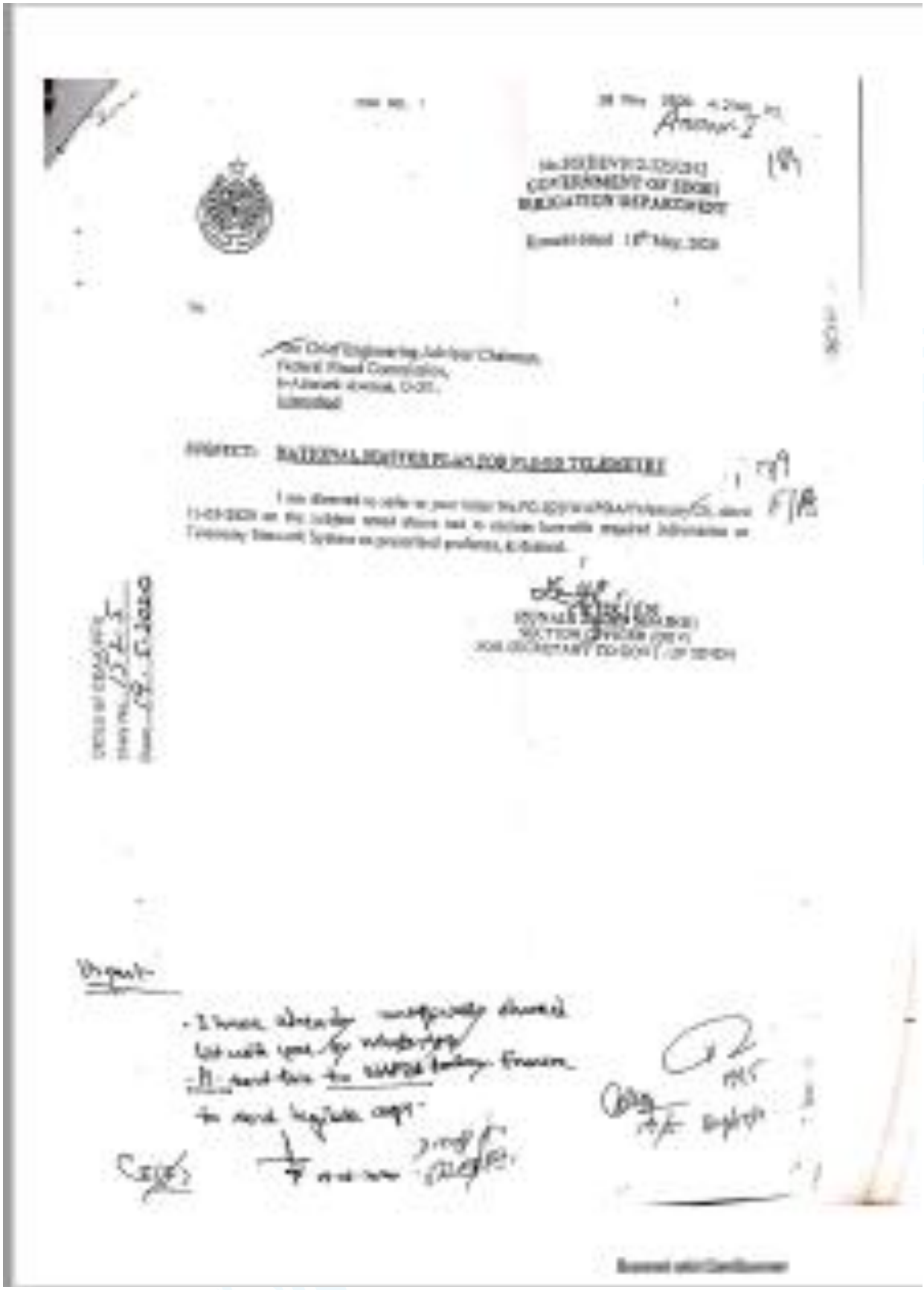
Executive Engineer

Copy of the above along with its enclosure is forwarded to Chief Engineer (South), Irrigation Department Peshawar for information please.

Executive Engineer

Diary No. 1062
Date 4-03-2020

Received with Certificate



GOVERNMENT OF SINDH
IRRIGATION DEPARTMENT

SUBJECT: NATIONAL MASTER PLAN FOR FLOOD TELEMETRY

NATIONAL MASTER PLAN FOR FLOOD TELEMETRY NETWORK 107

Annex IV

OFFICE OF THE
CHIEF ENGINEER DRAINAGE & FLOOD ZONE
IRRIGATION DEPARTMENT
Government Engineering Academy Punjab, Canal Bank Road
Thokar Niaz Baig, Lahore-53700
E-mail: cedd@yahoo.com Ph: 042-99233651

To

Chairman/Chief Engineering Advisor,
Federal Flood Commission,
Islamabad

Kind Attention: Mr. Hussain Shigri, Senior Engineer (Flood-II),

No.DSF/2020/ 13051FFC Dated 16/08/2020

Subject: NATIONAL MASTER PLAN FOR FLOOD TELEMETRY

Ref: Your office letter No. FC-1(2) WAPDA/ Telemetry/ 18, dated April, 29, 2020

Kindly find enclosed herewith the requisite data of Punjab Irrigation Department on prescribed format as desired vide your office letter under reference. The information has also been sent via email to shigri@yahoo.com and adhoc@yahoo.com as desired in the letter, please.

D.A./As above

for DEPUTY DIRECTOR FLOOD
CHIEF ENGINEER
DRAINAGE & FLOOD ZONE

C.C.

1. The Secretary, Government of the Punjab, Irrigation Department, Lahore.
2. General Manager (H&R), WAPDA House, Lahore.

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No. Zon.Agri.Gov/Dev/2338-40 /2020

AZAD GOVERNMENT OF THE STATE OF JAMMU & KASHMIR

SECRETARIAT AGRICULTURE, LIVESTOCK, IRRIGATION & ESMA

MUZAFFARABAD

Dated 27 October 2020

To,

Mr. Hussain Shigri Sahib,
Senior Engineer (Floods)
Office of the Chief Engineering Advisor &
Chairman Federal Flood Commission,
Ministry of Water Resources,
6-Ataturk, Avenue, G-5/1, Islamabad,
Pakistan.

Subject: **INCEPTION REPORT OF PAKISTAN NATIONAL MASTER PLAN FOR FLOOD TELEMETRY NETWORK.**

Kindly refer to your letter No. FC/IDNMP/WAPDA-Telemetry/2020 dated October 11, 2020 on the subject noted above, the undersigned is directed to convey that Department of Irrigation & Small Dams GoAJ&K has agreed with the Inception Report of WAPDA and the Department of Irrigation AJ&K will co-ordinate and provide all relevant data if required (copy attached).

The matter is submitted for your information and further necessary action please.

Encl. 01 Page

With Regards,

Chief Planning
Ph: FC/DCC-FC/2020

Copy to:

1. The Secretary Agriculture, Livestock, Irrigation and ESMA, Azad Government of the State of Jammu & Kashmir Muzaffarabad
2. The Director General Irrigation & Small Dams, Azad Government of the State of Jammu & Kashmir Muzaffarabad

Chief Planning

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OFFICE OF THE EXECUTIVE ENGINEER
HYDROLOGY IRRIGATION DIVISION
PESHAWAR

Phone: [illegible] Email: [illegible]

No. 2311 / 31-TH Dated Peshawar, the 15 /07/2020

To,

The Section Officer (Dev-I)
O/O the Secretary Irrigation Government
Of Khyber Pakhtun Khwa Peshawar

p. 228/c

Subject: **MINUTES OF THE MEETING REGARDING PREPRATION OF NATIONAL MASTER PLAN FOR FLOOD TELEMETRY HELD ON 15 JUNE, 2020 IN FPC ISLAMABAD.**

Ref: Your office letter No.SO (Dev) /Irr. 4-26/ Monsoon /2020 dated 02-07-2020

Kindly refer to the subject mentioned above, it is stated that the complete information on the prescribed proforma is enclosed herewith for enclosure to the subject plan. It is further added that the same has already been emailed to concern officer Chairman Hj Ch.gov.pk, dated on 1-3-7-2020.

Submitted for onward submission to Federal Flood Commission office please.

Good as above.

EXECUTIVE ENGINEER

Copy forwarded to the:-

1. Superintending Engineer (HQ), O/O the Chief Engineer (South) Irr. Deptt. Peshawar
2. Technical Officer O/O the Chief Engineer (South) Irr. Deptt. Peshawar

For information please.

EXECUTIVE ENGINEER

Dev. 390
24/07/2020

[illegible]

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No.SO(TH-4/2020) 851
GOVERNMENT OF BALOCHISTAN
IRRIGATION DEPARTMENT

Dated Quetta the 2 / 6 /2020

To

The Chief Engineering Advisor &
Chairman Federal Flood Commission,
Ministry of Water Resources
Government of Pakistan,
Islamabad.

Subject:- **NATIONAL MASTER PLAN FOR FLOOD TELEMETRY.**

The undersigned is directed to refer your office letter No.7D-[illegible]/WAPDA/Telemetry/20 dated 13th May, 2020 on the subject cited above and to share Provincial Priority List of new flood telemetry stations for inclusion in Adjust Master Plan likely financing out of ADB/WAPDA.

Deputy Secretary (Tech.)

D.A/Priority list

CC:

1. The PS to Secretary Irrigation Department, [illegible]

SO(T) 6/6/2020

Pl. send it to WAPDA for its further action

SO(T)

OFFICE OF THE
CHIEF ENGINEER DRAINAGE & FLOOD ZONE
IRRIGATION DEPARTMENT
Government Engineering Academy Punjab, Canal Bank Road
Thokar Niaz Baig, Lahore-53700
E-mail: [illegible]@yahoo.com Ph: 042-[illegible]

To

Chairman/Chief Engineering Advisor,
Federal Flood Commission,
Islamabad

Kind Attention: Mr. Hussain Shigri, Senior Engineer (Flood-II).

No.DSF/2020/ 1309 / FFC Dated 16/05/2020

Subject: NATIONAL MASTER PLAN FOR FLOOD TELEMETRY

Ref: Your office letter No. FC-1(2) WAPDA/ Telemetry/ 15, dated April, 29, 2020

Kindly find enclosed herewith the requisite data of Punjab Irrigation Department on prescribed format as desired vide your office letter under reference. The information has also been sent via email to shigri87@yahoo.com and [illegible]@yahoo.com as desired in the letter, please.

D.A./As above

for DEPUTY DIRECTOR (FLOOD)
CHIEF ENGINEER
DRAINAGE & FLOOD ZONE

C.C

1. The Secretary, Government of the Punjab, Irrigation Department, Lahore.
2. General Manager (H&R), WAPDA House, Lahore.

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OFFICE OF THE
CHIEF ENGINEER DRAINAGE & FLOOD ZONE
IRRIGATION DEPARTMENT
Government Engineering Academy Punjab, Canal Bank Road
Thokar Niaz Baig, Lahore-53700
E-mail: [illegible] Ph: 042-[illegible]

To

Chairman/Chief Engineering Advisor,
Federal Flood Commission,
Islamabad

Kind Attention: Mr. Hussain Shigri, Senior Engineer (Flood-II),

No.DSFC026/ 1309 / FFC Dated. 16/05/2020

Subject: NATIONAL MASTER PLAN FOR FLOOD TELEMETRY

Ref: Your office letter No. FC-1(2) WAPDA/ Telemetry/ 16, dated April, 28, 2020

Kindly find enclosed herewith the requisite data of Punjab Irrigation Department on prescribed format as desired vide your office letter under reference. The information has also been sent via email to shigri87@yahoo.com and [illegible] as desired in the letter, please.

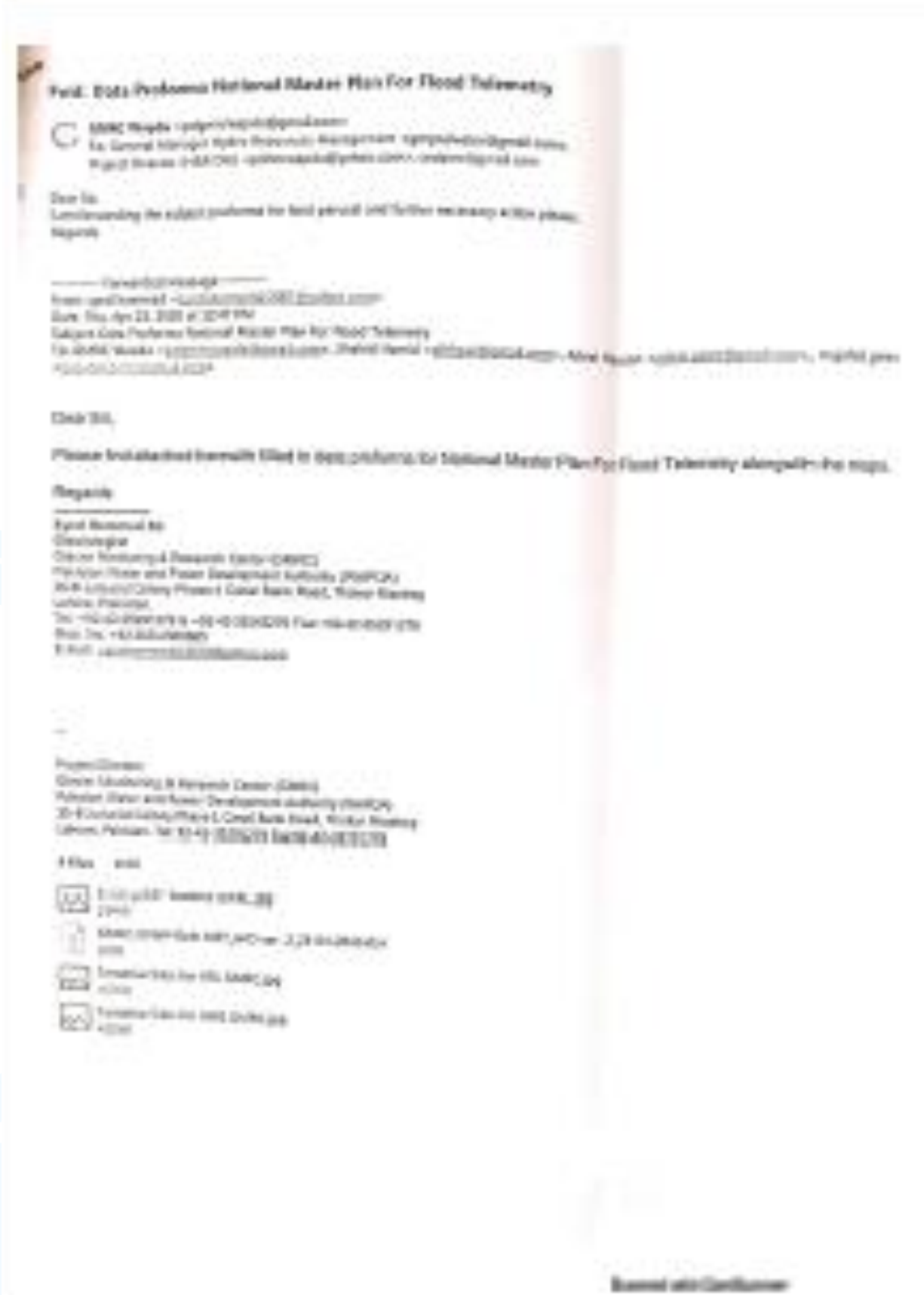
D.A.As above

for DEPUTY DIRECTOR IFLOOD
CHIEF ENGINEER
DRAINAGE & FLOOD ZONE

C.C

1. The Secretary, Government of the Punjab, Irrigation Department, Lahore.
2. General Manager (H&R), WAPDA House, Lahore.

ANNEXURE - 2



Fwd: Data Proforma National Master Plan For Flood Telemetry

Dear Sir,

Please Instalached herewith filled in data proforma for National Master Plan For Flood Telemetry alongwith the maps.

Regards

Pakistan Water and Power Development Authority

Telephone: 92-42-99202483
PBX: 92-42-99202211/2227
Fax: 92-42-99204831
Email: dirwrmd@yahoo.com

Office of the Director,
Water Resources Management Directorate
227-Wapda House, Lahore.

No. WRM/62/2462

Dated 20-04-2020

The General Manager,
Hydro Resources Management,
228-Wapda house,
Lahore.

G.M. (HYD) WATER
Dy. No. 1908
Date 20-04-2020

Subject **Master Plan for Installation of New Flood Telemetry Network in Pakistan**

Ref: Your Office Letter No. PD(H&R)NWP(S)s.ed dated 17-04-2020

As desired vide above referred letter, it is to inform that this directorate does not operate any hydrological / meteorological stations however a network of HF Radio stations is being operated and maintained for the transmission of hydromet data observed by SWHP at key locations in the catchment of Tarbela, Mangla & Chashma reservoirs. The related information has been filled in the attached Performa.

This is for information and further necessary action please.

D.A/As above

(Zulfiqar Hussain Shah)
Director (WRMD)

PD (H&R) Dte. AD(H&R)
Dy. No. 741
Date 11-06-2020
Sr. Engr. (H&R)
Sr. Engr. (H&C)
Jr. Engr. (H&C)
Flood Forecasting (Ref)
S&AO
Sr.Supt. (Admn)

21/6/2020

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Pakistan Water and Power Development Authority

Telephone: 92-42-99202483
PBX: 92-42-99202211/2227
Fax: 92-42-99204531
Email: dirwmd@yahoo.com

Office of the Director
Water Resources Management Directorate
227 Wapda House, Lahore.

No. [illegible]

Dated: [illegible]

The General Manager,
Hydro Resources Management,
228 Wapda House,
Lahore.

B.R. (HR) WATER
Diary No. [illegible]
Dated: [illegible]

Subject: **Master Plan for Installation of New Flood Telemetry Network in Pakistan**
Ref: Your Office Letter No.PD/HER/NNR/[illegible]-04 dated 17-04-2020

As desired vide above referred letter, it is to inform that this directorate does not operate any hydrological / meteorological stations however a network of HF Radio stations is being operated and maintained for the transmission of hydromet data observed by SWHP at key locations in the catchment of Tarbela, Mangla & Chashma reservoirs. The related information has been filled in the attached Performa.

This is for information and further necessary action please.

D.Adv. above

(Zulfiqar Hussain Shah)
Director (Wapda)

PD (HER)

PD (HER) Dte.
Dy. No. 559
Date 24-04-2020

21/4/2020

[illegible]

For needful pl.

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ANNEXURE - 3

INVENTORY OF EXISTING HYDROLOGICAL NETWORK OF PAKISTAN

SUMMARY TABLE – PUNJAB

PUNJAB NETWORK - TOTAL HYDROLOGICAL STATION (151)													
EXISTING STATIONS			UP-GRADATION / NEW PROPOSED STATIONS										
PID	WAPDA		CAT	UPGRADATION			NEW PROPOSED						
	SWHP	H&R		PID	WAPDA		PID	WAPDA					
					SWHP	H&R		SWHP	WCAP	JICA	HILL-TOR	MANGLA	Total
50	7	20	A	32	5	-	48	-	1		10		96
			B	17	2	-	19			1	1	1	41
			C				12			2			14
77				49	7		79		1	3	11	1	
				56			95						151
Over Lap				1			47			1	5		
				1			53						54

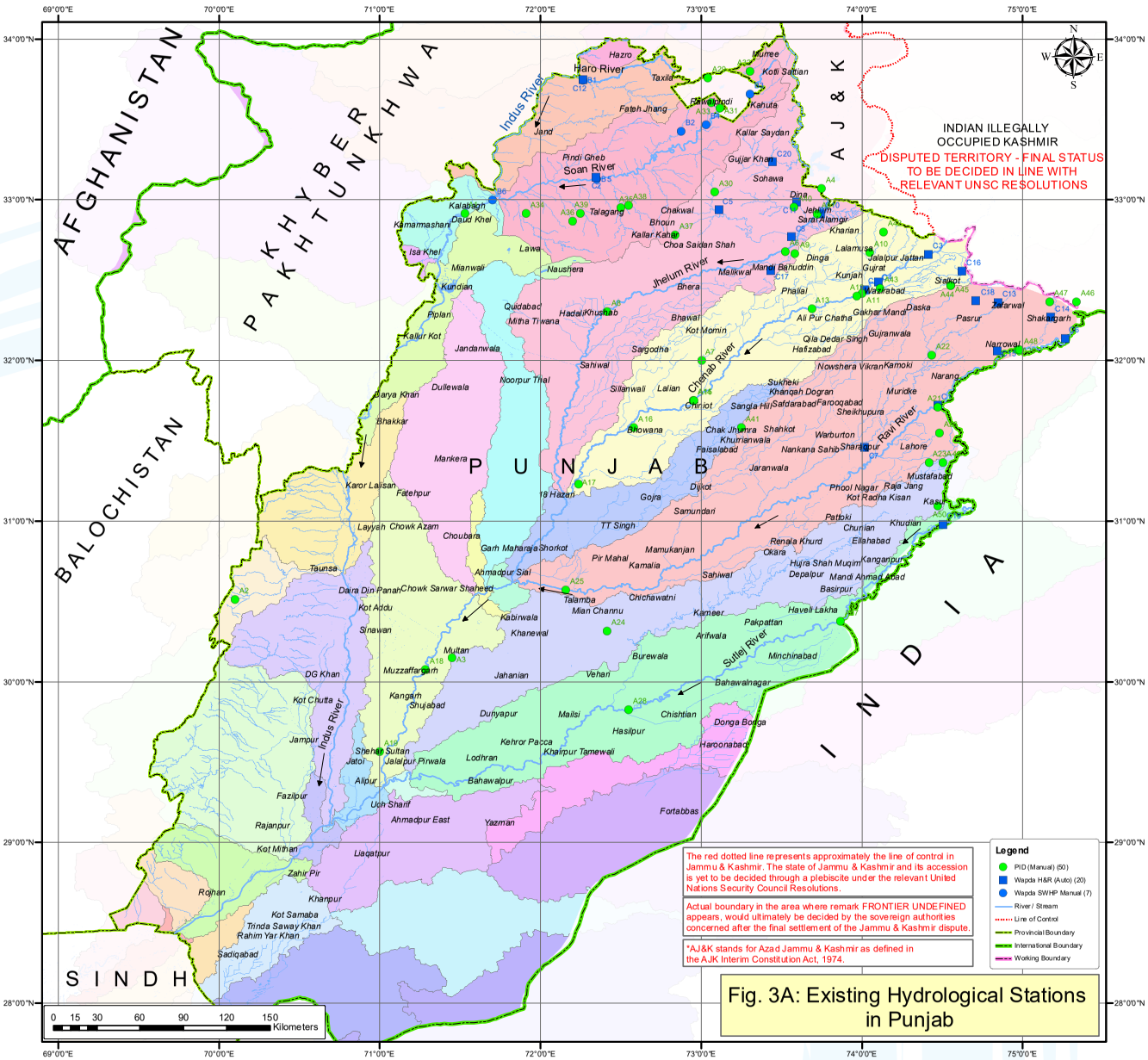


Fig. 3A: Existing Hydrological Stations in Punjab

EXISTING HYDROLOGICAL STATIONS

Map Reference	Description
Existing, PID	
A1	Jinnah Barrage
A2	Taunsa Barrage
A3	Ghazi ghat bridge
A4	Bong Mangla Down D/s
A5	Jhelum Railway Bridge
A6	Rasul Barrage
A7	Victoria Railway Bridge
A8	Khushab Railway Bridge
A9	Bajwat road Bridge River Jammu tavi
A10	Marala head work
A11	Alexandra Bridge
A12	Khanki Head Works
A13	Qadirabad Barrage
A14	Chinioit Railway Bridge (Right Side Creak)
A15	Chinioit Railway Bridge (Left Side Creak)
A16	Revaz bridge
A17	Trimmu Barrage
A18	shershah bridge
A19	purjnad headwork
A20	jassar Railwy Bridge
A21	Ravi Syphon
A22	Shahdra Railway Bridge
A23	Balloki Headworks
A24	Chichawatni Road Bridge
A25	sidnhai headworks
A26	Bakarke
A27	Sulemanki head work
A28	islam headwork
A29	Soan River at Dhok Chiniot.
A30	Small Korang at Chattar Bagh.
A31	Korang River at Lohi Bher.
A32	Korang Nullah at Bari Kangran.
A33	Leih Nullah at Liaqat Bagh Rawalpindi.
A34	Soan River at Makhad.
A35	Ghimber River at Nika Kahut.
A36	Sirl Nullah at Bhider Villige.
A37	Ghimber Nullah at Danda Shah.
A38	Dharrab River at Dharab Bridge.
A39	Ankar Nullah at Dhok Baza
A40	Kohan Nullah at Rohtas.
A41	Bunnah Nullah at Pind Sawika.
A42	Halsi Nullah at Bollainwala.
A43	Pakhu Nullah at Wazirabad.
A44	Ura Nullah at Sialkot
A45	Deg Nullah at Kingra Bridge
A46	Bein Nullah at Chakamru
A47	Bein Nullah at Shkaker Garh
A48	Bassantar Nullah at Jassar
A49	Hudiara Nullah at BRBD Crossing
A50	Rohi Nallah at Kasur
Existing WAPDA, SWHP	
B1	Haro river at Gurtala
B2	Sil river near Chahan
B3	Soan river at Chirah
B4	Soan river at Gorakhpur
B5	Soan river at Dhok Pattan
B6	Indus river at Massan
B7	Jhelum river at Jhelum

Map Reference	Description
Existing WCAP (20) WAPDA, H&R	
C1	Ravi Siphon
C2	Dhok Pathan
C3	Marala - D/S
C4	Alexendra Bridge
C5	Baba Shah Jalal
C6	Kot Naina
C7	Deg Diversion Channel
C8	Chakri
C9	Bhinber Nullah
C10	Sarai Alamgir
C11	Rohtas
C12	Garhiala
C13	Zafarwal
C14	Shakargarah
C15	Jassar
C16	Palku
C17	Daulat Nagar
C18	Ura
C19	G S Wala
C20	Palote

ANNEXURE - 3

Status	No. of Stations	Map Reference	Year of Installation	Province	Basin/ District	Sub Basin	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Longitude	Type Auto/Manual	Water stage Recording Equipment (Manual / Automatic)	Flow / Velocity Measurment	Additional Equipment	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Name/Contact No of site incharge	Organization responsible for O&M
Existing (PID)	1	A1		Punjab	Mianwali/ Indus River		Main River	Jinnah Barrage	32.91527778	71.5275	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Abdul Sattar 03320777095	PID Punjab
Existing (PID)	2	A2		Punjab	M. Garh/ Indus River		Main River	Taunsa Barrage	30.51277778	70.09916667	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	AS ABOVE	PID Punjab
Existing (PID)	3	A3		Punjab	M. Garh/ Indus River		Main River	Ghazi ghat bridge	30.15	71.45	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Abid Hussain 0308-4890038	PID Punjab
Existing (PID)	4	A4		Punjab	Jhelum / Jhelum River		Main River	Bong Mangla Down D/s	33.06972222	73.74972222	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Arshad Mahmood 03214096566	PID Punjab
Existing (PID)	5	A5		Punjab	Jhelum / Jhelum River		Main River	Jhelum Railway Bridge	32.91333333	73.72277778	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Maboob Rabahani 03016219619	PID Punjab
Existing (PID)	6	A6		Punjab	M.Bahauddin/ Jhelum River		Main River	Rasul Barrage	32.67833333	73.52222222	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Khuram Shezad 03466802709	PID Punjab
Existing (PID)	7	A7		Punjab	M.Bahauddin/ Jhelum River		Main River	Victoria Railway Bridge	32	73	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	AS ABOVE	PID Punjab
Existing (PID)	8	A8		Punjab	Khushab/ Jhelum River		Main River	Khushab Railway Bridge	32.30277778	72.41305556	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Imtiaz Ahmed 03009608754	PID Punjab
Existing (PID)	9	A9		Punjab	Sialkot/ Jamu Tavi River		Secondary River	Bajwat road Bridge River Jammu tavi	32.6675	73.58361111	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	M.Akmal Naeem 0303-5208909	PID Punjab
Existing (PID)	10	A10		Punjab	Sialkot/ Chenab River		Main River	Marala head work	32.67333333	74.04722222	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	AS ABOVE	PID Punjab
Existing (PID)	11	A11		Punjab	Gujrat/ Chenab River		Main River	Alexandra Bridge	32.41666667	74	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Habib-Ullaha 03225919464	PID Punjab
Existing (PID)	12	A12		Punjab	Gujrawala/ Chenab River		Main River	Khanki Head Works	32.40194444	73.96722222	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Shahid Saleem 03007420175	PID Punjab
Existing (PID)	13	A13		Punjab	Hafizabad/ Chenab River		Main River	Qadirabad Barrage	32.32305556	73.68555556	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Muhammad Ashrif 03007160875	PID Punjab
Existing (PID)	14	A14		Punjab	Chiniot/ Chenab River		Main River	Chiniout Railway Bridge (Right Side Creak)	31.75194444	72.94888889	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Tasawar Iqbal 03066846689	PID Punjab
Existing (PID)	15	A15		Punjab	Chiniot/ Chenab River		Main River	Chiniout Railway Bridge (Left Side Creak)	31.75208333	72.95611111	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	AS ABOVE	PID Punjab
Existing (PID)	16	A16		Punjab	Jhang/ Chenab River		Main River	Revaz bridge	31.58333333	72.58333333	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Muhammad Riaz 0322-4557060	PID Punjab

Existing (PID)	17	A17		Punjab	Jhang/ Chenab River		Main River	Trimmu Barrage	31.23333333	72.23333333	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Abid Hussain 0308-4890038	PID Punjab
Existing (PID)	18	A18		Punjab	M. Garh/ Chenab River		Main River	shershah bridge	34.03333333	73.55	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	AS ABOVE	PID Punjab
Existing (PID)	19	A19		Punjab	Bahawalpur/ Chenab River		Main River	punjnad headwork	29.56666667	71	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	M.Ashraf 0300-7160875	PID Punjab
Existing (PID)	20	A20		Punjab	Narowal/ Ravi River		Main River	jassar Railwy Bridge	32.06666667	74.96666667	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	M.Arslan 0301-2979301	PID Punjab
Existing (PID)	21	A21		Punjab	Lahore/ Ravi River		Main River	Ravi Syphon	31.71	74.47	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Abid Hussain 0308-4890038	PID Punjab
Existing (PID)	22	A22		Punjab	Lahore/ Ravi River		Main River	Shahdra Railway Bridge	32.03333333	74.43333333	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Sadam Hussain 0340-4536663	PID Punjab
Existing (PID)	23	A23		Punjab	Kasur/ Ravi River		Main River	Balloki Headworks	31.36666667	74.41666667	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Haider Ali 03005777514	PID Punjab
Existing (PID)	24	A24		Punjab	Chichawatni / RaviRiver		Main River	Chichawatni Road Bridge	30.31666667	72.41666667	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Hassan Shabbir 0345-8988570	PID Punjab
Existing (PID)	25	A25		Punjab	Abdul Hakim/ Ravi River		Main River	sidnhai headworks	30.57222222	72.15777778	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Abid Hussain 0308-4890038	PID Punjab
Existing (PID)	26	A26		Punjab	Kasur/ Sutlej River		Main River	Bakarke	31.55	74.48333333	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Muhammad Riaz 0322-4557060	PID Punjab
Existing (PID)	27	A27		Punjab	Okara/ Sutlej River		Main River	Sulemanki head work	30.3775	73.86666667	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	AS ABOVE	PID Punjab
Existing (PID)	28	A28		Punjab	Bahwalpur / Sutlej River		Main River	islam headwork	29.82638889	72.54916667	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Arshad Mahmood 03214096566	PID Punjab
Existing (PID)	29	A29		Punjab	Rawalpindi/ Soan River		Secondary	Soan River at Dhok Chiniot.	33.75833333	73.04166667	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Khalid Mahmood 03228537985	PID Punjab
Existing (PID)	30	A30		Punjab	Rawalpindi.		Nullah	Small Korang at Chattar Bagh.	33.05	73.08333333	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	AS ABOVE	PID Punjab
Existing (PID)	31	A31		Punjab	Rawalpindi.		Nullah	Korang River at Lohi Bher.	33.57083333	73.11666667	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	AS ABOVE	PID Punjab
Existing (PID)	32	A32		Punjab	Rawalpindi.		Nullah	Korang Nullah at Bari Kangran.	33.8	73.3	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	AS ABOVE	PID Punjab
Existing (PID)	33	A33		Punjab	Rawalpindi.		Tertiary	Leih Nullah at Liaqat Bagh Rawalpindi.	33.605335	73.06175	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	AS ABOVE	PID Punjab
Existing (PID)	34	A34		Punjab	Attock/ Soan River		Secondary	Soan River at Makhad.	32.91666667	71.90833333	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Arslan Jamil 03347249559	PID Punjab
Existing (PID)	35	A35		Punjab	Chakwal		Nullah	Ghimber River at Nika Kahut.	32.95	72.5	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Abid Hussain Shah 03077022809	PID Punjab

Existing (PID)	36	A36		Punjab	Chakwal		Nullah	Sirri Nullah at Bhider Villige.	32.86666667	72.2	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	AS ABOVE	PID Punjab
Existing (PID)	37	A37		Punjab	Chakwal		Nullah	Ghimber Nullah at Danda Shah.	32.78333333	72.83333333	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	AS ABOVE	PID Punjab
Existing (PID)	38	A38		Punjab	Chakwal		Nullah	Dharrab River at Dharab Bridge.	32.96666667	72.55	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	AS ABOVE	PID Punjab
Existing (PID)	39	A39		Punjab	Chakwal		Nullah	Ankar Nullah at Dhok Baza	32.91666667	72.25	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	AS ABOVE	PID Punjab
Existing (PID)	40	A40		Punjab	Jhelum		Nullah	Kohan Nullah at Rohtas.	32.95555556	74.525	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Maboob Rabahani 03016219619	PID Punjab
Existing (PID)	41	A41		Punjab	Jhelum		Nullah	Bunnah Nullah at Pind Sawika.	31.58333333	73.25	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Khuram Shezad 03466802709	PID Punjab
Existing (PID)	42	A42		Punjab	Gujrat		Nullah	Halsi Nullah at Bollainwala.	32.8	74.13333333	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Habib-Ullaha 03225919464	PID Punjab
Existing (PID)	43	A43		Punjab	Gujranwala		Nullah	Palkhu Nullah at Wazirabad.	32.44944444	74.11138889	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	AS ABOVE	PID Punjab
Existing (PID)	44	A44		Punjab	Sialkot/ Aik Nullah		Nullah	Ura Nullah at Sialkot	32.46666667	74.55	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	khalid perviz Butt 0321-6216733	PID Punjab
Existing (PID)	45	A45		Punjab	Norowal /Main Deg Nullah		Nullah	Deg Nullah at Kingra Bridge	32.46666667	74.55	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	AS ABOVE	PID Punjab
Existing (PID)	46	A46		Punjab	Shakar garh / Chakamru		Nullah	Bein Nullah at Chakamru	32.36666667	75.33333333	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Arslan 03012979301	PID Punjab
Existing (PID)	47	A47		Punjab	Shakar garh		Nullah	Bein Nullah at Shkaker Garh	32.36666667	75.16666667	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	AS ABOVE	PID Punjab
Existing (PID)	48	A48		Punjab	Narowal		Nullah	Bassantar Nullah at Jassar	32.06666667	74.97916667	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	AS ABOVE	PID Punjab
Existing (PID)	49	A49		Punjab	Lahore		Nullah	Hudiara Nullah at BRBD Crossing	31.36666667	74.5	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Sadam Hussain 0340-4536663	PID Punjab
Existing (PID)	50	A50		Punjab	Kasur		Nullah	Rohi Nallah at Kasur	31.09583333	74.47083333	Manual	Manual /gauges	Manual		Manually	Current meter	Daily	Arshad Mahmood 03214096566	PID Punjab
Existing WAPDA (SWHP)	1	B1	1969	Punjab			Indus	Haro river at Gurriala	33.74444444	72.2625	Manual	Staff Gauge / Manual		N.A.		Current Meter	9 Hours	Yasir Arafat Hyd 0300-3435052	SWHP Wapda
Existing WAPDA (SWHP)	2	B2	1962	Punjab			Indus	Sil river near Chahan	33.42583333	72.875	Manual	Staff Gauge / Manual		N.A.		Current Meter	-	site closed	SWHP Wapda
Existing WAPDA (SWHP)	3	B3	1960	Punjab			Indus	Soan river at Chirrah	33.65694444	73.30416667	Manual	Staff Gauge / Manual		N.A.		Current Meter	9 Hours	Muhammad Maaz Khan Hyd (Contigent) 0343-4142687	SWHP Wapda
Existing WAPDA (SWHP)	4	B4	1996	Punjab			Indus	Soan river at Gorakhpur	33.46833333	73.03027778	Manual	Staff Gauge / Manual		N.A.		Current Meter	9 Hours	Muhammad Shakeel Hyd (D/W) 0332-5452953	SWHP Wapda

Existing WAPDA (SWHP)	5	B5	1963	Punjab			Indus	Soan river at Dhok Pattan	33.13	72.35138889	Manual	Staff Gauge / Manual		N.A.		Current Meter	9 Hours	Faisal Dawood Hyd (D/W) 0345-9834586	SWHP Wapda
Existing WAPDA (SWHP)	6	B6	1972	Punjab			Indus River	Indus river at Massan	33	71.69861111	Manual	Staff Gauge / Manual		N.A.		Current Meter	08 hours	Muhammad Azam 03055090321	SWHP Wapda
Existing WAPDA (SWHP)	7	B7	2016	Punjab			Jhelum	Jhelum river at Jhelum	32.90833333	73.73083333									SWHP Wapda
Existing WAPDA WCAP (H&R)	1	C1	2007	Punjab	Lahore		Ravi	Ravi Siphon	31.7225	74.47	Auto	Automatic /PT	Manual	Rain	GSM	Current Meter	Minute	Muhammad Saad	H&R Dte.
Existing WAPDA WCAP (H&R)	2	C2	1998	Punjab	Chakwal		Swan River	Dhok Pathan	33.14194444	72.34444444	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Adil Shahzad Khan	H&R Dte.
Existing WAPDA WCAP (H&R)	3	C3	2007	Punjab	Gujrat		Chenab	Marala - D/S	32.66083333	74.41083333	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Ayyan Arshad	H&R Dte.
Existing WAPDA WCAP (H&R)	4	C4	2007	Punjab	Gujrat		Chenab	Alexendra Bridge	32.48888889	74.09805556	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Muhammad Akram	H&R Dte.
Existing WAPDA WCAP (H&R)	5	C5	2007	Punjab	Chakwal		Jhelum River	Baba Shah Jalal	32.93916667	73.10694444	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Abu Bakar	H&R Dte.
Existing WAPDA WCAP (H&R)	6	C6	2007	Punjab	Narowal		Ravi River	Kot Naina	32.13888889	75.26277778	Auto	Automatic /PT	Manual	Rain	Satellite	Current Meter	Minute	Asif Rasool	H&R Dte.
Existing WAPDA WCAP (H&R)	7	C7	2007	Punjab	Sheikhupura		Deg Nullah	Deg Diversion Channel	31.45916667	74.015	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Muhammad Ali Raza	H&R Dte.
Existing WAPDA WCAP (H&R)	8	C8	2007	Punjab	Jehlum		Bunha River	Chakri	32.76944444	73.55972222	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Faisal Mehmood	H&R Dte.
Existing WAPDA WCAP (H&R)	9	C9	2007	Punjab	Gujrat		Chenab	Bhinber Nullah	32.44194444	74.01194444	Auto	Automatic /PT	Manual	Rain	GSM	Current Meter	Minute	Gulshad Ahmad	H&R Dte.
Existing WAPDA WCAP (H&R)	10	C10	2007	Punjab	Jehlum		Jhelum River	Sarai Alamgir	32.91388889	73.74166667	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Ali Raza	H&R Dte.
Existing WAPDA WCAP (H&R)	11	C11	2007	Punjab	Jehlum		Kahan River	Rohtas	32.98583333	73.59111111	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly		H&R Dte.
Existing WAPDA WCAP (H&R)	12	C12	2007	Punjab	Attock		Haro River	Garhiala	33.74722222	72.26138889	Auto	Automatic /PT	Manual	Rain	GSM	Current Meter	Minute	Rizwan Khan	H&R Dte.
Existing WAPDA WCAP (H&R)	13	C13	1998	Punjab	Narowal			Zafarwal	32.36111111	74.845	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Saghir Ahmed	H&R Dte.
Existing WAPDA WCAP (H&R)	14	C14	1998	Punjab	Narowal		Bein Nullah	Shakargarah	32.27055556	75.17333333	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Muhammad Ibrar	H&R Dte.
Existing WAPDA WCAP (H&R)	15	C15	1998	Punjab	Narowal		Ravi River	Jassar	32.06138889	74.83944444	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Muhammad Farid	H&R Dte.
Existing WAPDA WCAP (H&R)	16	C16	1998	Punjab	Sialkot		Sialkot Nullah	Palku	32.55694444	74.62194444	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Zahid Ali	H&R Dte.
Existing WAPDA WCAP (H&R)	17	C17	1998	Punjab	Gujrat			Daulat Nagar	32.55916667	73.43055556	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Khurram Adnan	H&R Dte.
Existing WAPDA WCAP (H&R)	18	C18	1998	Punjab	Sialkot		Aik Nullah	Ura	32.37333333	74.70916667	Auto	Automatic /PT	Manual	Rain	GSM	Current Meter	Minute	Muhammad Mazhar Abrar	H&R Dte.
Existing WAPDA WCAP (H&R)	19	C19	1998	Punjab	Kasur		Sutlej River	G S Wala	30.98	74.5	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Mudasir Rafique	H&R Dte.
Existing WAPDA WCAP (H&R)	20	C20	2007	Punjab	Jehlum		Jhelum River	Palote	33.23555556	73.44194444	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Gulam Ishaq Khan	H&R Dte.

SUMMARY TABLE – KPK

KPK NETWORK - TOTAL HYDROLOGICAL STATION (156)																
Existing Stations			Ongoing Stations		Up-gradation / New Proposed Stations											
PID	WAPDA		PID	WAPDA	CAT	UPGRADATION				NEW PROPOSED						
	SWHP	H&R		AFD		PID	WAPDA			PID	WAPDA					
							SWHP	H&R	Ongoing (AFD)		SWHP	WCAP	JICA	TIKA	HYCOS	DASU
12	47	14	0	08	A	6	25	14	06	22			10	03	01	
					B	4	13			8		2	7	2	1	1
					C	1	8		-	1	1	4	8	2	1	
			Total			11	46	14	06	31	1	6	25	7	3	1
					Over lap	1	1		2	4		5	4	2		8
						12	47	14	08	35	1	11	29	9	3	9
73			08		81					104						

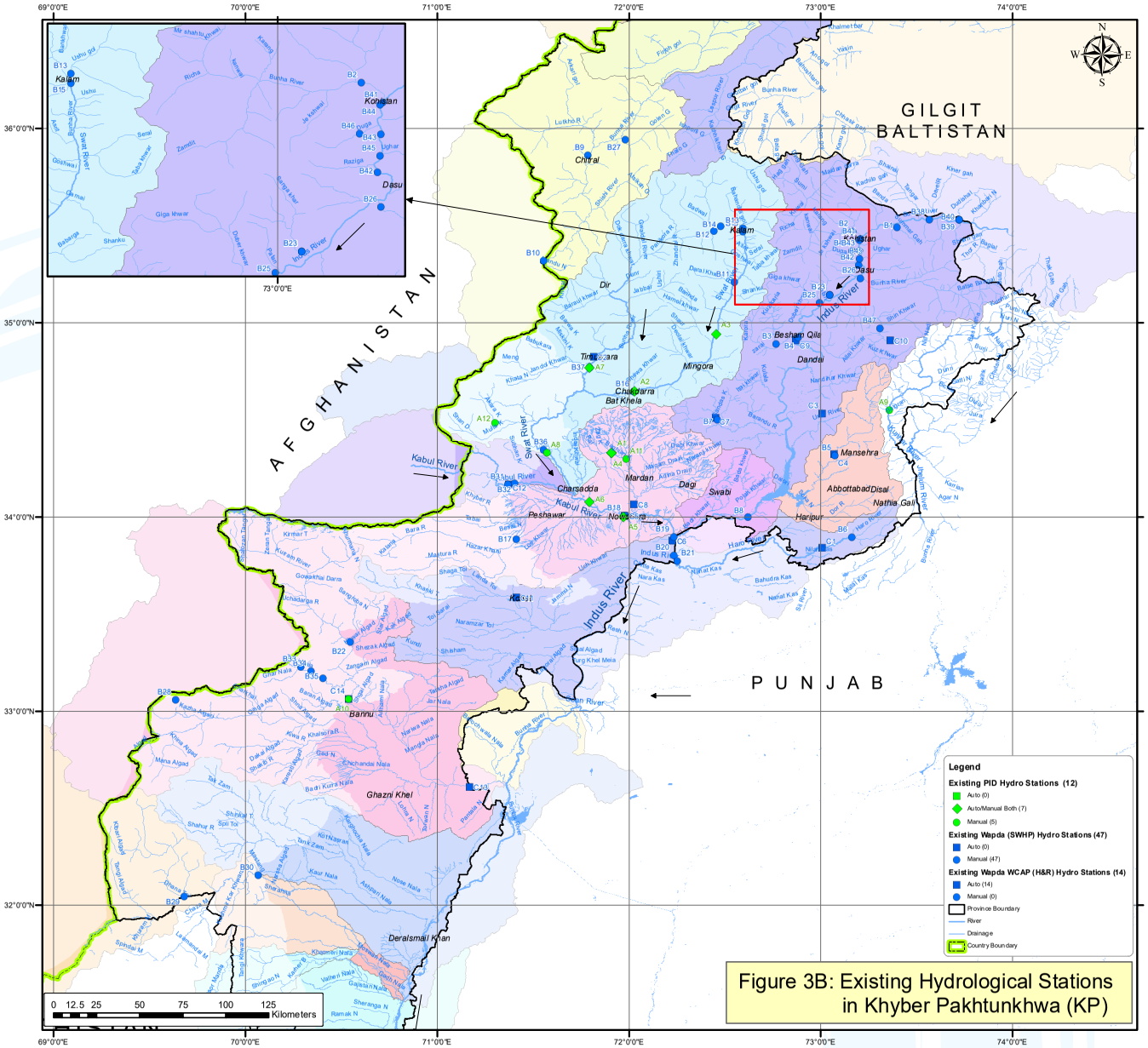


Figure 3B: Existing Hydrological Stations in Khyber Pakhtunkhwa (KP)

EXISTING HYDROLOGICAL STATIONS	
Map Reference	Description
Existing PID	
A1	Nowshera Mardan road Bridge
A2	Chakdara bridge station
A3	Khwazakhela Station
A4	Mardan Road Jala Bridge station
A5	Adizai Bridge staftion
A6	Budni darmangi Gauge station
A7	Jabalot Bridge lower dir
A8	Munda H/works
A9	Balakot station
A10	Kurram Ghari Station
A11	Said Abad Takhtbai Station
A12	Khanpur at Daryal
Existing WAPDA, SWHP	
B1	Summer Gah at Gosik
B2	Kandia Nullah at Tooti Bridge
B3	Gorband river at Karora
B4	Indus river at Besham Qila
B5	Siran river near Phulra
B6	Haro river at Jabri Bridge
B7	Brando river at Daggar
B8	Indus river at Jammun
B9	Chitral river at Chitral
B10	Chitral river near Arandu
B11	Daral Khawar at Behrain
B12	Batal Khawar at Utror
B13	Ushu River at Jildat
B14	Gabral River at Gulshanabad
B15	Swat river at Kalam
B16	Swat river at Chakdara
B17	Bara river at Jhansi Post
B18	Kabul river at Nowshera
B19	Indus river at Khairabad
B20	Indus river at Mandori
B21	Indus river at Brootha
B22	Kurram river at Thal
B23	Keyal Nullah at Shishal
B24	Keyal Khwar at Pashwa
B25	Indus River at Pattan
B26	Spatgah at Goshali
B27	Golan Gol River at Mustaj Road Bridge
B28	Toi River at Toi Khula
B29	Gomal River at Gulkuch
B30	Gomal River at Kot Murtaza
B31	Kabul River D/S of Warsak Dam
B32	Kabul River at Warsak Dam
B33	Kaitu River at Ziarat Post
B34	Kaitu River near STS Post
B35	Kaitu River at Spom Wam
B36	Swat River at Mohmand Dam Site
B37	Panjkora River at Zulam Bridge
B38	Indus river at Shatial
B39	Indus River D/S of Basha Dam
B40	Indus River at Dodishal
B41	Indus River at Dasu/Kandia
B42	Indus River at Dasu-Stage-I
B43	Indus River at Dasu-Stage-II
B44	Indus River at Dasu-Stage-III
B45	Indus River at Tailrace of Dasu Power House
B46	Gabarband at Doga
B47	Chor Nullah at Sarchoy

Map Reference	Description
Existing WAPDA, WCAP H&R	
C1	Dartian
C2	Chakdara
C3	Oghi
C4	Phulra
C5	Nowshera
C6	Attock (Khairabad)
C7	Daggar
C8	Kalpani - Rashid Abad
C9	Besham
C10	Talhatta
C11	Tanda Dam
C12	Warsak Dam D/S
C13	Dara E Tang
C14	Kurram Garhi

Status	No. of Stations	Map Reference	Year of Installation	Province	Basin/ District	Sub Basin	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Longitude	Type Auto/Manual	Water stage Recording Equipment (Manual / Automatic)	Flow / Velocity Measurment	Additional Equipment	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Name/Contact No of site incharge	Organization responsible for O&M
Existing (PID)	1	A1	2019-20	KPK/ Irrigation	Nowshera	Nowshera	Kabul River	Nowshera Mardan road Bridge	34.33038333	71.90850833	Auto/Manula Both	Both	Auto	Auto rain Gauge	Real time through settelite from data logger	ADCP	Hourly	091-9212114 Executive Engineer	Irrigation depatt:
Existing (PID)	2	A2	2019-20	KPK/ Irrigation	Swat	Swat	Swat River	Chakdara bridge station	34.64638333	72.02783889	Auto/Manula Both	Both	Auto	Auto rain Gauge	Real time through settelite from data logger	ADCP	Hourly		Irrigation depatt:
Existing (PID)	3	A3	2019-20	KPK/ Irrigation	Swat	Swat	swat river	Khwazakhela Station	34.94314	72.45072	Auto/Manula Both	Both	Auto	Auto rain Gauge	Real time through settelite from data logger	ADCP	Hourly		Irrigation depatt:
Existing (PID)	4	A4	2019-20	KPK/ Irrigation	Mardan	Mardan	Kalapani Nullah at Jalala	Mardan Road Jala Bridge station	34.33038333	71.90850833	Auto/Manula Both	Both	Auto	Auto rain Gauge	Real time through settelite from data logger	ADCP	Hourly		Irrigation depatt:
Existing (PID)	5	A5	2019-20	KPK/ Irrigation	Peshawar	Peshawar	Kabul River	Adizai Bridge staftion	34.00005278	71.966775	Auto/Manula Both	Both	Auto	Auto rain Gauge	Real time through settelite from data logger	ADCP	Hourly		Irrigation depatt:
Existing (PID)	6	A6	2019-20	KPK/ Irrigation	Peshawar	Peshawar	Budni nullah	Budni darmangi Gauge station	34.07680556	71.79166667	Auto/Manula Both	Both	Auto	Auto rain Gauge	Real time through settelite from data logger	ADCP	Hourly		Irrigation depatt:
Existing (PID)	7	A7	2019-20	KPK/ Irrigation	Lower Dir	Lower Dir	Panjkora River	Jabalot Bridge lower dir	34.76805556	71.79166667	Auto/Manula Both	Both	Auto	Auto rain Gauge	Real time through settelite from data logger	ADCP	Hourly		Irrigation depatt:
Existing (PID)	8	A8	2019-20	KPK/ Irrigation	Charsadda	Charsadda	Swat River	Munda H/works	34.33158889	71.57100833	Manual	Manual Staff Gauge	Manual	-		Current Meter	Fortnightly		Irrigation depatt:
Existing (PID)	9	A9	2019-20	KPK/ Irrigation	Balakot	Balakot	Kunhar River	Balakot station	34.54965	73.354275	Manual	Manual Staff Gauge	Manual	-		Current Meter	Fortnightly		Irrigation depatt:
Existing (PID)	10	A10	2019-20	KPK/ Irrigation	Bannu	Bannu	Kurram River	Kurram Ghari Station	33.06158333	70.53863889	Manual	Manual Staff Gauge	Manual	-		Current Meter	Fortnightly		Irrigation depatt:
Existing (PID)	11	A11	2019-20	KPK/ Irrigation	Mardan	Mardan	Kalapani Nullah Said abad	Said Abad Takhtbai Station	34.30025	71.98343333	Manual	Manual Staff Gauge	Manual	-		Current Meter	Fortnightly		Irrigation depatt:
Existing (PID)	12	A12	2019-20	KPK/ Irrigation	Mansehra	Mansehra	Siran River	Khanpur at Daryal	34.48388889	71.30243611	Manual	Manual Staff Gauge	Manual	-		Current Meter	Fortnightly		Irrigation depatt:
EXISTING WAPDA (SWHP)	1	B1	2005	KPK	Indus		Indus	Summer Gah at Gosik	35.49166667	73.39861111	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Zahir Hussain Hyd (D/W) 0355-5253688	Wapda (SWHP)
EXISTING WAPDA (SWHP)	2	B2	1995	KPK			Indus	Kandia Nullah at Tooti Bridge	35.46972222	73.16444444	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Naqash Ali Khan Hyd (D/W) 0334-5665908	Wapda (SWHP)
EXISTING WAPDA (SWHP)	3	B3	1974	KPK			Indus	Gorband river at Karora	34.89027778	72.76611111	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Sir Syed Ahmad Khan Hyd (D/W) 0346-9703717	Wapda (SWHP)
EXISTING WAPDA (SWHP)	4	B4	1969	KPK	Indus		Indus	Indus river at Besham Qila	34.92416667	72.88194444	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	24 Hours	Yar Muhammad Khan Hyd 0345-2667917	Wapda (SWHP)
EXISTING WAPDA (SWHP)	5	B5	1968	KPK	Indus		Indus	Siran river near Phulra	34.31611111	73.075	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	24 Hours	Muhammad Saad Khan Hyd 0301-5827714	Wapda (SWHP)
EXISTING WAPDA (SWHP)	6	B6	2012	KPK	Indus		Indus	Haro river at Jabri Bridge	33.89527778	73.16277778	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Muhammad Ilyas Hyd (D/W) 0345-3874033	Wapda (SWHP)
EXISTING WAPDA (SWHP)	7	B7	1969	KPK	Indus		Brandu River	Brando river at Daggar	34.50138889	72.45833333	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	24 hours	Waheed Ullah 0301-8538434	Wapda (SWHP)
EXISTING WAPDA (SWHP)	8	B8	1990	KPK			Indus River	Indus river at Jammun	33.99972222	72.61888889	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	08 hours	Daud jan 03015953588	Wapda (SWHP)

EXISTING WAPDA (SWHP)	9	B9	1963	KPK	Kabul		Chitral River	Chitral river at Chitral	35.86333333	71.7875	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	08 hours	Ijaz Ahmad 03215775953	Wapda (SWHP)
EXISTING WAPDA (SWHP)	10	B10	2008	KPK	Chitral		Chitral River	Chitral river near Arandu	35.32027778	71.55583333	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	08 hours	Jawad Ahmad 0349-2554258	Wapda (SWHP)
EXISTING WAPDA (SWHP)	11	B11	1996	KPK	Swat		Daral river(Swat River)	Daral Khawar at Behrain	35.21	72.54583333	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	08 hours	Seranzeb Khan 0346-9338570	Wapda (SWHP)
EXISTING WAPDA (SWHP)	12	B12	1996	KPK	Swat		Batal Khwar(Gabral River)	Batal Khawar at Utror	35.47222222	72.44027778	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	08 hours	Zarain Gul	Wapda (SWHP)
EXISTING WAPDA (SWHP)	13	B13	1996	KPK	Swat		Ushu River	Ushu River at Jildat	35.4875	72.59583333	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	08 hours	Khan zeb 0314-9974329	Wapda (SWHP)
EXISTING WAPDA (SWHP)	14	B14	1996	KPK	Swat		Gabraal River	Gabral River at Gulshanabad	35.49583333	72.47777778	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	08 hours		Wapda (SWHP)
EXISTING WAPDA (SWHP)	15	B15	1961	KPK	Indus		Swat River	Swat river at Kalam	35.46944444	72.59444444	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	08 hours	Zarain Gul 0313-9888455	Wapda (SWHP)
EXISTING WAPDA (SWHP)	16	B16	1960	KPK	Indus		Swat River	Swat river at Chakdara	34.64444444	72.025	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	08 hours	younas 03469307997	Wapda (SWHP)
EXISTING WAPDA (SWHP)	17	B17	1960	KPK	Indus		Bara River	Bara river at Jhansi Post	33.88611111	71.41083333	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	08 hours	Bakhtiar Ali 03005878548	Wapda (SWHP)
EXISTING WAPDA (SWHP)	18	B18	1960	KPK	Indus		Kabul River	Kabul river at Nowshera	34.00694444	71.98055556	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	24 hours	Akhtar Bilal 03151515292	Wapda (SWHP)
EXISTING WAPDA (SWHP)	19	B19	1981	KPK	Indus		Indus River	Indus river at Khairabad	33.89722222	72.23333333	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	24 hours	Habib ur Rahman 03120865520	Wapda (SWHP)
EXISTING WAPDA (SWHP)	20	B20	1965	KPK			Indus River	Indus river at Mandori	33.8025	72.23277778	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	24 hours	Abdul Akbar 03135767182	Wapda (SWHP)
EXISTING WAPDA (SWHP)	21	B21	1990	KPK			Indus River	Indus river at Brootha	33.77361111	72.25194444	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	08 hours	Fida Hussain 03465611103	Wapda (SWHP)
EXISTING WAPDA (SWHP)	22	B22	1967	KPK	Indus		Kurram River	Kurram river at Thal	33.35611111	70.54583333	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	08 hours	Jehanzeb	Wapda (SWHP)
EXISTING WAPDA (SWHP)	23	B23	1992	KPK			Indus	Keyal Nullah at Shishal	35.14361111	73.04777778	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Tariq Shah Hyd (D/W) 0345-4440528	Wapda (SWHP)
EXISTING WAPDA (SWHP)	24	B24	1992	KPK			Indus	Keyal Khwar at Pashwa	35.14361111	73.04777778	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Tariq Shah Hyd (D/W) 0345-4440528	Wapda (SWHP)
EXISTING WAPDA (SWHP)	25	B25	1978	KPK	Indus		Indus	Indus River at Pattan	35.10277778	72.99472222	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	-	site not open	Wapda (SWHP)
EXISTING WAPDA (SWHP)	26	B26	2005	KPK			Indus	Spatgah at Goshali	35.22916667	73.20277778	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Muhammad Jamshaid Hyd (Contigent) 0312-5904116	Wapda (SWHP)
EXISTING WAPDA (SWHP)	27	B27	1996	KPK			Golan Gol	Golan Gol River at Mustaj Road Bridge	35.94222222	71.98027778	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			Wapda (SWHP)
EXISTING WAPDA (SWHP)	28	B28	2015	KPK			Toi	Toi River at Toi Khula	33.05805556	69.63444444	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			Wapda (SWHP)
EXISTING WAPDA (SWHP)	29	B29	2015	KPK			Gomal	Gomal River at Gulkuch	32.04388889	69.67972222	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			Wapda (SWHP)
EXISTING WAPDA (SWHP)	30	B30	1960	KPK	Indus		Gomal	Gomal River at Kot Murtaza	32.15416667	70.06666667	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			Wapda (SWHP)
EXISTING WAPDA (SWHP)	31	B31	2008	KPK	Indus		Kabul	Kabul River D/S of Warsak Dam	34.16666667	71.36861111	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			Wapda (SWHP)

EXISTING WAPDA (SWHP)	32	B32	1961	KPK			Kabul	Kabul River at Warsak Dam	34.17166667	71.405	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			Wapda (SWHP)
EXISTING WAPDA (SWHP)	33	B33	2018	KPK			Swat	Kaitu River at Ziarat Post	33.22919444	70.28875	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			Wapda (SWHP)
EXISTING WAPDA (SWHP)	34	B34	2018	KPK			Swat	Kaitu River near STS Post	33.20541111	70.34252778	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			Wapda (SWHP)
EXISTING WAPDA (SWHP)	35	B35	2018	KPK			Swat	Kaitu River at Spim Wam	33.1695	70.40103333	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			Wapda (SWHP)
EXISTING WAPDA (SWHP)	36	B36	2018	KPK			Swat	Swat River at Mohmand Dam Site	34.34636111	71.55613889	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			Wapda (SWHP)
EXISTING WAPDA (SWHP)	37	B37		KPK				Panjkora River at Zulam Bridge	34.76797222	71.79225									Wapda (SWHP)
EXISTING WAPDA (SWHP)	38	B38	1983	KPK	Indus		Indus	Indus river at Shatial	35.53222222	73.56444444	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Salman Ahmad Khan Hyd (D/W) 0355-5646144	Wapda (SWHP)
EXISTING WAPDA (SWHP)	39	B39	2007	KPK	Indus		Indus	Indus River D/S of Basha Dam	35.53138889	73.72083333	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Daroof GO (D/W) 0341-8440572	Wapda (SWHP)
EXISTING WAPDA (SWHP)	40	B40	2012	KPK	Indus		Indus	Indus River at Dodishal	35.53222222	73.72111111	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Barkat Ullah GO (D/W) 0355-5128381	Wapda (SWHP)
EXISTING WAPDA (SWHP)	41	B41	2006	KPK	Indus		Indus	Indus River at Dasu/Kandia	35.43166667	73.20527778	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	24 Hours	Abdul Sadiq Hyd (D/W) 0314-5095196	Wapda (SWHP)
EXISTING WAPDA (SWHP)	42	B42	2007	KPK	Indus		Indus	Indus River at Dasu-Stage-I	35.29666667	73.19611111	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Gul Niaz GO (D/W) 0312-5386386	Wapda (SWHP)
EXISTING WAPDA (SWHP)	43	B43	2007	KPK	Indus		Indus	Indus River at Dasu-Stage-II	35.37027778	73.20111111	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Salah ud Din GO (D/W) 0345-9596004	Wapda (SWHP)
EXISTING WAPDA (SWHP)	44	B44	2007	KPK	Indus		Indus	Indus River at Dasu-Stage-III	35.42666667	73.20083333	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Noor Muhammad GO (D/W) 0313-3765333	Wapda (SWHP)
EXISTING WAPDA (SWHP)	45	B45	2007	KPK	Indus		Indus	Indus River at Tailrace of Dasu Power House	35.32861111	73.20083333	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	24 Hours	Said ul Haq GO (D/W) 0333-5063665	Wapda (SWHP)
EXISTING WAPDA (SWHP)	46	B46	2009	KPK			Indus	Gabarband at Doga	35.37111111	73.16027778	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Muhammad Umar (Contigent)	Wapda (SWHP)
EXISTING WAPDA (SWHP)	47	B47	2008	KPK			Indus	Chor Nullah at Sarchoy	34.97055556	73.30916667	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Muhammad Umar (Contigent)	Wapda (SWHP)
EXISTING WAPDA WCAP (H&R)	1	C1	2007	KPK	Haripur		Haro River	Dartian	33.8425	73.00722222	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Sarfraz	H&R Dte.
EXISTING WAPDA WCAP (H&R)	2	C2	2007	KPK	Swat		Swat	Chakdara	34.82472222	71.8125	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Akbar Ali Khan	H&R Dte.
EXISTING WAPDA WCAP (H&R)	3	C3	1998	KPK	Mansehra			Oghi	34.5325	73.00638889	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly		H&R Dte.
EXISTING WAPDA WCAP (H&R)	4	C4	1998	KPK	Mansehra		Siran River	Phulra	34.32333333	73.06861111	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly		H&R Dte.
EXISTING WAPDA WCAP (H&R)	5	C5	1998	KPK	Nowshera		Kabul	Nowshera	34.0075	71.97666667	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Muhammad Sharif	H&R Dte.
EXISTING WAPDA WCAP (H&R)	6	C6	1998	KPK	Nowshera		Indus	Attock (Khairabad)	33.8775	72.22555556	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Sher Bilal	H&R Dte.
EXISTING WAPDA WCAP	7	C7	1998	KPK	Swat		Barandu	Daggar	34.51	72.45194444	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly		H&R Dte.

EXISTING WAPDA WCAP (H&R)	8	C8	2007	KPK	Nowshera		Kalpani Nullah	Kalpani - Rashid Abad	34.065	72.02444444	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Muhammad Nadir Nasir	H&R Dte.
EXISTING WAPDA WCAP (H&R)	9	C9	2007	KPK	Shangala		Indus	Besham	34.90972222	72.86805556	Auto	Automatic /PT	Manual	Rain	GSM	Current Meter	Minute	Muhammad Abid	H&R Dte.
EXISTING WAPDA WCAP (H&R)	10	C10	2007	KPK	Mansehra		Kunhar River	Talhatta	34.90972222	73.35944444	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Muhammad Nasir	H&R Dte.
EXISTING WAPDA WCAP (H&R)	11	C11	2007	KPK	Kohat		Toi	Tanda Dam	33.585	71.41083333	Auto	Automatic /PT	Manual	Rain	Satellite	Current Meter	Minute	Yasir Arfat	H&R Dte.
EXISTING WAPDA WCAP (H&R)	12	C12	2007	KPK	Peshawar		Kabul	Warsak Dam D/S	34.16722222	71.36972222	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Muhammad Ismail	H&R Dte.
EXISTING WAPDA WCAP (H&R)	13	C13	2007	KPK	Lakki Marwat		Kurram	Dara E Tang	32.61027778	71.16833333	Auto	Automatic /PT	Manual	Rain	Satellite	Current Meter	Minute	Gul Hameed	H&R Dte.
EXISTING WAPDA WCAP (H&R)	14	C14	2007	KPK	Bannu		Kurram	Kurram Garhi	33.06166667	70.53861111	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Gul Zaeef Khan	H&R Dte.

SUMMARY TABLE – SIND

SIND NETWORK - TOTAL HYDROLOGICAL STATION (29)															
Existing Stations			Ongoing Stations		Up-gradation / New Proposed Stations										
PID	WAPDA		PID	WAPDA	CAT	UPGRADATION				NEW PROPOSED					
	SWHP	H&R		AFD		PID	WAPDA			PID	WAPDA				
							SWHP	H&R	Ongoing (AFD)		SWHP	WCAP	JICA	TIKA	FPSP-I DASU
17	10		0		A	6	6						1	1	8
					B	3	1								
					C		3		-						
			Total			9	10						1	1	8
					Over Lap	8							1		
						17	10						2	1	8
27			0		27					11					

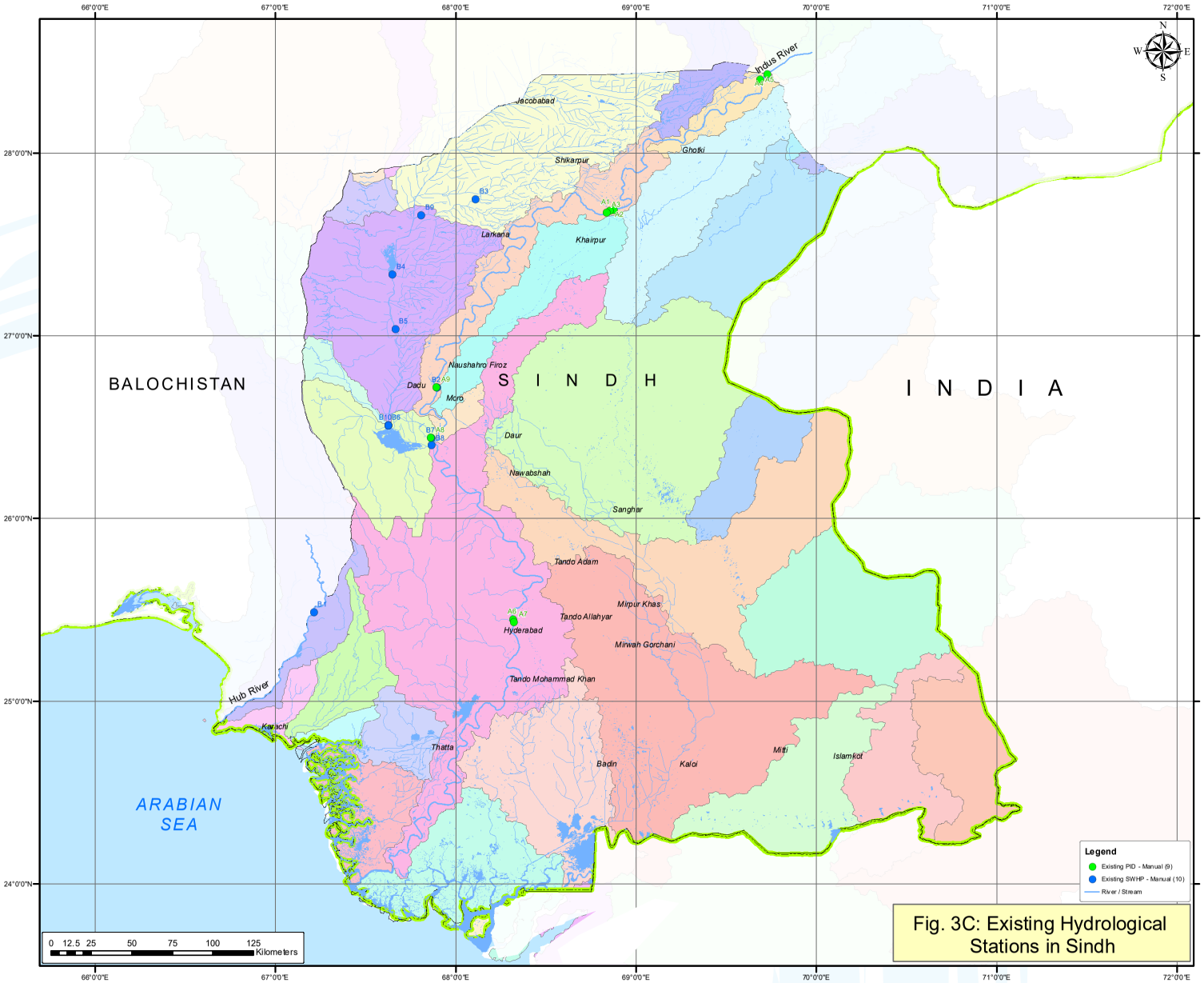


Fig. 3C: Existing Hydrological Stations in Sindh

EXISTING HYDROLOGICAL STATIONS	
Map Reference	Monitoring Station Ref.
Existing (PID)	
A1	Sukkur Barrage 02 Km UpStream
A2	Sukkur Barrage 01 Km UpStream
A3	Sukkur Barrage 01 Km DownStream
A4	Guddu Barrage 01 Km UpStream
A5	Guddu Barrage 01 Km DownStream
A6	Kotri Barrage 01 Km UpStream
A7	Kotri Barrage 01 Km DownStream
A8	RD-48 MNVD UpStream Manchar Lake
A9	Daddu Moro Bridge
Existing (SWHP)	
B1	Hub River at Karpasaniwat
B2	Indus River at Dadu M.Bridge
B3	Miro Khan Main Drain near M.K.Z.P Site No.2
B4	M.N.V.D at Hamal Regulator Site No.6
B5	M.N.V.D at RD-277 Nr.Goth A.H.Chandio Site No.10
B6	Manchar Lake at RD 68
B7	Aral Wah at Head
B8	Aral Wah at Regulator near Sehwan Site No. 25
B9	Miro Khan Drain at Warah Canal Site No.18
B10	WNVD at Tail Site No. 28

ANNEXURE - 3

Status	No. of Stations	Map Reference	Year of Installation	Province	Basin/ District	Sub Basin	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Longitude	Type Auto/Manual	Water stage Recording Equipment (Manual / Automatic)	Flow / Velocity Measurment	Additional Equipment	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Name/Contact No of site incharge	Organization responsible for O&M
Existing Gauging Station (PID)	1	A1	1960	Sindh	Indus/ Sukkur	Sukkur	Indus River	Sukkur Barrage 02 Km UpStream	27.6896	68.8723	Manual	Manual Staff Gauge	Manual Flow Measurement	-	Manually	Gauge/ Current Meter	Fortnightly	AEN Sukkhur Barrage	Irrigation Dept Sindh
Existing Gauging Station (PID)	2	A2	1960	Sindh	Indus/ Sukkur	Sukkur	Indus River	Sukkur Barrage 01 Km UpStream	27.6839	68.8550	Manual	Manual Staff Gauge	Manual Flow Measurement	-	Manually	Gauge/ Current Meter	Fortnightly	AEN Sukkhur Barrage	Irrigation Dept Sindh
Existing Gauging Station (PID)	3	A3	1960	Sindh	Indus/ Sukkur	Sukkur	Indus River	Sukkur Barrage 01 Km DownStream	27.6739	68.8361	Manual	Manual Staff Gauge	Manual Flow Measurement	-	Manually	Gauge/ Current Meter	Fortnightly	AEN Sukkhur Barrage	Irrigation Dept Sindh
Existing Gauging Station (PID)	4	A4	1970	Sindh	Indus/ Kashmore	Guddu	Indus River	Guddu Barrage 01 Km UpStream	28.4321	69.7272	Manual	Manual Staff Gauge	Manual Flow Measurement	-	Manually	Gauge/ Current Meter	Fortnightly	AEN Guddu Barrage	Irrigation Dept Sindh
Existing Gauging Station (PID)	5	A5	1970	Sindh	Indus/ Kashmore	Guddu	Indus River	Guddu Barrage 01 Km DownStream	28.4025	69.6870	Manual	Manual Staff Gauge	Manual Flow Measurement	-	Manually	Gauge/ Current Meter	Fortnightly	AEN Guddu Barrage	Irrigation Dept Sindh
Existing Gauging Station (PID)	6	A6	1975	Sindh	Indus/ Hyderabad	Kotri	Indus River	Kotri Barrage 01 Km UpStream	25.4481	68.3186	Manual	Manual Staff Gauge	Manual Flow Measurement	-	Manually	Gauge/ Current Meter	Fortnightly	AEN Kotri Barrage	Irrigation Dept Sindh
Existing Gauging Station (PID)	7	A7	1975	Sindh	Indus/ Hyderabad	Kotri	Indus River	Kotri Barrage 01 Km DownStream	25.4342	68.3206	Manual	Manual Staff Gauge	Manual Flow Measurement	-	Manually	Gauge/ Current Meter	Fortnightly	AEN Kotri Barrage	Irrigation Dept Sindh
Existing Gauging Station (PID)	8	A8	1996	Sindh	Indus/ Daduu	Daduu	MNVD	RD-48 MNVD UpStream Manchar Lake	26.4413	67.8603	Manual	Manual Staff Gauge	Manual Flow Measurement	-	Manually	Gauge/ Current Meter	Fortnightly	XEN Irrigation Dept	Irrigation Dept Sindh
Existing Gauging Station (PID)	9	A9	1996	Sindh	Indus/ Nowshehro Feroz	Nowshehro Feroz	Indus River	Daddu Moro Bridge	26.7181	67.8921	Manual	Manual Staff Gauge	Manual Flow Measurement	-	Manually	Gauge/ Current Meter	Fortnightly	PD RBOD -I Sukkhur	Irrigation Dept Sindh
Existing (SWHP)	1	B1	2006	Sindh	Hub		Indus	Hub River at Karpasaniwat	25.48555556	67.21138889	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			WAPDA SWHP
Existing (SWHP)	2	B2	1966	Sindh	Indus		Indus	Indus River at Dadu M.Bridge	26.7175	67.89277778	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			WAPDA SWHP
Existing (SWHP)	3	B3	1995	Sindh	Indus		Indus	Miro Khan Main Drain near M.K.Z.P Site No.2	27.74666667	68.10888889	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			WAPDA SWHP
Existing (SWHP)	4	B4	1995	Sindh	Indus		Indus	M.N.V.D at Hamal Regulator Site No.6	27.335	67.64833333	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			WAPDA SWHP

Existing (SWHP)	5	B5	1995	Sindh	Indus		Indus	M.N.V.D at RD-277 Nr.Goth A.H.Chandio Site No.10	27.036389	67.662778	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			WAPDA SWHP
Existing (SWHP)	6	B6	2011	Sindh	Indus		Indus	Manchar Lake at RD 68	26.51083333	67.62472222	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			WAPDA SWHP
Existing (SWHP)	7	B7	2011	Sindh	Indus		Indus	Aral Wah at Head	26.43972222	67.86083333	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			WAPDA SWHP
Existing (SWHP)	8	B8	2011	Sindh	Indus		Indus	Aral Wah at Regulator near Sehwan Site No. 25	26.4	67.86333333	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			WAPDA SWHP
Existing (SWHP)	9	B9	1995	Sindh	Indus		Indus	Miro Khan Drain at Warah Canal Site No.18	27.66	67.808056	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			WAPDA SWHP
Existing (SWHP)	10	B10	2011	Sindh	Indus		Indus	MNVD at Tail Site No. 28	26.510876	67.624737	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			WAPDA SWHP

SUMMARY TABLE – BALUCHISTAN

BALUCHISTAN NETWORK - TOTAL HYDROLOGICAL STATION (207)																
Existing Stations			Ongoing Stations		Up-gradation / New Proposed Stations											
PID	WAPDA		PID	WAPDA	CAT	UPGRADATION				NEW PROPOSED						
	SWHP	H&R		AFD		PID	WAPDA			PID	WAPDA					
							SWHP	H&R	Ongoing (AFD)		SWHP	WCAP	JICA	TIKA	FPSP-III	-
31			0	0	A	16					2		4		125	
					B	3					1		2		42	
					C				-				1		7	
			Total			19					3		7		174	
					Over Lap	12					15				73	
						31					18		7		247	
31			0		31					279						

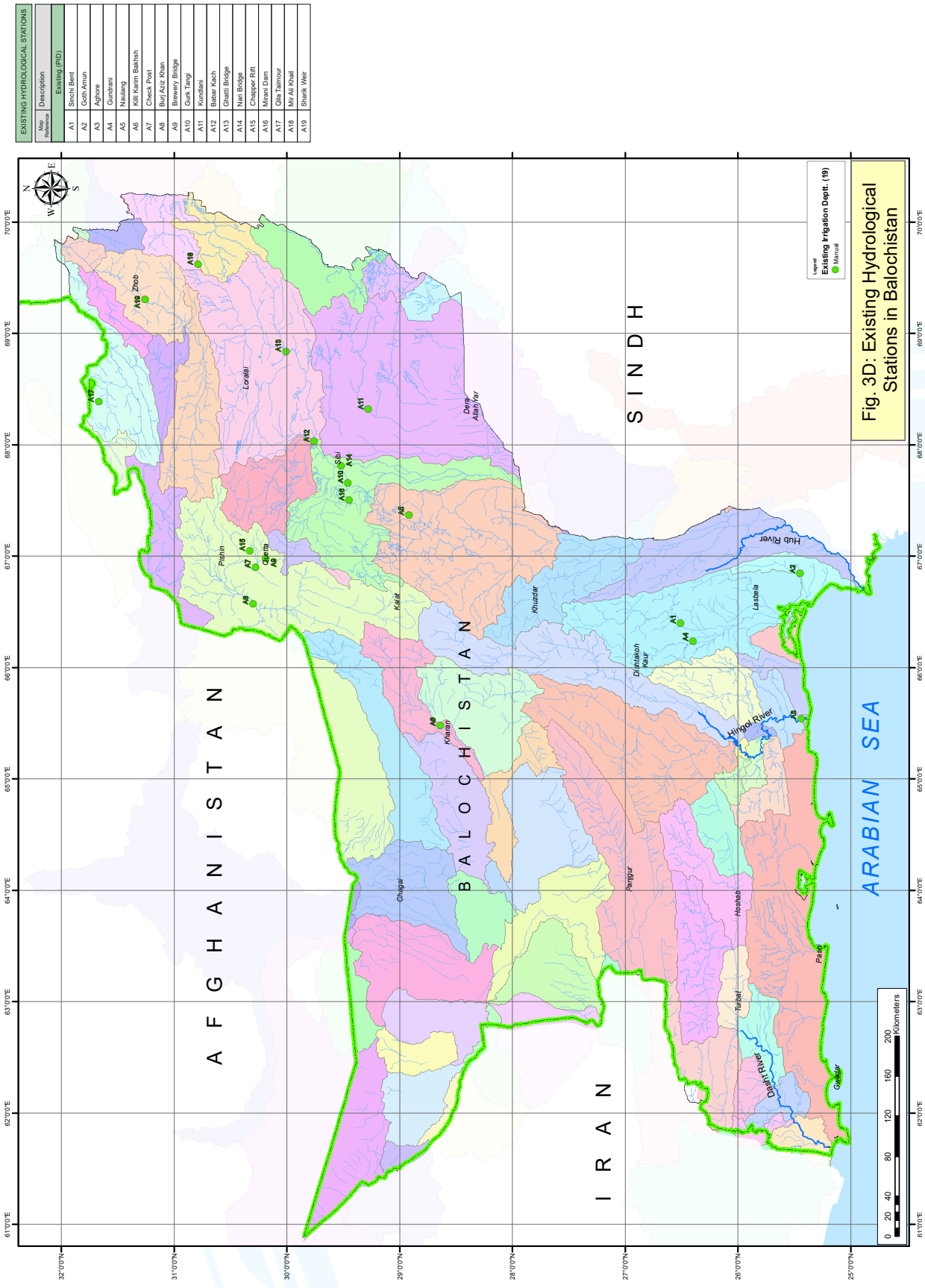


Fig. 3D: Existing Hydrological Stations in Balochistan

EXISTING HYDROLOGICAL STATIONS		
Map Reference	Description	
	Existing (PID)	
A1	Sinchi Bent	
A2	Goth Amun	
A3	Aghore	
A4	Gundrani	
A5	Naulang	
A6	Killi Karim Bakhsh	
A7	Check Post	
A8	Burj Aziz Khan	
A9	Brewery Bridge	
A10	Gurk Tangi	
A11	Kundiani	
A12	Baksar Kach	
A13	Ghatti Bridge	
A14	Nari Bridge	
A15	Chapper Rift	
A16	Mitsani Dam	
A17	Qila Taimour	
A18	Mir Ali Khail	
A19	Sharik Weir	

Longitude	Type Auto/Manual	Water stage Recording Equipment (Manual / Automatic)	Flow / Velocity Measurment	Additional Equipment	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Name/Contact No of site incharge	Organization responsible for O&M				
66.4	Manual	Staff Guages	Manual		Manual	Current Meter			Irrigation depatt:	Porali River	Sinchi Bent	26.51	66.4
66.85	Manual	Staff Guages	Manual		Manual	Current Meter			Irrigation depatt:	Windor Dora	Goth Amun	25.45	66.85
65.54	Manual	Staff Guages	Manual		Manual	Current Meter			Irrigation depatt:	Hingol River	Aghore	25.44	65.54
66.24	Manual	Staff Guages	Manual		Manual	Current Meter			Irrigation depatt:	Kud River	Gundrani	26.4	66.24
67.37	Manual	Staff Guages	Manual		Manual	Current Meter			Irrigation depatt:	Mula River	Naulang	28.92	67.37
65.48	Manual	Staff Guages	Manual		Manual	Current Meter			Irrigation depatt:	Baddo Rud	Killi Karim Bakhsh	28.64	65.48
66.9	Manual	Staff Guages	Manual		Manual	Current Meter			Irrigation depatt:	Baleli Nullah	Check Post	30.28	66.9
66.57	Manual	Staff Guages	Manual		Manual	Current Meter			Irrigation depatt:	Pishin Lora	Burj Aziz Khan	30.3	66.57
66.98	Manual	Staff Guages	Manual		Manual	Current Meter			Irrigation depatt:	Sariab Lora	Brewery Bridge	30.19	66.98
67.66	Manual	Staff Guages	Manual		Manual	Current Meter			Irrigation depatt:	Lehri River	Gurk Tangi	29.46	67.66

68.32	Manual	Staff Guages	Manual		Manual	Current Meter			Irrigation depatt:	Bolan River	Kundlani	29.28	68.32
68.03	Manual	Staff Guages	Manual		Manual	Current Meter			Irrigation depatt:	Beiji River	Babar Kach	29.76	68.03
68.84	Manual	Staff Guages	Manual		Manual	Current Meter			Irrigation depatt:	Beiji River	Ghatti Bridge	30.01	68.84
67.81	Manual	Staff Guages	Manual		Manual	Current Meter			Irrigation depatt:	Nari River	Nari Bridge	29.52	67.81
67.05	Manual	Staff Guages	Manual		Manual	Current Meter			Irrigation depatt:	Khost River	Chapper Rift	30.33	67.05
67.5	Manual	Staff Guages	Manual		Manual	Current Meter			Irrigation depatt:	Dasht River	Mirani Dam	29.45	67.5
68.39	Manual	Staff Guages	Manual		Manual	Current Meter			Irrigation depatt:	Zhob River	Qila Taimour	31.67	68.39
69.62	Manual	Staff Guages	Manual		Manual	Current Meter			Irrigation depatt:	Zhob River	Mir Ali Khail	30.79	69.62
69.31	Manual	Staff Guages	Manual		Manual	Current Meter			Irrigation depatt:	Zhob River	Sharik Weir	31.26	69.31

SUMMARY TABLE – GB

G.B NETWORK - TOTAL HYDROLOGICAL STATION (84)																		
Existing Stations			Ongoing Stations		Up-gradation / New Proposed Stations													
PID	WAPDA		PID	WAPDA	CAT	UPGRADATION				NEW PROPOSED								
	SW HP	H & R		AFD		PID	WAPDA			PID	WAPDA							
							SW HP	H& R	Ongoing (AFD)		SW HP	GB H& R	JICA	TIKA	HYCOS	DASU	GMRC	
	30		0		A		14			6		9				5	7	
					B		15			6		1		1		2	4	
					C				-			4				3		
			Total				29			12		14		1		10	11	
					Over Lap		1			24		6	1	1		5	2	
							30			36		20	1	2		15	13	
30					30					94								

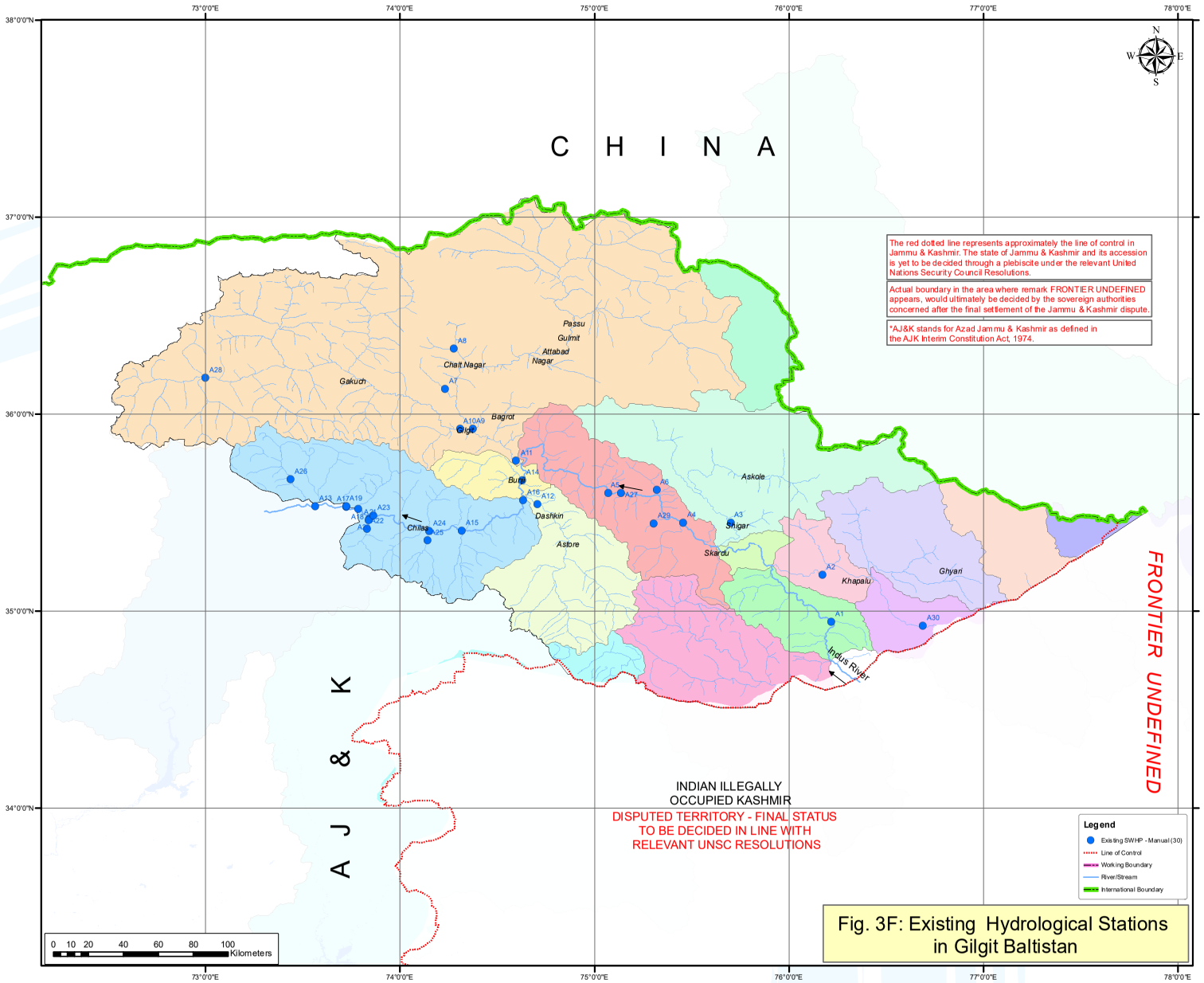


Fig. 3F: Existing Hydrological Stations in Gilgit Baltistan

EXISTING HYDROLOGICAL STATIONS	
Map Reference	Monitoring Station Ref.
Existing SWHP	
A1	Indus river at Kharmong
A2	Shyok river at Yogo
A3	Shiger river at Shiger
A4	Indus river at Kachura
A5	Talu Nullah at Talu
A6	Tormic Nullah at Tormic
A7	Naltar Nullah at Naltar Bala
A8	Dahitar(Denter) Nullah at Bassin
A9	Hunza river at Dainyor
A10	Gilgit river at Gilgit
A11	Gilgit river at Alam bridge
A12	Astore river at Doyan
A13	Indus river at Shatial
A14	Indus river at Bunji
A15	Indus River at Ganji Bridge
A16	Indus River at Thalichi Bridge
A17	Indus River D/S of Basha Dam
A18	Indus River at Khanbari
A19	Indus River at Dodishal
A20	Thor Nullah at Bridge
A21	Thor Nullah at Tail Race
A22	Thor Site at Shital
A23	Thor Site of D/S of Thor Colony
A24	Thak Nullah at Weir Site
A25	Thak Nullah at Tail Race Channel
A26	Tangir Nullah at Tangir
A27	Harpo Nullah at Harpo
A28	Ghizar River at Phandar
A29	Basho Lungma Nullah at Khar village
A30	Shyoke River at Chowar Near LOC

ANNEXURE - 3

Status	No. of Stations	Map Reference	Year of Installation	Province	Basin/ District	Sub Basin	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Longitude	Type Auto/Manual	Water stage Recording Equipment (Manual / Automatic)	Flow / Velocity Measurment	Additional Equipment	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Name/ Contact No of site incharge	Organization responsible for O&M
Existing (SWHP)	1	A1	1982	GB	Indus		Indus	Indus river at Kharmong	34.9472222	76.2169444	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	24 Hours	Ghulam Hasnain Hyd 0355-5284483	Wapda SWHP
Existing (SWHP)	2	A2	1972	GB	Indus		Indus	Shyok river at Yogo	35.1852778	76.1716667	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Muhammad Ali Azhar Hyd 05816-481450	Wapda SWHP
Existing (SWHP)	3	A3	2002	GB	Indus		Indus	Shiger river at Shiger	35.45	75.6988889	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Manzoor Hussain GO (D/W) 0345-5885185	Wapda SWHP
Existing (SWHP)	4	A4	1969	GB	Indus		Indus	Indus river at Kachura	35.4505556	75.4552778	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	24 Hours	Zahid Hussain Hyd (D/W) 0346-8485162	Wapda SWHP
Existing (SWHP)	5	A5	2005	GB	Indus		Tallu Nallah	Talu Nullah at Talu	35.5998321	75.0679318	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Muhammad Shakeel Hyd (D/W) 0344-8820996	Wapda SWHP
Existing (SWHP)	6	A6	2005	GB	Indus		Tormic Nallah	Tormic Nullah at Tormic	35.6163889	75.3180556	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Shakeel Ahmad Hyd (D/W) 0336-5225482	Wapda SWHP
Existing (SWHP)	7	A7	1994	GB	Indus		Nalter Nallah	Naltar Nullah at Naltar Bala	36.1291667	74.2311111	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Sayyam Ashraf (D/W) Hyd 0355-5752019	Wapda SWHP
Existing (SWHP)	8	A8	2005	GB	Indus		Denter Nallah	Dahitar(Denter) Nullah at Bassin	36.3316667	74.275	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Siraj ul Haq Hyd (D/W) 0312-8322023	Wapda SWHP
Existing (SWHP)	9	A9	1965	GB	Indus		Indus	Hunza river at Dainyor	35.9250562	74.3712607	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Shahid Hussain Hyd 0342-5118866	Wapda SWHP
Existing (SWHP)	10	A10	1960	GB	Indus		Indus	Gilgit river at Gilgit	35.9255353	74.3075403	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Shahid Hussain Hyd 0342-5118866	Wapda SWHP
Existing (SWHP)	11	A11	1966	GB	Indus		Indus	Gilgit river at Alam bridge	35.7652778	74.5977778	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Shahid Hussain Hyd 0342-5118866	Wapda SWHP
Existing (SWHP)	12	A12	1974	GB	Indus		Indus	Astore river at Doyan	35.545	74.7041667	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Naseer ur Rehman Hyd 0355-5110771	Wapda SWHP
Existing (SWHP)	13	A13	1983	GB	Indus		Indus	Indus river at Shatial	35.5322222	73.5644444	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Salman Ahmad Khan Hyd (D/W) 0355-5646144	Wapda SWHP
Existing (SWHP)	14	A14	1999	GB	Indus		Indus	Indus river at Bunji	35.665	74.6280556	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	24 Hours	Zahir Khan Hyd 0315-6201124	Wapda SWHP
Existing (SWHP)	15	A15	2002	GB	Indus		Indus	Indus River at Ganji Bridge	35.4097222	74.3159347	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Tanveer Hussain Hyd (D/W) 0355-5551113	Wapda SWHP
Existing (SWHP)	16	A16	2007	GB	Indus		Indus	Indus River at Thalichi Bridge	35.565	74.6331667	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Muhammad Qasim Hyd (Contrgent) 0312-5202175	Wapda SWHP
Existing (SWHP)	17	A17	2007	GB	Indus		Indus	Indus River D/S of Basha Dam	35.5313889	73.7208333	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Daroof GO (D/W) 0341-8440572	Wapda SWHP
Existing (SWHP)	18	A18	2012	GB	Indus		Indus	Indus River at Khanbari	35.5197222	73.7866667	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Muhammad Rawan GO (D/W) 0346-9292171	Wapda SWHP
Existing (SWHP)	19	A19	2012	GB	Indus		Indus	Indus River at Dodishal	35.5322222	73.7211111	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Barkat Ullah GO (D/W) 0355-5128381	Wapda SWHP
Existing (SWHP)	20	A20	2012	GB	Indus		Indus	Thor Nullah at Bridge	35.4697222	73.8407222	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	24 Hours	Zakir Ahmad Hyd (D/W) 0312-5600699	Wapda SWHP
Existing (SWHP)	21	A21	2016	GB	Indus		Indus	Thor Nullah at Tail Race	35.4641667	73.8369444	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	24 Hours	Zakir Ahmad Hyd (D/W) 0312-5600699	Wapda SWHP

Existing (SWHP)	22	A22	2012	GB	Indus		Indus	Thor Site at Shital	35.4177778	73.8288889	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	24 Hours	Usama (Contigent) Hyd 0355-5127899	Wapda SWHP
Existing (SWHP)	23	A23	2012	GB	Indus		Indus	Thor Site of D/S of Thor Colony	35.4858333	73.8616667	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	24 Hours	Sheryar Khan Hyd (Contigent) 0342-9628033	Wapda SWHP
Existing (SWHP)	24	A24	2012	GB	Indus		Indus	Thak Nullah at Weir Site	35.4066667	74.1480556	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	24 Hours	Muhammad Atif (Contigent) Hyd 0315-5300836	Wapda SWHP
Existing (SWHP)	25	A25	2012	GB	Indus		Indus	Thak Nullah at Tail Race Channel	35.3588889	74.1380556	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	24 Hours	Muhammad Atif (Contigent) Hyd 0315-5300836	Wapda SWHP
Existing (SWHP)	26	A26	2018	GB	Indus		Indus	Tangir Nullah at Tangir	35.6694444	73.4375	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	24 Hours	Abdul Haq Hyd (Contigent) 0355-4122098	Wapda SWHP
Existing (SWHP)	27	A27	2005	GB	Indus		Harpo Nallah	Harpo Nullah at Harpo	35.6004323	75.1360363	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Sharafat Ali GO (D/W) 0355-5195395	Wapda SWHP
Existing (SWHP)	28	A28	1996	GB	Indus		Indus	Ghizar River at Phandar	36.1837962	72.9987187	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	9 Hours	Amin Khan (D/W) Chow: 0355-5132638	Wapda SWHP
Existing (SWHP)	29	A29	2005	GB	Indus		Indus	Basho Lungma Nullah at Khar village	35.4444444	75.3027778	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	-	Site Closed by Sponsoring Agency	Wapda SWHP
Existing (SWHP)	30	A30	2014	GB	Chitral		Indus	Shyoke River at Chowar Near LOC	34.9261111	76.6888889	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter	24 Hours	Ghulam Abbas Hyd (D/W) 0355-5230165	SWHP

SUMMARY TABLE – AJK

AJK NETWORK - TOTAL HYDROLOGICAL STATION (33)																
Existing Stations			Ongoing Stations		Up-gradation / New Proposed Stations											
PID	WAPDA		PID	WAPDA	CAT	UPGRADATION				NEW PROPOSED						
	SWHP	H&R		AFD		PID	WAPDA			PID	WAPDA					
							SW HP	H&R	On going (AFD)		SW HP	Mangla	JICA	TIKA	FPSP-III	Consultant
	15	10	0	0	A		11	03	0	0		1	0	0	5	3
					B		04			0			0		1	
					C				-	0		1	0			
			Total				15	3				2			6	3
					Over Lap			07		0		3	0		6	0
							15	10	0	0		5	0		12	3
25			0		25					24						

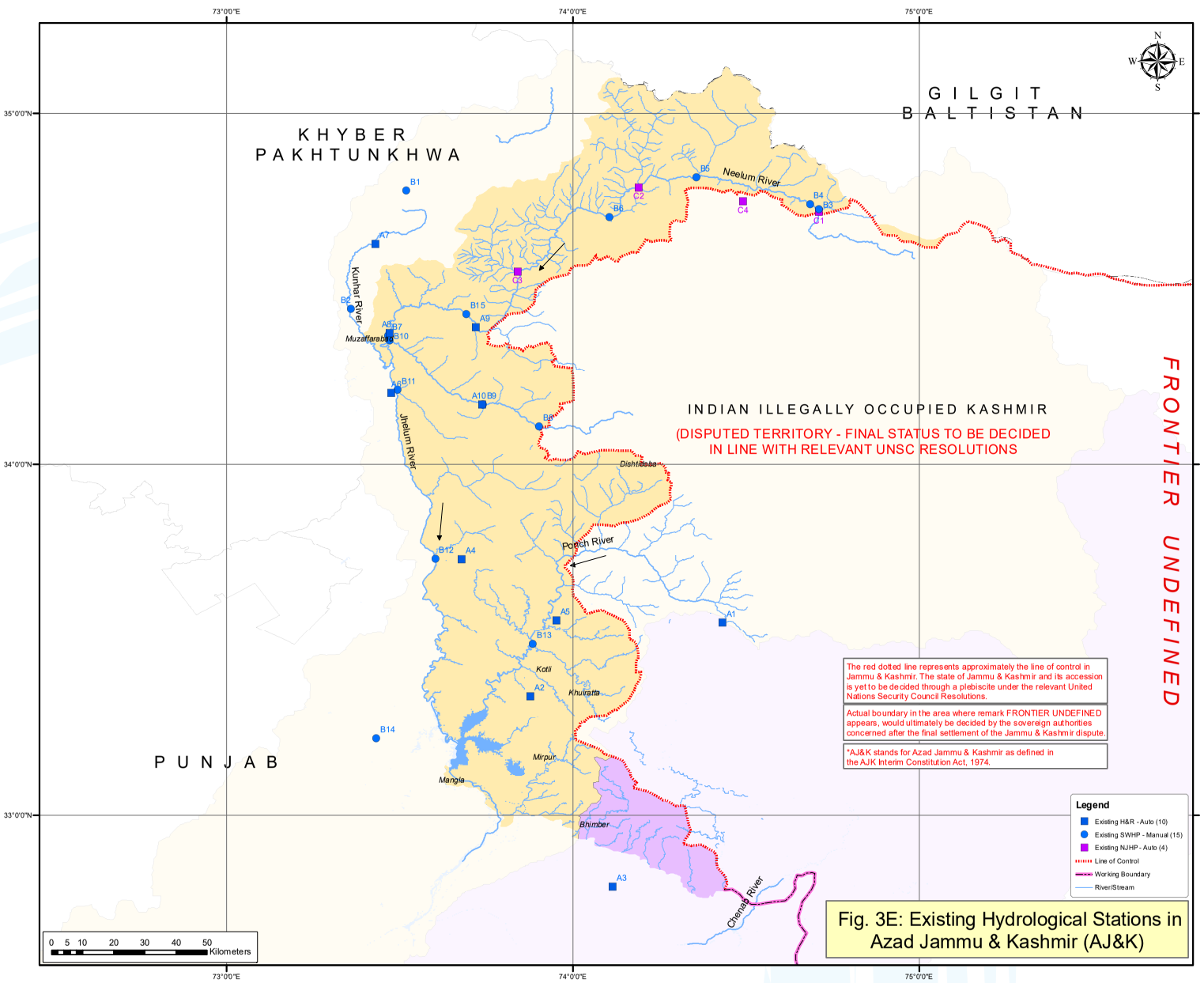


Fig. 3E: Existing Hydrological Stations in Azad Jammu & Kashmir (AJ&K)

EXISTING HYDROLOGICAL STATIONS	
Map Reference	Description
Existing (H&R)	
A1	Mangla
A2	Kotli
A3	Kund
A4	Plandri
A5	Shair Ka Kota
A6	Chattar Kallas (Kohala)
A7	Domel
A8	Muzaffarbad
A9	Neelum Nauseri
A10	Jhelum Hatain Bala
Existing (SWHP)	
B1	Kunhar river at Kaghan
B2	Kunhar river at Talhutta
B3	Gagai Nullah at Taubat
B4	Neelum River at Karimabad
B5	Neelum river at Kel
B6	Neelum River at Dudhnial
B7	Neelum river at Muzaffarabad
B8	Jhelum river at Chakothi
B9	Jhelum river at Hattian Bala
B10	Jhelum river at Domel
B11	Jhelum river at Chattarklass
B12	Jhelum river at Azad Pattan
B13	Poonch river at Kotli
B14	Kanshi river near Palote
B15	Neelum River at Nauseri
Existing (NJHPC)	
C1	Taobat
C2	Sharda
C3	Islampura
C4	Karimabad

ANNEXURE - 3

Status	No. of Stations	Map Reference	Year of Installation	Province	Basin/ District	Sub Basin	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Longitude	Type Auto/Manual	Water stage Recording Equipment (Manual / Automatic)	Flow / Velocity Measurment	Additional Equipment	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Name/Contact No of site incharge	Organization responsible for O&M
Existing (H&R)	1	A1	1998	AJ&K	Mirpur		Jhelum	Mangla	33.12844	73.6343	Auto	Automatic /PT	Manual	Rain	GSM	Current Meter	Minute	Muhammad Shahbaz	H&R Dte.
Existing (H&R)	2	A2	1998	AJ&K	Kotli		Ponch	Kotli	33.34	73.8775	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Muhammad Syyab	H&R Dte.
Existing (H&R)	3	A3	1998	AJ&K	Mirpur			Kund	32.79694444	74.11527778	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Abdul Basit	H&R Dte.
Existing (H&R)	4	A4	1998	AJ&K	Sudhanoti			Plandri	33.73027778	73.67944444	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Nafees Imtiaz	H&R Dte.
Existing (H&R)	5	A5	1998	AJ&K	Muzaffarabad			Shair Ka Kota	33.555	73.95111111	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Javaid Iqbal	H&R Dte.
Existing (H&R)	6	A6	1998	AJ&K	Muzaffarabad		Jehlum	Chattar Kallas (Kohala)	34.20444444	73.498189	Auto	Automatic /PT	Manual	Rain	MBC	Current Meter	Hourly	Hussain Afzal	H&R Dte.
Existing (H&R)	7	A7	1998	AJ&K	Muzaffarabad		Jehlum	Domel	34.35422	73.470293	Auto	Automatic /PT	Manual	Rain	GSM	Current Meter	Minute	Muhammad Nasim	H&R Dte.
Existing (H&R)	8	A8	1998	AJ&K	Muzaffarabad		Neelum	Muzaffarbad	34.37416667	73.47027778	Auto	Automatic /PT	Manual	Rain	GSM	Current Meter	Minute	Shoukat Hussain Kayani	H&R Dte.
Existing (H&R)	9	A9	2007	AJ&K	Muzaffarabad		Neelum	Neelum Nauseri	34.39138889	73.72027778	Auto	Automatic /PT	Manual	Rain	Satellite	Current Meter	Minute	Muhammad Nasir	H&R Dte.
Existing (H&R)	10	A10	2007	AJ&K	Muzaffarabad		Jehlum	Jehlum Hatain Bala	34.1716514	73.7374193	Auto	Automatic /PT	Manual	Rain	Satellite	Current Meter	Minute	Adnan Anwar	H&R Dte.
Existing (SWHP)	1	B1	2009	AJ&K			Jhelum	Kunhar river at Kaghan	34.78	73.51972222	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			SWHP
Existing (SWHP)	2	B2	1995	AJ&K			Jhelum	Kunhar river at Talhutta	34.443867	73.35905	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			SWHP
Existing (SWHP)	3	B3	1991	AJ&K			Jhelum	Gagai Nullah at Taubat	34.7275	74.71055556	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			SWHP
Existing (SWHP)	4	B4	2010	AJ&K			Jhelum	Neelum River at Karimabad	34.74194444	74.68416667	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			SWHP
Existing (SWHP)	5	B5	2012	AJ&K			Jhelum	Neelum river at Kel	34.81888889	74.35666667	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			SWHP
Existing (SWHP)	6	B6	1983	AJ&K			Jhelum	Neelum River at Dudhnial	34.70472222	74.10583333	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			SWHP
Existing (SWHP)	7	B7	1962	AJ&K			Jhelum	Neelum river at Muzaffarabad	34.3675	73.46611111	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			SWHP
Existing (SWHP)	8	B8	2012	AJ&K			Jhelum	Jhelum river at Chakothi	34.10805556	73.9025	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			SWHP
Existing (SWHP)	9	B9	1997	AJ&K			Jhelum	Jhelum river at Hattian Bala	34.17138889	73.73944444	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			SWHP
Existing (SWHP)	10	B10	1974	AJ&K			Jhelum	Jhelum river at Domel	34.35361111	73.47055556	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			SWHP
Existing (SWHP)	11	B11	1997	AJ&K			Jhelum	Jhelum river at Chattarklass	34.2125	73.49444444	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			SWHP

Existing (SWHP)	12	B12	1974	AJ&K			Jhelum	Jhelum river at Azad Pattan	33.73138889	73.60222222	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			SWHP
Existing (SWHP)	13	B13	1960	AJ&K			Jhelum	Poonch river at Kotli	33.48888889	73.88472222	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			SWHP
Existing (SWHP)	14	B14	1970	AJ&K			Jhelum	Kanshi river near Palote	33.22027778	73.43194444	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			SWHP
Existing (SWHP)	15	B15	1990	AJ&K			Jhelum	Neelum River at Nauseri	34.42908611	73.692225	Manual	Staff Gauge / Manual	Manual	N.A.	Manual	Current Meter			SWHP
Existing (NJHPC)	1	C1		AJ&K			Neelum	Taobat	34.72	74.71	Auto	Manual Staff Gauge	Auto	Rain, Temperature, Relative Humidity,		Flow/Velocity Sensor			H&R Dte.
C. EXISTING (NJHPC)	2	C2		AJ&K			Neelum	Sharda	34.79	74.19	Auto	Manual Staff Gauge	Auto	Rain, Temperature, Relative Humidity,		Flow/Velocity Sensor			H&R Dte.
Existing (NJHPC)	3	C3		AJ&K			Neelum	Islampura	34.55	73.84	Auto	Manual Staff Gauge	Auto	Rain, Temperature, Relative Humidity,		Flow/Velocity Sensor			H&R Dte.
Existing (NJHPC)	4	C4		AJ&K			Neelum	Karimabad	34.75	74.49	Auto	Manual Staff Gauge	Auto	Rain, Temperature, Relative Humidity,		Flow/Velocity Sensor			H&R Dte.

ANNEXURE - 4

INVENTORY OF ON-GOING PROJECTS FOR HYDROLOGICAL NETWORK

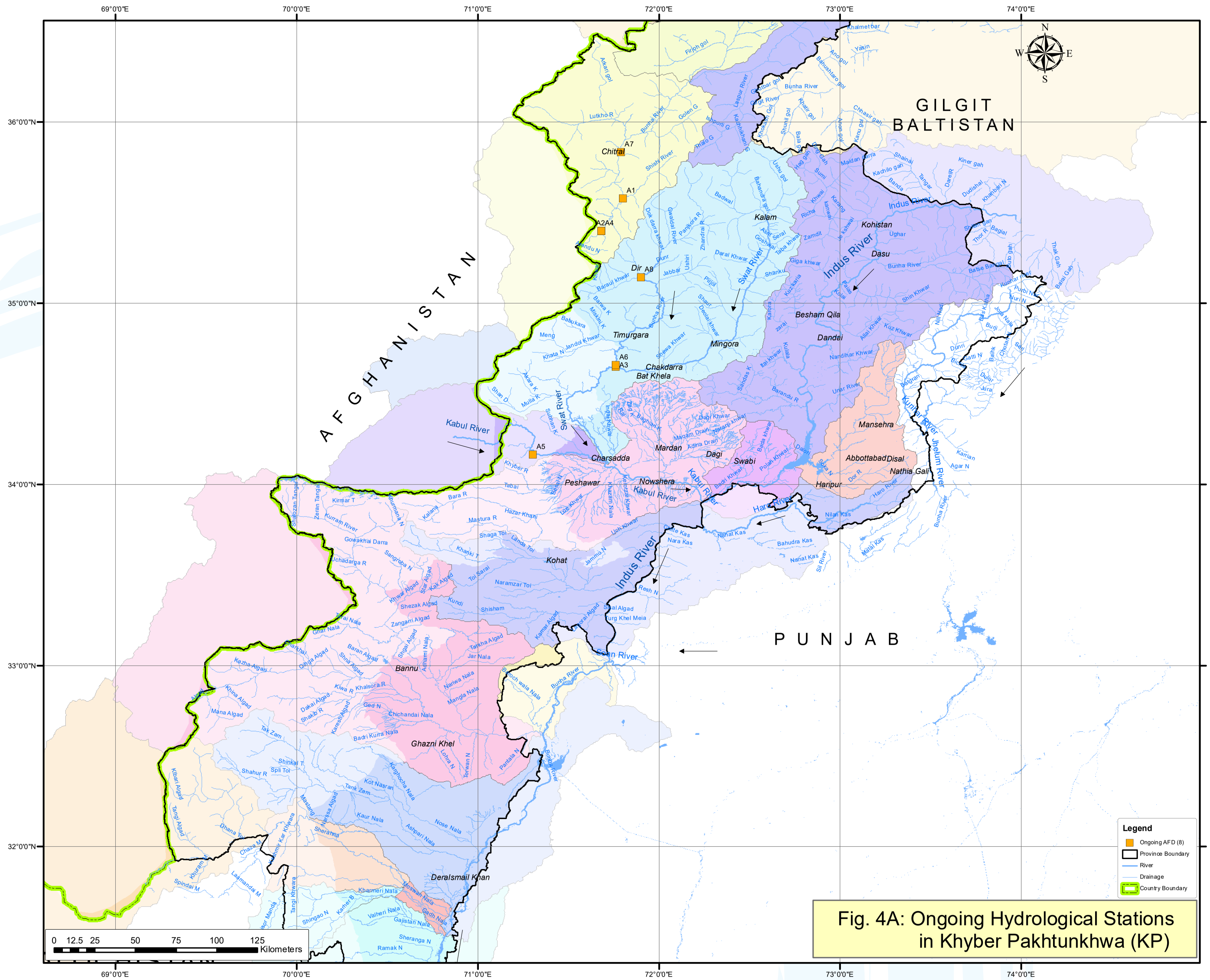


Fig. 4A: Ongoing Hydrological Stations in Khyber Pakhtunkhwa (KP)

ONGOING HYDROLOGICAL STATIONS	
Map Reference	Description
Upgradation (Ongoing, AFD)	
D1	Shisi Bridge
D2	Arrandu
D3	Boausak
D4	Kahoti Br. Arrandu
D5	(Shaheed Mina) Khyber Agency
D6	Up stream Munda Dam
D7	Chitral
D8	Chitral

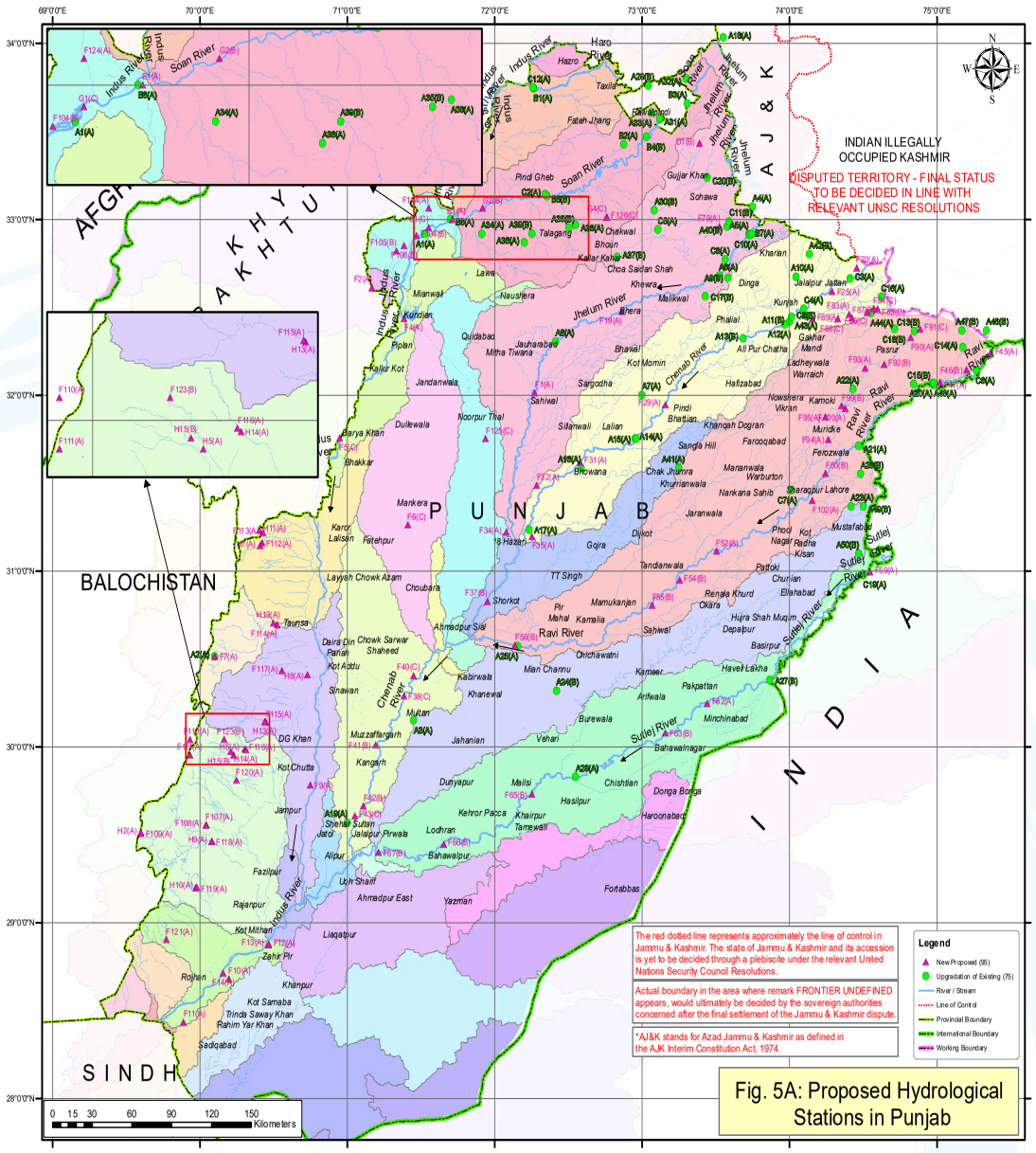
Table - 4A

Ongoing Hydrological Stations - Khyber Pakhtunkhwa

Status	No. of Stations	Map Reference	Province	Basin/ District	Sub Basin	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Longitude	Water stage Recording Equipment (Manual / Automatic)	Flow / Velocity Measurment	Additional Equipment	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M
ON-GOING (AFD)	1	D1	KPK			Chitral	Shisi Bridge	35.58	71.8	Manual Staff Gauge/Automatic PT	Auto	Rain, Temperature, Relative Humidity, Wind,Turbidity	GSM	ADCP	15 Minutes	H&R Dte
ON-GOING (AFD)	2	D2	KPK			Arrandu Nullah	Arrandu	35.4	71.68	Manual Staff Gauge/Automatic PT	Auto	Rain, Temperature, Relative Humidity, Wind,Turbidity	Satellite	ADCP	15 Minutes	H&R Dte
ON-GOING (AFD)	3	D3	KPK			Swat river	Boausak	34.65	71.76	Manual Staff Gauge/Automatic PT	Auto	Rain, Temperature, Relative Humidity, Wind,Turbidity	GSM	ADCP	15 Minutes	H&R Dte
ON-GOING (AFD)	4	D4	KPK			Chitral	Kahoti Br. Arrandu	35.4	71.68	Manual Staff Gauge/Automatic PT	Auto	Rain, Temperature, Relative Humidity, Wind,Turbidity	GSM	ADCP	15 Minutes	H&R Dte
ON-GOING (AFD)	5	D5	KPK			Kabul	(Shaheed Mina) Khyber Agency	34.1663	71.302	Manual Staff Gauge/Automatic PT	Auto	Rain, Temperature, Relative Humidity, Wind,Turbidity	Satellite	ADCP	15 Minutes	H&R Dte
ON-GOING (AFD)	6	D6	KPK			Panjkora	Up stream Munda Dam	34.66	71.76	Manual Staff Gauge/Automatic PT	Auto	Rain, Temperature, Relative Humidity, Wind,Turbidity	GSM	ADCP	15 Minutes	H&R Dte
ON-GOING (AFD)	7	D7	KPK			Chitral	Chitral	35.836	71.789	Manual Staff Gauge/Automatic PT	Auto	Rain, Temperature, Relative Humidity, Wind,Turbidity	GSM	ADCP	15 Minutes	H&R Dte
ON-GOING (AFD)	8	D8	KPK			Panjkora	Chitral	35.145	71.9	Manual Staff Gauge/Automatic PT	Auto	Rain, Temperature, Relative Humidity, Wind,Turbidity	GSM	ADCP	15 Minutes	H&R Dte

ANNEXURE - 5

INVENTORY OF PROPOSED HYDROLOGICAL NETWORK



The red dotted line represents approximately the line of control in Jammu & Kashmir. The state of Jammu & Kashmir and its accession is yet to be decided through a plebiscite under the relevant United Nations Security Council Resolutions.

Actual boundary in the area where remark FRONTIER UNDEFINED appears, would ultimately be decided by the sovereign authorities concerned after the final settlement of the Jammu & Kashmir dispute.

*AJ&K stands for Azad Jammu & Kashmir as defined in the AJK Interim Constitution Act, 1974.

Fig. 5A: Proposed Hydrological Stations in Punjab

UPGRADATION OF EXISTING HYDROLOGICAL STATIONS

Map Reference	Description
Upgradation (Existing, PID)	
A1	Jinnah Barrage
A2	Taunsa Barrage
A3	Ghazi ghat bridge
A4	Bong Mangla Down D/s
A5	Jhelum Railway Bridge
A6	Rasul Barrage
A7	Victoria Railway Bridge
A8	Khushab Railway Bridge
A9	Bajwat road Bridge River Jammu tavi
A10	Marala head work
A11	Alexandra Bridge
A12	Khanki Head Works
A13	Qadirabad Barrage
A14	Chiniout Railway Bridge (Right Side Creak)
A15	Chiniout Railway Bridge (Left Side Creak)
A16	Revaz bridge
A17	Trimmu Barrage
A18	shershah bridge

Map Reference	Description
A19	punjnad headwork
A20	jassar Railwy Bridge
A21	Ravi Syphon
A22	Shahdra Railway Bridge
A23	Balloki Headworks
A24	Chichawatni Road Bridge
A25	sidhnai headworks
A26	Bakarke
A27	Sulemanki head work
A28	islam headwork
A29	Soan River at Dhok Chiniot.
A30	Small Korang at Chattar Bagh.
A31	Korang River at Lohi Bher.
A32	Korang Nullah at Bari Kangran.
A33	Leh Nullah at Liaqat Bagh Rawalpindi.
A34	Soan River at Makhad.
A35	Ghimber River at Nika Kahut.
A36	Sirri Nullah at Bhider Village.
A37	Ghimber Nullah at Danda Shah.
A38	Dharrab River at Dharab Bridge.
A39	Ankar Nullah at Dhok Baza

Map Reference	Description
A40	Kohan Nullah at Rohtas.
A41	Bunnah Nullah at Pind Sawika.
A42	Halsi Nullah at Bollainwala.
A43	Palkhu Nullah at Wazirabad.
A44	Ura Nullah at Sialkot
A46	Bein Nullah at Chakamru
A47	Bein Nullah at Shikaker Garh
A48	Bassantar Nullah at Jassar
A49	Hudara Nullah at BRBD Crossing
A50	Rohi Nallah at Kasur
Upgradation (Existing WAPDA, SWHP)	
B1	Haro river at Gurriala
B2	Sil river near Chahan
B3	Soan river at Chirrah
B4	Soan river at Gorakhpur
B5	Soan river at Dhok Pattan
B6	Indus river at Massan
B7	Jhelum river at Jhelum

Map Reference	Description
Upgradation of Existing WCAP (20) WAPDA, H&R	
C2	Dhok Pathan
C3	Marala - D/S
C4	Alexendra Bridge
C5	Baba Shah Jalal
C6	Kot Naina
C7	Deg Diversion Channel
C8	Chakri
C9	Bhinber Nullah
C10	Sarai Alamgir
C11	Rohtas
C12	Garhiala
C13	Zafarwal
C14	Shakargarah
C15	Jassar
C16	Palku
C17	Daulat Nagar
C18	Ura
C19	G S Wala
C20	Palote

ADDITIONAL PROPOSED HYDROLOGICAL STATIONS

Map Reference	Description
New Proposed Mangla H&R	
D1	Kalar Syedan
New Proposed (Wapda, WCAP)	
E1	Massan
New Proposed (PID)	
F1	Kalabagh Mari indus Railway Bridge
F2	Dara Tang at Kurram River
F4	Chashma Barrage on River Indus
F5	Dera ismial Khan Bridge on River indus
F6	Shah wala groyne RD 47+000 on River indus
F7	Taunsa Barrage
F9	Ganda jhakar imam shah
F10	Minchin Flood Bund RD 197+000 on River Indus
F11	Minchin Flood Bund RD 450+000 on River indus
F12	Chachran Link Bund RD 78+000 on River indus
F13	Benazirabad Bridge on River Indus
F14	Rojhan Bridge
F19	Bhera Motor way Bridge on River Jhelum
F22	Road Bridge River Manawar Tavi
F25	SialKot AirPort Road Bridge on River Chenab (Shahbazpur)
F29	Motor way Bridge Talab wala on River Chenab
F31	Ghulam Muhammad Lali Bridge (Kalri) on River Chenab
F32	Chund Barhawana Bridge on River Chenab
F34	RD 40+000 RMB Trimmu Barrage

Map Reference	Description
F35	RD 46+000 LMB Trimmu Barrage
F37	Sultan Bahoo Bridge on River Chenab on River Chenab
F38	Muhammad wala Bridge on River Chenab
F40	Muzaffar ghar FPB RD 0+00 on River Chenab
F41	Khanghar FPB RD 25+000 on River Chenab
F42	Shehr Sultan FPB RD 20+000 on River Chenab
F43	Shehr Sultan FPB RD 50+000 on River Chenab
F45	Jalala Flood Bund RD 12+000 on River Ravi
F46	Beko chack FPB 13+000 on River Ravi
F47	Kartar Pur Bridge
F50	Lahore-Sialkot Motorway Bridge
F52	Sayeedwala bridge
F54	Mari Pattan Bridge on River Ravi
F55	Qatab Shana Bridge on River Ravi
F58	Motor way Lahore to Multan Bridge on River Ravi
F59	Ganda sing wala Gauge Station on River Sutlej
F62	Pakpattan to Minchinabad Road Bridge on River Sutlej
F63	Arifwala to Shawal Road Bridge on River Sutlej
F65	Malsi Syphon Bridge on River Sutlej
F66	Bahawal Pur Road Bridge on River Sutlej
F67	Sukkar Multan Motor way Bridge on River Sutlej
F79	Kohan Nullah at Rohtas.

Map Reference	Description
F83	Mallah Chak Flood Protection Bund along Aik Nullah
F84	Raiwaly Bridge on Nullah Aik D/S Aura
F85	Ura Bridge
F86	City flood Protection Bund along Aik Nullah
F87	M R Link Supper Passage for Aik Nullah
F88	UCC Siphon for Aik Nullah
F89	Sialkot Wazirabad Bridge for Aik Nullah
F90	Flood Protection Bund along Deg Nullah D/S Chahoor Bridge
F91	Kingra Bridge
F92	DEG NULLAH OF SUPERPASSAGE RD. 220+122 MRL Crossing
F93	DEG NULLAH OF SUPERPASSAGE BRBD Crossing
F94	G.T Road Bridge Kala Shah kaku
F95	G.T Road Bridge Khori
F99	Bridge at Lailah
F100	Bridge at Bhed
F102	LHR-MULTAN ROAD Crossing
F104	Chichali Nullah (Bridge Mianwali Bannu road)
F105	Broach Nullah (Bridge Mianwali Bannu road)
F106	Adwala Nullah (Bridge Mianwali Bannu road)
F107	Said Alaf, Kaha Nullah
F108	Kaha Nullah Harand Dam
F109	Kaha Nullah Muranj Dam
F110	Rakhi Nullah
F111	Rakhi Nullah

Map Reference	Description
F112	Vehova
F113	Kaura Nullah
F114	Sanghar Nullah
F115	Vidore Nullah
F116	Sakhi Sarwar
F117	Suri Nullah
F118	Chachar Nullah
F119	Pitok Nullah
F120	Mithawan
F121	Zangi
F123	Suri Janobi
F124	Tarap Bridge @ Soan
F125	Chiniot Dam
F126	Aral Wah @ Lakhwal Dam
New Proposed (WAPDA, (JICA)	
G1	Kala Bagh @ Indus
G2	Tarap Bridge @ Soan
G4	Aral Wah
Proposed Wapda (Hill Torrents)	
H2	kaha Nullah
H5	Mithawan
H7	vehowa
H8	Suri Nullah
H9	Chachar Nullah
H10	Pitok Nullah
H11	Kaura Nullah
H12	Sanghar Nullah
H13	Vidore Nullah
H14	Sakhi Serwar
H15	Suri Shumali

Table -5A

Proposed Hydrological Stations - Punjab

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
CATEGORY - A																
Upgradation (Existing, PID)	1	A1	Punjab	Mianwali/ Indus River	Main River	Jinnah Barrage	32.91527778	71.5275	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	2	A2	Punjab	M. Garh/ Indus River	Main River	Taunsa Barrage	30.51277778	70.09916667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	3	A3	Punjab	M. Garh/ Indus River	Main River	Ghazi ghat bridge	30.15	71.45	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	4	A4	Punjab	Jhelum / Jhelum River	Main River	Bong Mangla Down D/s	33.06972222	73.74972222	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	5	A5	Punjab	Jhelum / Jhelum River	Main River	Jhelum Railway Bridge	32.91333333	73.72277778	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	6	A6	Punjab	M.Bahauddin/ Jhelum River	Main River	Rasul Barrage	32.67833333	73.52222222	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	7	A7	Punjab	M.Bahauddin/ Jhelum River	Main River	Victoria Railway Bridge	32	73	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	8	A8	Punjab	Khushab/ Jhelum River	Main River	Khushab Railway Bridge	32.30277778	72.41305556	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	9	A10	Punjab	Sialkot/ Chenab River	Main River	Marala head work	32.67333333	74.04722222	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	10	A12	Punjab	Gujrawala/ Chenab River	Main River	Khanki Head Works	32.40194444	73.96722222	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	11	A14	Punjab	Chiniot/ Chenab River	Main River	Chiniout Railway Bridge (Right Side Creak)	31.75194444	72.94888889	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	12	A15	Punjab	Chiniot/ Chenab River	Main River	Chiniout Railway Bridge (Left Side Creak)	31.75208333	72.95611111	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	13	A16	Punjab	Jhang/ Chenab River	Main River	Revaz bridge	31.58333333	72.58333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	14	A17	Punjab	Jhang/ Chenab River	Main River	Trimmu Barrage	31.23333333	72.23333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	15	A18	Punjab	M. Garh/ Chenab River	Main River	shershah bridge	34.033333	73.55	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	16	A19	Punjab	Bahawalpur/ Chenab River	Main River	punjnad headwork	29.56666667	71	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	17	A20	Punjab	Narowal/ Ravi River	Main River	jassar Railwy Bridge	32.06666667	74.96666667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	18	A21	Punjab	Lahore/ Ravi River	Main River	Ravi Syphon	31.71	74.47	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	19	A22	Punjab	Lahore/ Ravi River	Main River	Shahdra Railway Bridge	32.03333333	74.43333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	20	A23	Punjab	Kasur/ Ravi River	Main River	Balloki Headworks	31.36666667	74.41666667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	21	A25	Punjab	Abdul Hakim/ Ravi River	Main River	sidnhai headworks	30.57222222	72.15777778	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	22	A28	Punjab	Bahwalpur / Sutlej River	Main River	islam headwork	29.82638889	72.54916667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
Upgradation (Existing, PID)	23	A31	Punjab	Rawalpindi.	Nullah	Korang River at Lohi Bher.	33.57083333	73.11666667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	24	A32	Punjab	Rawalpindi.	Nullah	Korang Nullah at Bari Kangran.	33.8	73.3	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	25	A33	Punjab	Rawalpindi.	Tertiary	Leih Nullah at Liaqat Bagh Rawalpindi.	33.605335	73.06175	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	26	A34	Punjab	Attock/ Soan River	Secondary	Soan River at Makhad.	32.91666667	71.90833333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	27	A36	Punjab	Chakwal	Nullah	Sirri Nullah at Bhider Villige.	32.86666667	72.2	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	28	A38	Punjab	Chakwal	Nullah	Dharrab River at Dharab Bridge.	32.96666667	72.55	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	29	A41	Punjab	Jhelum	Nullah	Bunnah Nullah at Pind Sawika.	31.58333333	73.25	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	30	A43	Punjab	Gujranwala	Nullah	Palkhu Nullah at Wazirabad.	32.44944444	74.11138889	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	31	A44	Punjab	Sialkot/ Aik Nullah	Nullah	Ura Nullah at Sialkot	32.46666667	74.55	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing, PID)	32	A48	Punjab	Narowal	Nullah	Bassantar Nullah at Jassar	32.06666667	74.97916667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Upgradation (Existing WAPDA, SWHP)	33	B1	Punjab		Indus	Haro river at Gurriala	33.74444444	72.2625	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	Wapda SWHP	A
Upgradation (Existing WAPDA, SWHP)	34	B2	Punjab		Indus	Sil river near Chahan	33.42583333	72.875	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	Wapda SWHP	A
Upgradation (Existing WAPDA, SWHP)	35	B3	Punjab		Indus	Soan river at Chirrah	33.65694444	73.30416667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	Wapda SWHP	A
Upgradation (Existing WAPDA, SWHP)	36	B6	Punjab		Indus River	Indus river at Massan	33	71.69861111	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	Wapda SWHP	A
Upgradation (Existing WAPDA, SWHP)	37	B7	Punjab		Jhelum	Jhelum river at Jhelum	32.90833333	73.73083333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	Wapda SWHP	A
Upgradation of Existing WCAP (20) WAPDA, H&R	38	C2	Punjab	Chakwal	Swan River	Dhok Pathan	33.14194444	72.34444444	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
Upgradation of Existing WCAP (20) WAPDA, H&R	39	C3	Punjab	Gujrat	Chenab	Marala - D/S	32.66083333	74.41083333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
Upgradation of Existing WCAP (20) WAPDA, H&R	40	C4	Punjab	Gujrat	Chenab	Alexendra Bridge	32.48888889	74.09805556	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
Upgradation of Existing WCAP (20) WAPDA, H&R	41	C5	Punjab	Chakwal	Jhelum River	Baba Shah Jalal	32.93916667	73.10694444	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
Upgradation of Existing WCAP (20) WAPDA, H&R	42	C6	Punjab	Narowal	Ravi River	Kot Naina	32.13888889	75.26277778	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
Upgradation of Existing WCAP (20) WAPDA, H&R	43	C7	Punjab	Sheikhupura	Deg Nullah	Deg Diversion Channel	31.45916667	74.015	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
Upgradation of Existing WCAP (20) WAPDA, H&R	44	C8	Punjab	Jehlum	Bunha River	Chakri	32.76944444	73.55972222	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
Upgradation of Existing WCAP (20) WAPDA, H&R	45	C10	Punjab	Jehlum	Jhelum River	Sarai Alamgir	32.91388889	73.74166667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
Upgradation of Existing WCAP (20) WAPDA, H&R	46	C12	Punjab	Attock	Haro River	Garhiala	33.74722222	72.26138889	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
Upgradation of Existing WCAP (20) WAPDA, H&R	47	C14	Punjab	Narowal	Bein Nullah	Shakargarah	32.27055556	75.17333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
Upgradation of Existing WCAP (20) WAPDA, H&R	48	C16	Punjab	Sialkot	Sialkot Nullah	Palku	32.55694444	74.62194444	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
Upgradation of Existing WCAP (20) WAPDA, H&R	49	C19	Punjab	Kasur	Sutlej River	G S Wala	30.98	74.5	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
New Proposed (Wapda, WCAP)	50	E1	Punjab		Indus	Massan	33	71.71	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
New Proposed (PID)	51	F1	Punjab	Mianwali/ Indus River	Indus River	Kalabagh Mari indus Railway Bridge	32.01388889	72.27277778	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	52	F2	Punjab	Mianwali/ Kurram River	Kurrum River	Dara Tang at Kurram River	32.609795	71.166671	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	53	F4	Punjab	Mianwali/ Indus River	Indus River	Chashma Barrage on River indus	32.43527778	71.38583333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	54	F7	Punjab	M. Garh/ Indus River	Indus River	Taunsa Barrage	30.51277778	70.09916667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	55	F9	Punjab	DG Khan/ Indus River	Indus River	Ganda jhakar imam shah	29.78088611	70.74695833	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	56	F10	Punjab	RY Khan/ Indus River	Indus River	Minchin Flood Bund RD 197+000 on River indus	28.678944	70.19407	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	57	F11	Punjab	RY Khan/ Indus River	Indus River	Minchin Flood Bund RD 450+000 on River indus	28.434218	69.886796	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	58	F12	Punjab	Chachran/ Indus River	Indus River	Chachran Link Bund RD 78+000 on River indus	28.872551	70.465914	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	59	F13	Punjab	Chachran/ Indus River	Indus River	Benazirabad Bridge on River indus	28.87611111	70.46305556	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	60	F14	Punjab	Rajanpur/ Indus River	Indus River	Rojhan Bridge	28.71138889	70.1581	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	61	F19	Punjab	Sargodha/ Jhelum River	Jhelum River	Bhera Motor way Bridge on River Jhelum	32.47388889	72.86194444	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	62	F22	Punjab	Gujrat/ Manawar Tawi	Jhelum River	Road Bridge River Manawar Tavi	32.72305556	74.45305556	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	63	F25	Punjab	Sialkot/ Chenab River	Chenab River	SialKot AirPort Road Bridge on River Chenab (Shahbazpur)	32.58888889	74.29083333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	64	F29	Punjab	Hafazabad/ Chenab River	Chenab River	Motor way Bridge Talab wala on River Chenab	31.94388889	73.15638889	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	65	F31	Punjab	Sargodha/ Chenab River	Chenab River	Ghulam Muhammad Lali Bridge (Kalri) on River Chenab	31.6175	72.57861111	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	66	F32	Punjab	Sargodha/ Chenab River	Chenab River	Chund Barhawana Bridge on River Chenab	31.48666667	72.28416667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed (PID)	67	F34	Punjab	Jhang/ Chenab River	Chenab River	RD 40+000 RMB Trimmu Barrage	31.218411	72.075632	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	68	F35	Punjab	Jhang/ Chenab River	Chenab River	RD 46+000 LMB Trimmu Barrage	31.195995	72.253353	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	69	F45	Punjab	Shakar garh/ Ravi River	Ravi River	Jalala Flood Bund RD 12+000 on River Ravi	32.23611111	75.36361111	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	70	F47	Punjab	Narowal/ Ravi River	Ravi River	Kartar Pur Bridge	32.07166667	75.01916667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	71	F52	Punjab	Okara	Ravi River	Sayeedwala bridge	31.11222222	73.50166667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	72	F59	Punjab	Kasur/ Sutlej River	Sutlej River	Ganda sing wala Gauge Station on River Sutlej	30.99277778	74.54638889	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	73	F62	Punjab	Bahawal Nagar/ Sutlej River	Sutlej River	Pakpattan to Minchinabad Road Bridge on River Sutlej	30.24583333	73.44333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	74	F79	Punjab	Jhelum		Kohan Nullah at Rohtas.	32.95555556	73.525	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	75	F83	Punjab	Sialkot/ Aik Nullah	Aik Nullah	Mallah Chak Flood Protection Bund along Aik Nullah	32.458448	74.404975	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	76	F89	Punjab	Gujranwala		Sialkot Wazirabad Bridge for Aik Nullah	32.43083333	74.15444444	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	77	F90	Punjab	Narowal/ Deg Nullah	Deg Nullah	Flood Protection Bund along Deg Nullah D/S Chahoor Bridge	32.32583333	74.82194444	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	78	F93	Punjab	Sialkot/ Deg Nullah	Deg Nullah	DEG NULLAH OF SUPERPASSAGE BRBD Crossing	32.15194444	74.51361111	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	79	F94	Punjab	Sheikhupura/ Deg Nullah	Deg Nullah	G.T Road Bridge Kala Shah kaku	31.74638889	74.26333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	80	F95	Punjab	Sheikhupura/ Nikki Deg	Niki Deg	G.T Road Bridge Khori	31.87388889	74.24166667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	81	F100	Punjab	Sheikhupura/ Bhed Nullah	Bhed Nullah	Bridge at Bhed	31.9225	74.37527778	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	82	F102	Punjab	Hudiara	Hudiara	LHR-MULTAN ROAD Crossing	31.39888889	74.15583333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	83	F107	Punjab	DG Khan/ Kaha Nullah	Kaha Nullah	Said Alaf, Kaha Nullah	29.55319444	70.03888889	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	84	F108	Punjab	D.G khan/ Kaha Nullah	Kaha Nullah	Kaha Nullah Harand Dam	29.55306	70.04028	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	85	F109	Punjab	D.G khan/ Kaha Nullah	Kaha Nullah	Kaha Nullah Muranj Dam	29.504978	69.599224	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	86	F110	Punjab	D.G khan/ Rakhi Nullah	Rakhni Nullah	Rakhi Nullah	30.04	69.93	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	87	F111	Punjab	D.G khan/ Rakhi Nullah	Rakhni Nullah	Rakhi Nullah	29.95	69.93	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	88	F112	Punjab	D.G khan/ Vehova Nullah	Vehova Nullah	Vehova	31.157741	70.416545	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A

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New Proposed (PID)	89	F113	Punjab	D.G khan/ Kaura Nullah	Kaura Nullah	Kaura Nullah	31.216283	70.426863	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	90	F114	Punjab	D.G khan/ Sanghar Nullah	Sanghar Nullah	Sanghar Nullah	30.692802	70.520195	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	91	F115	Punjab	D.G khan/ Vidore Nullah	Vidore Nullah	Vidore Nullah	30.137428	70.445404	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	92	F116	Punjab	D.G khan/ Sakhi Sarwar Nullah	Sakhi Sarwar Nullah	Sakhi Sarwar	29.98656	70.302456	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	93	F117	Punjab	Rajanpur/ Suri Nullah	Suri Nullah	Suri Nullah	30.429478	70.557699	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	94	F118	Punjab	Rajanpur/ Chachar Nullah	Chachar Nullah	Chachar Nullah	29.459377	70.079266	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	95	F119	Punjab	Rajanpur/ Pitok Nullah	Pitok Nullah	Pitok Nullah	29.193426	69.974625	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	96	F120	Punjab	Rajanpur/ Mithawan Nullah	Mithawan Nullah	Mithawan	29.807546	70.245808	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	97	F121	Punjab	Rajanpur/ Zangi Nullah	Zangi Nullah	Zangi	28.9	69.77	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
New Proposed (PID)	98	F124	Punjab			Tarap Bridge @ Soan	33.06	71.55	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	A
Proposed Wapda (Hill Torrents)	99	H2	Punjab			kaha Nullah	29.51	69.6	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
Proposed Wapda (Hill Torrents)	100	H5	Punjab			Mithawan	29.95	70.23	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
Proposed Wapda (Hill Torrents)	101	H7	Punjab			vehowa	31.14	70.405	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
Proposed Wapda (Hill Torrents)	102	H8	Punjab			Suri Nullah	30.405	70.73	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
Proposed Wapda (Hill Torrents)	103	H9	Punjab			Chachar Nullah	29.46	70.08	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
Proposed Wapda (Hill Torrents)	104	H10	Punjab			Pitok Nullah	29.2	69.98	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
Proposed Wapda (Hill Torrents)	105	H11	Punjab			Kaura Nullah	31.23	70.4	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
Proposed Wapda (Hill Torrents)	106	H12	Punjab			Sanghar Nullah	30.7	70.5	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
Proposed Wapda (Hill Torrents)	107	H13	Punjab			Vidore Nullah	30.14	70.44	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
Proposed Wapda (Hill Torrents)	108	H14	Punjab			Sakhi Serwar	29.98	70.31	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	A
CATEGORY -B																
Upgradation (Existing, PID)	1	A9	Punjab	Sialkot/ Jamu Tavi River	Secondary River	Bajwat road Bridge River Jammu tavi	32.6675	73.58361111	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
Upgradation (Existing, PID)	2	A11	Punjab	Gujrat/ Chenab River	Main River	Alexandra Bridge	32.41666667	74	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
Upgradation (Existing, PID)	3	A13	Punjab	Hafizabad/ Chenab River	Main River	Qadirabad Barrage	32.32305556	73.68555556	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
Upgradation (Existing,	4	A24	Punjab	Chichawatni /	Main River	Chichawatni Road Bridge	30.31666667	72.41666667	Both	Manual	Auto	Auto rain Gauge, Tempaerature,	Real time Communication	Flow/Velocity	PID Punjab	B

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Upgradation (Existing, PID)	5	A26	Punjab	Kasur/ Sutlej River	Main River	Bakarke	31.55	74.48333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
Upgradation (Existing, PID)	6	A27	Punjab	Okara/ Sutlej River	Main River	Sulemanki head work	30.3775	73.86666667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
Upgradation (Existing, PID)	7	A29	Punjab	Rawalpindi/ Soan River	Secondary	Soan River at Dhok Chiniot.	33.75833333	73.04166667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
Upgradation (Existing, PID)	8	A30	Punjab	Rawalpindi.	Nullah	Small Korang at Chattar Bagh.	33.05	73.08333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
Upgradation (Existing, PID)	9	A35	Punjab	Chakwal	Nullah	Ghimber River at Nika Kahut.	32.95	72.5	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
Upgradation (Existing, PID)	10	A37	Punjab	Chakwal	Nullah	Ghimber Nullah at Danda Shah.	32.78333333	72.83333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
Upgradation (Existing, PID)	11	A39	Punjab	Chakwal	Nullah	Ankar Nullah at Dhok Baza	32.91666667	72.25	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
Upgradation (Existing, PID)	12	A40	Punjab	Jhelum	Nullah	Kohan Nullah at Rohtas.	32.95555556	73.5765	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
Upgradation (Existing, PID)	13	A42	Punjab	Gujrat	Nullah	Halsi Nullah at Bollainwala.	32.8	74.13333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
Upgradation (Existing, PID)	14	A46	Punjab	Shakar garh / Chakamru	Nullah	Bein Nullah at Chakamru	32.36666667	75.33333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
Upgradation (Existing, PID)	15	A47	Punjab	Shakar garh	Nullah	Bein Nullah at Shkaker Garh	32.36666667	75.16666667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
Upgradation (Existing, PID)	16	A49	Punjab	Lahore	Nullah	Hudiara Nullah at BRBD Crossing	31.36666667	74.5	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
Upgradation (Existing, PID)	17	A50	Punjab	Kasur	Nullah	Rohi Nallah at Kasur	31.09583333	74.47083333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
Upgradation (Existing WAPDA, SWHP)	18	B4	Punjab		Indus	Soan river at Gorakhpur	33.46833333	73.03027778	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	Wapda SWHP	B
Upgradation (Existing WAPDA, SWHP)	19	B5	Punjab		Indus	Soan river at Dhok Pattan	33.13	72.35138889	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	Wapda SWHP	B
Upgradation of Existing WCAP (20) WAPDA, H&R	20	C9	Punjab	Gujrat	Chenab	Bhinber Nullah	32.44194444	74.01194444	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	B
Upgradation of Existing WCAP (20) WAPDA, H&R	21	C11	Punjab	Jehlum	Kahan River	Rohtas	32.98583333	73.59111111	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	B
Upgradation of Existing WCAP (20) WAPDA, H&R	22	C13	Punjab	Narowal		Zafarwal	32.36111111	74.845	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	B
Upgradation of Existing WCAP (20) WAPDA, H&R	23	C15	Punjab	Narowal	Ravi River	Jassar	32.06138889	74.83944444	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	B
Upgradation of Existing WCAP (20) WAPDA, H&R	24	C17	Punjab	Gujrat		Daulat Nagar	32.55916667	73.43055556	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	B
Upgradation of Existing WCAP (20) WAPDA, H&R	25	C18	Punjab	Sialkot	Aik Nullah	Ura	32.37333333	74.70916667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	B
Upgradation of Existing WCAP (20) WAPDA, H&R	26	C20	Punjab	Jehlum	Jhelum River	Palote	33.23555556	73.44194444	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	B
New Proposed Mangla H&R	27	D1	Punjab		Mangla	Kalar Syedan	33.4301	73.3881	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	B
New Proposed (PID)	28	F37	Punjab	Shor Kot/ Chenab River	Chenab River	Sultan Bahoo Bridge on River Chenab on River Chenab	30.82555556	71.94888889	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B

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New Proposed (PID)	30	F42	Punjab	Multan/ Chenab River	Chenab River	Shehr Sultan FPB RD 20+000 on River Chenab	29.66333333	71.10875	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
New Proposed (PID)	31	F46	Punjab	Shakar garh/ Ravi River	Ravi River	Beko chack FPB 13+000 on River Ravi	32.14416667	75.20222222	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
New Proposed (PID)	32	F50	Punjab	Lahore/ Ravi River	Ravi River	Lahore-Sialkot Motorway Bridge	31.55305556	74.24666667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
New Proposed (PID)	33	F54	Punjab	Okhara/ Ravi River	Ravi River	Mari Pattan Bridge on River Ravi	30.94583333	73.25388889	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
New Proposed (PID)	34	F55	Punjab	Sahiwal/ Ravi River	Ravi River	Qatab Shana Bridge on River Ravi	30.80444444	73.06583333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
New Proposed (PID)	35	F58	Punjab	Shorkot/ Ravi River	Ravi River	Motor way Lahore to Multan Bridge on River Ravi	30.57611111	72.13722222	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
New Proposed (PID)	36	F63	Punjab	Vahari/ Sutlej River	Sutlej River	Arifwala to Shawal Road Bridge on River Sutlej	30.07777778	73.15638889	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
New Proposed (PID)	37	F65	Punjab	Hasil Pur/ Sutlej River	Sutlej River	Malsi Syphon Bridge on River Sutlej	29.7275	72.24944444	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
New Proposed (PID)	38	F66	Punjab	Lodharan/ Sutlej River	Sutlej River	Bahawal Pur Road Bridge on River Sutlej	29.44361111	71.65472222	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
New Proposed (PID)	39	F67	Punjab	Bahawal Pur/ Sutlej River	Sutlej River	Sukkar Multan Motor way Bridge on River Sutlej	29.39722222	71.21277778	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
New Proposed (PID)	40	F87	Punjab	Sialkot/ Aik Nullah	Aik Nullah	M R Link Supper Passage for Aik Nullah	32.43722222	74.425	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
New Proposed (PID)	41	F92	Punjab	Sialkot/ Deg Nullah	Deg Nullah	DEG NULLAH OF SUPERPASSAGE RD. 220+122 MRL Crossing	32.17333333	74.64305556	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
New Proposed (PID)	42	F99	Punjab	Sheikhupura/ Laila Nullah	Laila Nullah	Bridge at Lailah	31.9375	74.355	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
New Proposed (PID)	43	F104	Punjab	Kalabagh/ Chichali Nullah	Chichali Nullah	Chichali Nullah (Bridge Mianwali Bannu road)	32.905651	71.466578	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
New Proposed (PID)	44	F105	Punjab	Kalabagh/ Broach Nullah	Broach Nullah	Broach Nullah (Bridge Mianwali Bannu road)	32.817175	71.331409	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
New Proposed (PID)	45	F106	Punjab	Kalabagh	Kalabagh	Adwala Nullah (Bridge Mianwali Bannu road)	32.84807771	71.385239	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
New Proposed (PID)	46	F123	Punjab	Rajanpur/ Suri Janobi	Suri Janobi	Suri Janobi	30.039768	70.162473	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	B
New Proposed (WAPDA, (JICA)	47	G2	Punjab			Tarap Bridge @ Soan	33.06	71.92	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	B
Proposed Wapda (Hill Torrents)	48	H15	Punjab			Suri Shumali	29.969389	70.206083	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	B
CATEGORY -C																
New Proposed (PID)	1	F5	Punjab	Bhakkar/ Indus River	Indus River	Dera ismial Khan Bridge on River indus	31.75527778	70.94527778	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	C
New Proposed (PID)	2	F6	Punjab	M. Garh/ Indus River	Indus River	Shah wala groyne RD 47+000 on River indus	31.26035833	71.40647222	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	C
New Proposed (PID)	3	F38	Punjab	M.Ghar/ Chenab River	Chenab River	Muhammad wala Bridge on River Chenab	30.28833333	71.38083333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	C
New Proposed (PID)	4	F40	Punjab	Muzaffar ghar/ Chenab River	Chenab River	Muzaffar ghar FPB RD 0+00 on River Chenab	30.40308333	71.45008333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	C
New Proposed (PID)	5	F43	Punjab	Multan/ Chenab River	Chenab River	Shehr Sultan FPB RD 50+000 on River Chenab	29.60533333	71.04830556	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	C

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New Proposed (PID)	6	F84	Punjab	Sialkot/ Aik Nullah	Aik Nullah	Raiwaly Birdge on Nullah Aik D/S Aura	32.49027778	74.56888889	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	C
New Proposed (PID)	7	F85	Punjab	Sialkot/ Aik Nullah	Aik Nullah	Ura Bridge	32.48833333	74.59638889	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	C
New Proposed (PID)	8	F86	Punjab	Sialkot/ Aik Nullah	Aik Nullah	City flood Protection Bund along Aik Nullah	32.47111111	74.5275	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	C
New Proposed (PID)	9	F88	Punjab	Sialkot/ Aik Nullah	Aik Nullah	UCC Siphon for Aik Nullah	32.43083333	74.32333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	C
New Proposed (PID)	10	F91	Punjab	Sialkot/ Main Deg Nullah	Main Deg Nullah	Kingra Bridge	32.37388889	74.88611111	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	C
New Proposed (PID)	11	F125	Punjab	Chiniot		Chiniot Dam	31.75	71.94	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	C
New Proposed (PID)	12	F126	Punjab	Chakwal		Aral Wah @ Lakhwal Dam	33.01	72.76	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	C
New Proposed (WAPDA, (JICA)	13	G1	Punjab			Kala Bagh @ Indus	32.95	71.55	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	C
New Proposed (WAPDA, (JICA)	14	G4	Punjab			Aral Wah	33.01	72.76	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	C

Overlapping Stations

CATEGORY - OVERLAPPING																
Upgradation (Existing, PID)	1	A45	Punjab	Norowal / Main Deg Nullah	Nullah	Deg Nullah at Kingra Bridge	32.46666667	74.55	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
Upgradation of Existing WCAP (20) WAPDA, H&R	2	C1	Punjab	Lahore	Ravi	Ravi Siphon	31.7225	74.47	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	Overlap
New Proposed (PID)	3	F3	Punjab	Mianwali/ Indus River	Indus River	Jannah Barrage	32.91527778	71.5275	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	4	F8	Punjab	M. Garh/ Indus River	Indus River	Ghazi ghat bridge	30.15	71.45	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	5	F15	Punjab	Jhelum / Jhelum River	Jhelum River	Bong Mangla Down D/s	33.06972222	73.74972222	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	6	F16	Punjab	Jhelum / Jhelum River	Jhelum River	Jhelum Railway Bridge	32.91333333	73.72277778	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	7	F17	Punjab	M.Bahauddin/ Jhelum River	Jhelum River	Rasul Barrage	32.67833333	73.52222222	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	8	F18	Punjab	M.Bahauddin/ Jhelum River	Jhelum River	Victoria Railway Bridge	32	73	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	9	F20	Punjab	Khushab/ Jhelum River	Jhelum River	Khushab Railway Bridge	32.30277778	72.41305556	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	10	F21	Punjab	Khushab/ Jhelum River	Jhelum River	Langar wala River Jhelum Bridge	32.01388889	72.27277778	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	11	F23	Punjab	Sialkot/ Jamu Tavi River	Jamu Tavi	Bajwat road Bridge River Jammu tavi	32.6675	73.58361111	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap

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New Proposed (PID)	12	F24	Punjab	Sialkot/ Chenab River	Chenab River	Marala head work	32.67333333	74.04722222	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	13	F26	Punjab	Gujrat/ Chenab River	Chenab River	Alexandra Bridge	32.41666667	74	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	14	F27	Punjab	Gujrawala/ Chenab River	Chenab River	Khanki Head Works	32.40194444	73.96722222	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	15	F28	Punjab	Hafizabad/ Chenab River	Chenab River	Qadirabad Barrage	32.32305556	73.68555556	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	16	F30	Punjab	Chiniot/ Chenab River	Chenab River	Chiniout Railway Bridge	31.75	72.93333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	17	F33	Punjab	Jhang/ Chenab River	Chenab River	Revaz bridge	31.58333333	72.58333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	18	F36	Punjab	Jhang/ Chenab River	Chenab River	Trimmu Barrage	31.23333333	72.23333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	19	F39	Punjab	M. Garh/ Chenab River	Chenab River	shershah bridge	34.033333	73.55	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	20	F44	Punjab	Bahawalpur/ Chenab River	Chenab River	punjnad headwork	29.56666667	71	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	21	F48	Punjab	Narowal/ Ravi River	Ravi River	jassar Railwy Bridge	32.06666667	74.96666667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	22	F49	Punjab	Lahore/ Ravi River	Ravi River	Ravi Syphon	31.71	74.47	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	23	F51	Punjab	/ Ravi River	Ravi River	Shahdra Railway Bridge	32.03333333	74.43333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	24	F53	Punjab	Kasur/ Ravi River	Ravi River	Balloki Headworks	31.36666667	74.41666667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	25	F56	Punjab	Chichawatni / RaviRiver	Ravi River	Chichawatni Road Bridge	30.31666667	72.41666667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	26	F57	Punjab	Abdul Hakim/ Ravi River	Ravi River	sidnhai headworks	30.57222222	72.15777778	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	27	F60	Punjab	sutlej/ Sutlej River	Sutlej River	Bakarke	31.55	74.48333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	28	F61	Punjab	Okara/ Sutlej River	Sutlej River	Sulemanki head work	30.3775	73.86666667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	29	F64	Punjab	Bahwalpur / Sutlej River	Sutlej River	islam headwork	29.82638889	72.54916667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	30	F68	Punjab	Rawalpindi/ Soan River	Soan River	Soan River at Dhok Chiniot.	33.75833333	73.04166667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	31	F69	Punjab	Rawalpindi.		Small Korang at Chattar Bagh.	33.05	73.08333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	32	F70	Punjab	Rawalpindi.		Korang River at Lohi Bher.	33.57083333	73.11666667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	33	F71	Punjab	Rawalpindi.		Korang Nullah at Bari Kangran.	33.8	73.3	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap

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New Proposed (PID)	34	F72	Punjab	Rawalpindi.		Leih Nullah at Liaqat Bagh Rawalpindi.	33.605335	73.06175	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	35	F73	Punjab	Attock/ Soan River	Soan River	Soan River at Makhad.	32.91666667	71.90833333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	36	F74	Punjab	Chakwal		Ghimber River at Nika Kahut.	32.95	72.5	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	37	F75	Punjab	Chakwal		Sirri Nullah at Bhider Villige.	32.86666667	72.2	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	38	F76	Punjab	Chakwal		Ghimber Nullah at Danda Shah.	32.78333333	72.83333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	39	F77	Punjab	Chakwal		Dharrab River at Dharab Bridge.	32.96666667	72.55	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	40	F78	Punjab	Chakwal		Ankar Nullah at Dhok Baza	32.91666667	72.25	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	41	F80	Punjab	Jhelum		Bunnah Nullah at Pind Sawika.	31.58333333	73.25	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	42	F81	Punjab	Gujrat		Halsi Nullah at Bollainwala.	32.8	74.13333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	43	F82	Punjab	Gujranwala		Palkhu Nullah at Wazirabad.	32.44944444	74.11138889	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	44	F96	Punjab	Bein	Bein	Chakamru	32.36666667	75.33333333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	45	F97	Punjab	Bein	Bein	Shkaker Garh	32.36666667	75.16666667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	46	F98	Punjab	Bassantar	Bassantar	Jassar	32.06666667	74.97916667	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	47	F101	Punjab	Shahdra/ Hudiara Nullah	Hudiara Nullah	BRBD Crossing	31.36666667	74.5	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	48	F103	Punjab	Kasur/ Rohi Nullah	Rohi Nullah	Kasur	31.09583333	74.47083333	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (PID)	49	F122	Punjab	Rajanpur/ Suri Shumali	Suri Shumali	Suri Shumali	29.969389	70.206083	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	PID Punjab	Overlap
New Proposed (WAPDA, (JICA)	50	G3	Punjab			Chiniot Dam	31.75	72.94	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	Overlap
Proposed Wapda (Hill Torrents)	51	H1	Punjab			Kaha Nullah	29.55306	70.04028	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	Overlap
Proposed Wapda (Hill Torrents)	52	H3	Punjab			Rakhi Nullah	30.04	69.93	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	Overlap
Proposed Wapda (Hill Torrents)	53	H4	Punjab			Rakhi Nullah	29.95	69.93	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	Overlap
Proposed Wapda (Hill Torrents)	54	H6	Punjab			zangi	28.9	69.77	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	Overlap
Proposed Wapda (Hill Torrents)	55	H16	Punjab			Suri janobi	30.039768	70.162473	Both	Manual	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	H&R Dte.	Overlap

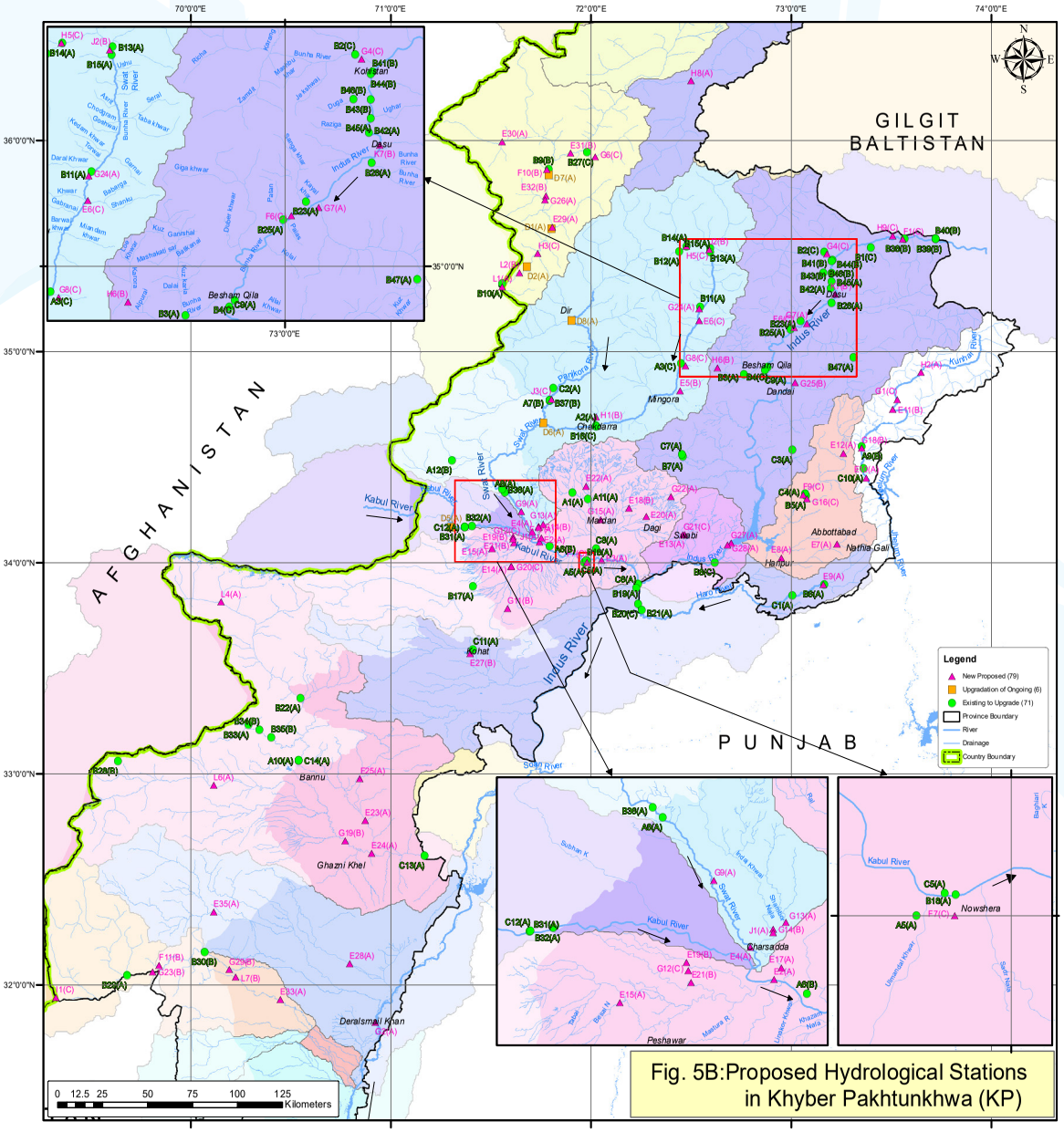

Fig. 5B:Proposed Hydrological Stations in Khyber Pakhtunkhwa (KP)

UPGRADATION OF EXISTING HYDROLOGICAL STATIONS

Map Reference	Description
	Upgradation (Existing PID)
A1	Nowshera Mardan road Bridge
A2	Chakdara bridge station
A3	Khwazakhela Station
A5	Adizai Bridge station
A6	Budni darmangi Gauge station
A7	Jabalot Bridge lower dir
A8	Munda Hworks
A9	Balakot station
A10	Kurram Ghari Station
A11	Said Abad Takhtbai Station
A12	Khanpur at Daryal
	Upgradation (Existing WAPDA, SWHP)
B1	Summer Gah at Gosik
B2	Kandia Nullah at Tooti Bridge
B3	Gorband river at Karora
B4	Indus river at Besham Qila
B5	Siran river near Phulra
B6	Haro river at Jabri Bridge
B7	Brando river at Daggar
B8	Indus river at Jammun
B9	Chitral river at Chitral
B10	Chitral river near Arandu
B11	Daral Khawar at Behrain
B12	Batal Khawar at Utror
B13	Ushu River at Jilidat
B14	Gabral River at Gulshanabad
B15	Swat river at Kalam
B16	Swat river at Chakdara
B17	Bara river at Jhansi Post
B18	Kabul river at Nowshera
B19	Indus river at Khairabad
B20	Indus river at Mandori
B21	Indus river at Brootha
B22	Kurram river at Thal
B23	Keyal Nullah at Shishal
B25	Indus River at Pattan
B26	Spatgah at Goshali
B27	Golan Gol River at Mustaj Road Bridge
B28	Toi River at Toi Khula
B29	Gomal River at Gulkuch
B30	Gomal River at Kot Murtaza
B31	Kabul River D/S of Warsak Dam
B32	Kabul River at Warsak Dam
B33	Kaitu River at Ziarat Post
B34	Kaitu River near STS Post
B35	Kaitu River at Spom Wam
B36	Swat River at Mohmand Dam Site
B37	Panjkora River at Zulam Bridge
B38	Indus river at Shatial
B39	Indus River D/S of Basha Dam
B40	Indus River at Dodishal
B41	Indus River at Dasu/Kandia
B42	Indus River at Dasu-Stage-I
B43	Indus River at Dasu-Stage-II
B44	Indus River at Dasu-Stage-III
B45	Indus River at Tailrace of Dasu Power House
B46	Gabarband at Doga
B47	Chor Nullah at Sarchoy
	Upgradation (Existing WAPDA, WCAP H&R)
C1	Dartian
C2	Chakdara
C3	Oghi
C4	Phulra
C5	Nowshera
C6	Attock (Khairabad)
C7	Daggar
C8	Kalpani - Rashid Abad
C9	Besham
C10	Talhatta
C11	Tanda Dam
C12	Warsak Dam D/S
C13	Dara E Tang
C14	Kurram Garhi

UPGRADATION OF ONGOING HYDROLOGICAL STATIONS

Map Reference	Description
	Upgradation (Ongoing, AFD)
D1	Shisi Bridge
D2	Arrandu
D5	(Shaheed Mina) Khyber Agency
D6	Upstream Munda Dam
D7	Chitral
D8	Chitral

ADDITIONAL PROPOSED HYDROLOGICAL STATIONS

Map Reference	Description
	New Proposed (PID)
E2	Kabul River at Motorway Bridge
E3	Kabul River at Pir Sabaq Zara Miana
E4	Khali River at Charsadda Road
E5	Swat Manglawar khawar at Mingora Swat
E6	Swat River Madyan Swat
E7	Daur River at Rajoia Abbottabad
E8	Daur River at Dehri Chappar Haripur
E9	Haro River at Jabbri Bahadar Haripur
E10	Kunhar River at Garhi Habibullah Mansehera
E11	Kunhar River at kaghan Mansehera
E12	Upper Siran Canal Daryal
E13	Badri nullah at Swabi
E14	Bara River Warsak Gravity Canal syphon at Peshawar
E15	Daloos Nullah at Warsak Road Peshawar
E17	Jindi River at Motorway
E18	Muqam Nullah at shahbaz garhi
E19	Nugman River at Charsadda Road
E20	Narangi Nullah at Adena Bridge Swabi
E21	Shahalam River at Charsadda Road
E22	Tarkhta Baig khwar at district Khyber
E23	Dara Tang River at Bannu Bridge Lakki.
E24	Gambila River at Gambila bridge Lakki
E25	Kashu Algad at Bannu
E27	Tanda Main Canal at Kohat Dam
E28	Yarak Nullah at Yarak (Highway bridge) D.I.Khan
E29	Shishi River RCC bridge on main chitral road
E30	Lotkoh Rier, Shali Bridge Chitral
E31	Mastuj River, Kaju near Kari Koh area chitral
E32	Chitral river new RCC bridge at Ayun Chitral
E33	Upstream bridge Gomal Zam D.I.Khan
E35	Tank Zam Nullah D.I.Khan
	New Proposed Wapda H&R (WCAP)
F1	Shatial @ Indus River
F6	Pattan @ Indus River
F7	Nowshera@ Kabul River
F9	Phulra @ Siran River
F10	Chitral @ Chitral River
F11	Khajuri Kach @ Gomal River
	New Proposed H&R (JICA)
G1	Kaghan
G4	Dasu
G6	Golan Gol
G7	Patan
G8	Khwazakhela
G9	Charsadda Road
G11	Adezai Bridge
G12	Charsadda Road
G13	Charsadda Road
G14	Charsadda
G15	Mardan City Bughdada
G16	Dhryal
G18	Balakot
G19	Gambela Bridge
G20	Chamkani
G21	Swabi Mardan Road
G22	Mardan Swabi Road
G23	Gomal Zam D/S of Dam
G24	Swat
G25	Kund
G26	Ayun
G27	Indus River Tarbela Inflow
G28	Indus River Tarbela Outflow
G29	Gomal@Kot Murtaza
	New Proposed H&R (TIKA)
H1	Gulabad
H2	Naran
H3	Mirkhanni
H5	Utror
H6	Alpuri
H8	Mastuj
H9	Tanghir
	New Proposed Wapda (SWHP)
I1	Gomal River at Tarkhai (D)
	New wproposed Hycos
J1	Nowshera
J2	Kalam
J3	Zulam Bridge
	New Proposed Dasu
K7	Dasu River @ Dasu
	New Proposed (Transboundary)
L1	Arandu Nullah at Arandu
L2	Chitral River at Arandu
L4	Kurram River at Kharachi Post
L6	Tochi River at Marga Algada Touchi River Shashpali
L7	Gomal River at Tarkhai

Note: Duplicate stations are not shown.

Table -5B

Proposed Hydrological Stations - Khyber Pakhtunkhwa

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
CATEGORY - A																
Upgradation (Existing PID)	1	A1	KPK/ Irrigation	Nowshera	Kabul River	Nowshera Mardan road Bridge	34.33038333	71.90850833	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Upgradation (Existing PID)	2	A2	KPK/ Irrigation	Swat	Swat River	Chakdara bridge station	34.64638333	72.02783889	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Upgradation (Existing PID)	3	A5	KPK/ Irrigation	Peshawar	Kabul River	Adizai Bridge staftion	34.00005278	71.966775	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Upgradation (Existing PID)	4	A8	KPK/ Irrigation	Charsadda	Swat River	Munda H/works	34.33158889	71.57100833	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Upgradation (Existing PID)	5	A10	KPK/ Irrigation	Bannu	Kurram River	Kurram Ghari Station	33.06158333	70.53863889	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Upgradation (Existing PID)	6	A11	KPK/ Irrigation	Mardan	Kalapani Nullah Said abad	Said Abad Takhtbai Station	34.30025	71.98343333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Upgradation (Existing WAPDA, SWHP)	7	B3	KPK		Indus	Gorband river at Karora	34.89027778	72.76611111	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	8	B5	KPK	Indus	Indus	Siran river near Phulra	34.31611111	73.075	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	9	B6	KPK	Indus	Indus	Haro river at Jabri Bridge	33.89527778	73.16277778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	10	B7	KPK	Indus	Brandu River	Brando river at Daggar	34.50138889	72.45833333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	11	B10	KPK	Chitral	Chitral River	Chitral river near Arandu	35.32027778	71.55583333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	12	B11	KPK	Swat	Daral river(Swat River)	Daral Khawar at Behrain	35.21	72.54583333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	13	B12	KPK	Swat	Batal Khwar(Gabral River)	Batal Khawar at Utror	35.47222222	72.44027778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	14	B13	KPK	Swat	Ushu River	Ushu River at Jildat	35.4875	72.59583333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	15	B14	KPK	Swat	Gabraal River	Gabral River at Gulshanabad	35.49583333	72.47777778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	16	B15	KPK	Indus	Swat River	Swat river at Kalam	35.46944444	72.59444444	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	17	B17	KPK	Indus	Bara River	Bara river at Jhansi Post	33.88611111	71.41083333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	18	B18	KPK	Indus	Kabul River	Kabul river at Nowshera	34.00694444	71.98055556	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	19	B19	KPK	Indus	Indus River	Indus river at Khairabad	33.89722222	72.23333333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A

Table -5B

Proposed Hydrological Stations - Khyber Pakhtunkhwa

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
Upgradation (Existing WAPDA, SWHP)	20	B21	KPK		Indus River	Indus river at Brootha	33.77361111	72.25194444	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	21	B22	KPK	Indus	Kurram River	Kurram river at Thal	33.35611111	70.54583333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	22	B23	KPK		Indus	Keyal Nullah at Shishal	35.14361111	73.04777778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	23	B25	KPK	Indus	Indus	Indus River at Pattan	35.10277778	72.99472222	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	24	B26	KPK		Indus	Spatgah at Goshali	35.22916667	73.20277778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	25	B29	KPK		Gomal	Gomal River at Gulkuch	32.04388889	69.67972222	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	26	B31	KPK	Indus	Kabul	Kabul River D/S of Warsak Dam	34.16666667	71.36861111	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	27	B32	KPK		Kabul	Kabul River at Warsak Dam	34.17166667	71.405	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	28	B33	KPK		Swat	Kaitu River at Ziarat Post	33.22919444	70.28875	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	29	B36	KPK		Swat	Swat River at Mohmand Dam Site	34.34636111	71.55613889	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	30	B42	KPK	Indus	Indus	Indus River at Dasu-Stage-I	35.29666667	73.19611111	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	31	B45	KPK	Indus	Indus	Indus River at Tailrace of Dasu Power House	35.32861111	73.20083333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, SWHP)	32	B47	KPK		Indus	Chor Nullah at Sarchoy	34.97055556	73.30916667	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation (Existing WAPDA, WCAP H&R)	33	C1	KPK	Haripur	Haro River	Dartian	33.8425	73.00722222	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation (Existing WAPDA, WCAP H&R)	34	C2	KPK	Swat	Swat	Chakdara	34.82472222	71.8125	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation (Existing WAPDA, WCAP H&R)	35	C3	KPK	Mansehra		Oghi	34.5325	73.00638889	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation (Existing WAPDA, WCAP H&R)	36	C4	KPK	Mansehra	Siran River	Phulra	34.32333333	73.06861111	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation (Existing WAPDA, WCAP H&R)	37	C5	KPK	Nowshera	Kabul	Nowshera	34.0075	71.97666667	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation (Existing WAPDA, WCAP H&R)	38	C6	KPK	Nowshera	Indus	Attock (Khairabad)	33.8775	72.22555556	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation (Existing WAPDA, WCAP H&R)	39	C7	KPK	Swat	Barandu	Daggar	34.51	72.45194444	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A

Table -5B

Proposed Hydrological Stations - Khyber Pakhtunkhwa

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
Upgradation (Existing WAPDA, WCAP H&R)	40	C8	KPK	Nowshera	Kalpani Nullah	Kalpani - Rashid Abad	34.065	72.02444444	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation (Existing WAPDA, WCAP H&R)	41	C9	KPK	Shangala	Indus	Besham	34.90972222	72.86805556	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation (Existing WAPDA, WCAP H&R)	42	C10	KPK	Mansehra	Kunhar River	Talhatta	34.44388889	73.35944444	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation (Existing WAPDA, WCAP H&R)	43	C11	KPK	Kohat	Toi	Tanda Dam	33.585	71.41083333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation (Existing WAPDA, WCAP H&R)	44	C12	KPK	Peshawar	Kabul	Warsak Dam D/S	34.16722222	71.36972222	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation (Existing WAPDA, WCAP H&R)	45	C13	KPK	Lakki Marwat	Kurram	Dara E Tang	32.61027778	71.16833333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation (Existing WAPDA, WCAP H&R)	46	C14	KPK	Bannu	Kurram	Kurram Garhi	33.06166667	70.53861111	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation (Ongoing, AFD)	47	D1	KPK		Chitral	Shisi Bridge	35.58	71.8	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation (Ongoing, AFD)	48	D2	KPK		Arrandu Nullah	Arrandu	35.4	71.68	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation (Ongoing, AFD)	49	D5	KPK		Kabul	(Shaheed Mina) Khyber Agency	34.1663	71.302	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation (Ongoing, AFD)	50	D6	KPK		Panjkora	Up stream Munda Dam	34.66	71.76	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation (Ongoing, AFD)	51	D7	KPK		Chitral	Chitral	35.836	71.789	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation (Ongoing, AFD)	52	D8	KPK		Panjkora	Chitral	35.145	71.9	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed (PID)	53	E2	KPK		Kabul River	Kabul River at Motorway Bridge	34.09678776	71.74102409	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	54	E3	KPK		Kabul River	Kabul River at Pir Sabaq Zara Miana	34.010196	72.050918	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	55	E4	KPK		Khiali river	Khiali River at Charsadda Road	34.143628	71.70558	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	56	E7	KPK		Daur river	Daur River at Rajoia Abbottabad	34.086357	73.228027	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	57	E8	KPK		Daur river	Daur River at Dehri Chappar Haripur	34.019947	72.95162	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	58	E9	KPK		Haro river	Haro River at Jabbri Bahadar Haripur	33.89575226	73.16206148	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A

Table -5B

Proposed Hydrological Stations - Khyber Pakhtunkhwa

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed (PID)	59	E10	KPK		Kunhar river	Kunhar River at Garhi Habibullah Mansehera	34.39950969	73.37696581	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	60	E12	KPK		Siran Canal	Upper Siran Canal Daryal	34.51583	73.260381	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	61	E13	KPK		Badri Nullah	Badri nullah at Swabi	34.130801	72.464952	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	62	E14	KPK		Bara river	Bara River Warsak Gravity Canal syphon at Peshawar	33.980028	71.602076	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	63	E15	KPK		Dalus Nullah	Daloos Nullah at Warsak Road Peshawar	34.063898	71.506049	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	64	E17	KPK		Jindi River	Jindi River at Motorway	34.11408026	71.75276409	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	65	E20	KPK		Narangi Nullah	Narangi Nullah at Adena Bridge Swabi	34.216234	72.274179	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	66	E22	KPK		Tarkhta Baig khwar at	Tarkhta Baig khwar at district Khyber	34.359622	71.975112	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	67	E23	KPK		Kurram River	Dara Tang River at Bannu Bridge Lakki.	32.776289	70.871689	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	68	E24	KPK		Gambila river	Gambila River at Gambila bridge Lakki	32.6204	70.903778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	69	E25	KPK		Kashu Algad	Kashu Algad at Bannu	32.974372	70.845568	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	70	E28	KPK		Yarak Nullah	Yarak Nullah at Yarak (Highway bridge) D.I.Khan	32.09796532	70.7918817	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	71	E29	KPK		Shishi River	Shishi River RCC bridge on main chitral road	35.58740626	71.80770823	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	72	E30	KPK		Lothoh river	Lotkoh Rier, Shali Bridge Chitral	35.991571	71.555824	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	73	E33	KPK		Gambila river	Upstream bridge Gomal Zam D.I.Khan	31.927708	70.445536	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	74	E35	KPK		Tank Zam Nullah	Tank Zam Nullah D.I.Khan	32.344211	70.113618	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed H&R (JICA)	75	G2	KPK		Indus	D.I.Khan	31.82	70.92	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed H&R (JICA)	76	G7	KPK		Palas river	Palan	35.13	73.08	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed H&R (JICA)	77	G9	KPK		Swat River	Charsadda Road	34.24	71.65	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed H&R (JICA)	78	G13	KPK		Badni Nullah	Charsadda Road	34.18	71.76	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A

Table -5B

Proposed Hydrological Stations - Khyber Pakhtunkhwa

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed H&R (JICA)	79	G15	KPK		Kalpani Nullah	Mardan City Bughdada	34.2	72.05	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed H&R (JICA)	80	G22	KPK		Namji Nullah	Mardan Swabi Road	34.31	72.4	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed H&R (JICA)	81	G24	KPK		Daral Khawar	Swat	35.2	72.54	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed H&R (JICA)	82	G26	KPK		Kalaish	Ayun	35.715	71.77	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed H&R (JICA)	83	G27	KPK		Indus	Indus River Tarbela Inflow	34.09	72.7	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed H&R (JICA)	84	G28	KPK		Indus	Indus River Tarbela Outflow	34.08	72.68	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed H&R (TIKA)	85	H2	KPK		Kunhar	Naran	34.8982	73.6466	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed H&R (TIKA)	86	H8	KPK		Mastuj	Mastuj	36.28	72.5	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New wproposed Hycos	87	J1	KPK		Kabul River	Nowshera	34.165	71.74	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed (Transboundary)	88	L1	KPK		Arandu River	Arandu Nullah at Arandu	35.303364	71.556719	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed (Transboundary)	89	L4	KPK		Kurram River	Kurram River at Kharachi Post	33.810433	70.150954	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed (Transboundary)	90	L6	KPK		Tochi River	Tochi River at Marga Algada Touchi River Shashpali	32.94242484	70.11233082	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
CATEGORY - B																
Upgradation (Existing PID)	1	A6	KPK/ Irrigation	Peshawar	Budni nullah	Budni darmangi Gauge station	34.07680556	71.79166667	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
Upgradation (Existing PID)	2	A7	KPK/ Irrigation	Lower Dir	Panjkora River	Jabalot Bridge lower dir	34.76805556	71.79166667	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
Upgradation (Existing PID)	3	A9	KPK/ Irrigation	Balakot	Kunhar River	Balakot station	34.54965	73.354275	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
Upgradation (Existing PID)	4	A12	KPK/ Irrigation	Mansehra	Siran River	Khanpur at Daryal	34.48388889	71.30243611	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
Upgradation (Existing WAPDA, SWHP)	5	B9	KPK	Kabul	Chitral River	Chitral river at Chitral	35.86333333	71.7875	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	B
Upgradation (Existing WAPDA, SWHP)	6	B28	KPK		Toi	Toi River at Toi Khula	33.05805556	69.63444444	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	B
Upgradation (Existing WAPDA, SWHP)	7	B30	KPK	Indus	Gomal	Gomal River at Kot Murtaza	32.15416667	70.06666667	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	B

Table -5B

Proposed Hydrological Stations - Khyber Pakhtunkhwa

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
Upgradation (Existing WAPDA, SWHP)	8	B34	KPK		Swat	Kaitu River near STS Post	33.20541111	70.34252778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	B
Upgradation (Existing WAPDA, SWHP)	9	B35	KPK		Swat	Kaitu River at Spom Wam	33.1695	70.40103333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	B
Upgradation (Existing WAPDA, SWHP)	10	B37	KPK			Panjkora River at Zulam Bridge	34.76797222	71.79225	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	B
Upgradation (Existing WAPDA, SWHP)	11	B38	KPK	Indus	Indus	Indus river at Shatial	35.53222222	73.56444444	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	B
Upgradation (Existing WAPDA, SWHP)	12	B39	KPK	Indus	Indus	Indus River D/S of Basha Dam	35.53138889	73.72083333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	B
Upgradation (Existing WAPDA, SWHP)	13	B40	KPK	Indus	Indus	Indus River at Dodishal	35.53222222	73.72111111	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	B
Upgradation (Existing WAPDA, SWHP)	14	B41	KPK	Indus	Indus	Indus River at Dasu/Kandia	35.43166667	73.20527778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	B
Upgradation (Existing WAPDA, SWHP)	15	B43	KPK	Indus	Indus	Indus River at Dasu-Stage-II	35.37027778	73.20111111	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	B
Upgradation (Existing WAPDA, SWHP)	16	B44	KPK	Indus	Indus	Indus River at Dasu-Stage-III	35.42666667	73.20083333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	B
Upgradation (Existing WAPDA, SWHP)	17	B46	KPK		Indus	Gabarband at Doga	35.37111111	73.16027778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	B
New Proposed (PID)	18	E5	KPK		Manglawar Khawar	Swat Manglawar khawar at Mingora Swat	34.81228	72.444187	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
New Proposed (PID)	19	E11	KPK		Kunhar river	Kunhar River at kaghan Mansehera	34.72514	73.508961	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
New Proposed (PID)	20	E18	KPK		Muqam Nullah	Muqam Nullah at shahbaz garhi	34.255453	72.188081	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
New Proposed (PID)	21	E19	KPK		Nugman River	Nugman River at Charsadda Road	34.12187703	71.608006	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
New Proposed (PID)	22	E21	KPK		Shahalam River	Shahalam River at Charsadda Road	34.092379	71.614996	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
New Proposed (PID)	23	E27	KPK		Tanda main canal	Tanda Main Canal at Kohat Dam	33.568064	71.39515	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
New Proposed (PID)	24	E31	KPK		Mastuj River	Mastuj River, Kaju near Kari Koh area chitral	35.937075	71.896842	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
New Proposed (PID)	25	E32	KPK		chitral River	Chitral river new RCC bridge at Ayun Chitral	35.735609	71.77564	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
New Proposed Wapda H&R (WCAP)	26	F10	KPK		Chitral	Chitral @ Chitral River	35.86	71.78	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed Wapda H&R (WCAP)	27	F11	KPK		GOmal	Khajuri Kach @ Gomal River	32.09	69.84	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B

Table -5B

Proposed Hydrological Stations - Khyber Pakhtunkhwa

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed H&R (JICA)	28	G11	KPK		Adezai River	Adezai Bridge	33.78	71.58	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed H&R (JICA)	29	G14	KPK		Jindi River	Charsadda	34.17	71.74	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed H&R (JICA)	30	G18	KPK		Kunhar River	Balakot	34.54	73.35	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed H&R (JICA)	31	G19	KPK		Gambela River	Gambela Bridge	32.68	70.77	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed H&R (JICA)	32	G23	KPK		Gomal	Gomal Zam D/S of Dam	32.06	69.81	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed H&R (JICA)	33	G25	KPK		Allai Khawar	Kund	34.85	73.02	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed H&R (JICA)	34	G29	KPK		Gomal	Gomal@Kot Murtaza	32.07	70.19	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed H&R (TIKA)	35	H1	KPK		Swat	Gulabad	34.6884	72.0233	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed H&R (TIKA)	36	H6	KPK		Shain Khwar	Alpuri	34.9198	72.6316	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New wproposed Hycos	37	J2	KPK		Swat river	Kalam	35.48	72.59	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed Dasu	38	K7	KPK		Dasu	Dasu River @ Dasu	35.26898	73.22188	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed (Transboundary)	39	L2	KPK		Arandu River	Chitral River at Arandu	35.369307	71.642809	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed (Transboundary)	40	L7	KPK		Gomal River	Gomal River at Tarkhai	32.03343965	70.22391307	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
CATEGORY - C																
Upgradation (Existing PID)	1	A3	KPK/ Irrigation	Swat	swat river	Khwazakhela Station	34.94314	72.45072	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	C
Upgradation (Existing WAPDA, SWHP)	2	B1	KPK	Indus	Indus	Summer Gah at Gosik	35.49166667	73.39861111	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	C
Upgradation (Existing WAPDA, SWHP)	3	B2	KPK		Indus	Kandia Nullah at Tooti Bridge	35.46972222	73.16444444	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	C
Upgradation (Existing WAPDA, SWHP)	4	B4	KPK	Indus	Indus	Indus river at Besham Qila	34.92416667	72.88194444	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	C
Upgradation (Existing WAPDA, SWHP)	5	B8	KPK		Indus River	Indus river at Jammun	33.99972222	72.61888889	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	C
Upgradation (Existing WAPDA, SWHP)	6	B16	KPK	Indus	Swat River	Swat river at Chakdara	34.64444444	72.025	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	C

Table -5B

Proposed Hydrological Stations - Khyber Pakhtunkhwa

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
Upgradation (Existing WAPDA, SWHP)	7	B20	KPK		Indus River	Indus river at Mandori	33.8025	72.23277778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	C
Upgradation (Existing WAPDA, SWHP)	8	B27	KPK		Golan Gol	Golan Gol River at Mustaj Road Bridge	35.94222222	71.98027778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	C
New Proposed (PID)	9	E6	KPK		swat river	Swat River Madyan Swat	35.145708	72.538173	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	C
New Proposed Wapda H&R (WCAP)	10	F1	KPK		Indus River	Shatial @ Indus River	35.53	73.56	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed Wapda H&R (WCAP)	11	F6	KPK		Indus River	Pattan @ Indus River	35.11171	73.01447	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed Wapda H&R (WCAP)	12	F7	KPK		Kabul River	Nowshera@ Kabul River	34	71.98	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed Wapda H&R (WCAP)	13	F9	KPK		Siran	Phulra @ Siran River	34.32	73.06	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed H&R (JICA)	14	G1	KPK		Kurhar	Kaghan	34.77	73.53	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed H&R (JICA)	15	G4	KPK		Kandia	Dasu	35.46	73.18	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed H&R (JICA)	16	G6	KPK			Golan Gol	35.92	72.02	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed H&R (JICA)	17	G8	KPK		Swat River	Khwazakhela	34.93	72.47	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed H&R (JICA)	18	G12	KPK		Naguman River	Charsadda Road	34.11	71.61	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed H&R (JICA)	19	G16	KPK		Siran River	Dhryal	34.3	73.08	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed H&R (JICA)	20	G20	KPK		Bara River	Chamkani	33.98	71.6	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed H&R (JICA)	21	G21	KPK		Badri Nullah	Swabi Mardan Road	34.13	72.46	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed H&R (TIKA)	22	H3	KPK		Chitral	Mirkhani	35.4615	71.7344	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed H&R (TIKA)	23	H5	KPK		Utror	Utror	35.496	72.4752	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed H&R (TIKA)	24	H9	KPK		Tanghir	Tanghir	35.5452	73.5061	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed Wapda (SWHP)	25	I1	KPK		Indus	Gomal River at Tarkhai (D)	31.937728	69.325032	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	C
New wproposed Hycos	26	J3	KPK		Panjkora	Zulam Bridge	34.77	71.8	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C

Table -5B

Proposed Hydrological Stations - Khyber Pakhtunkhwa

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
Overlapping Stations																
CATEGORY - OVERLAPPING																
Upgradation (Existing WAPDA, SWHP)	1	B24	KPK		Indus	Keyal Khwar at Pashwa	35.14361111	73.04777778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	Overlap
Upgradation (Ongoing, AFD)	2	D3	KPK		Swat river	Boausak	34.65	71.76	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
Upgradation (Ongoing, AFD)	3	D4	KPK		Chitral	Kahoti Br. Arrandu	35.4	71.68	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed (PID)	4	E1	KPK		Kabul River	Kabul River at Karerai Warsak	34.16722222	71.36972222	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	5	E16	KPK		Indus River	Indus River at Motorway	34.007317	71.977699	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	6	E26	KPK		Kuram river	Kuram River at Thall bridge Thall	33.35624	70.54576	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	7	E34	KPK		Gambila river	Gomal Zam Barrage D.I.Khan	32.15115694	70.08093896	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed Wapda H&R (WCAP)	8	F2	KPK		Indus River	Besham @ Indus River	34.92	72.88	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed Wapda H&R (WCAP)	9	F3	KPK		Swat	Chakdara @ Swat river	34.64	72.025	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed Wapda H&R (WCAP)	10	F4	KPK		Indus River	Khairabad @ Indus River	33.9	72.23	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed Wapda H&R (WCAP)	11	F5	KPK		Kunhar River	Tallhta @ Kunhar River	34.47	73.34	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed Wapda H&R (WCAP)	12	F8	KPK		Brandu River	Daggar @ Brandu River	34.51	72.45	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed H&R (JICA)	13	G3	KPK			SpatGah	35.23	73.2	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed H&R (JICA)	14	G5	KPK		Indus	Dasu Tail race	35.27	73.22	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed H&R (JICA)	15	G10	KPK		Shah Alam River	Takkhtabad	34.09	71.61	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed H&R (JICA)	16	G17	KPK		Haro River	Kabori Bohar	33.78	72.23	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed H&R (TIKA)	17	H4	KPK		Swat	Bahrain	35.207	72.549	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap

Table -5B

Proposed Hydrological Stations - Khyber Pakhtunkhwa

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed H&R (TIKA)	18	H7	KPK		Kondia	Katgal	35.4416	73.208	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed Dasu	19	K1	KPK		Indus	River Indus @ Shatial	35.53	73.56	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed Dasu	20	K2	KPK		Indus	River Indus @ Pattan	35.11171	73.01447	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed Dasu	21	K3	KPK		Indus	River Indus @ Thakot	34.7843	72.92662	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed Dasu	22	K4	KPK		Siran	River Siran @ Phulra	34.33258	73.05502	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed Dasu	23	K5	KPK			Tanghir	35.54	73.51	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed Dasu	24	K6	KPK		Dasu	Dasu River @ kandia	35.43265	73.20441	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed Dasu	25	K8	KPK		Indus	River Indus @ Spatgah	35.23059	73.20282	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed Dasu	26	K9	KPK			Karora	34.88872	72.76968	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed (Transboundary)	27	L3	KPK		Kabul River	Kabul River at Shinpokh/Warsak	34.183	71.4	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed (Transboundary)	28	L5	KPK		Kaitu	Kaitu River at Dohtai	33.1686	70.4	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
Upgradation (Existing PID)	29	A4	KPK/ Irrigation	Mardan	Kalapani Nullah at Jalala	Mardan Road Jala Bridge station	34.33038333	71.90850833	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap

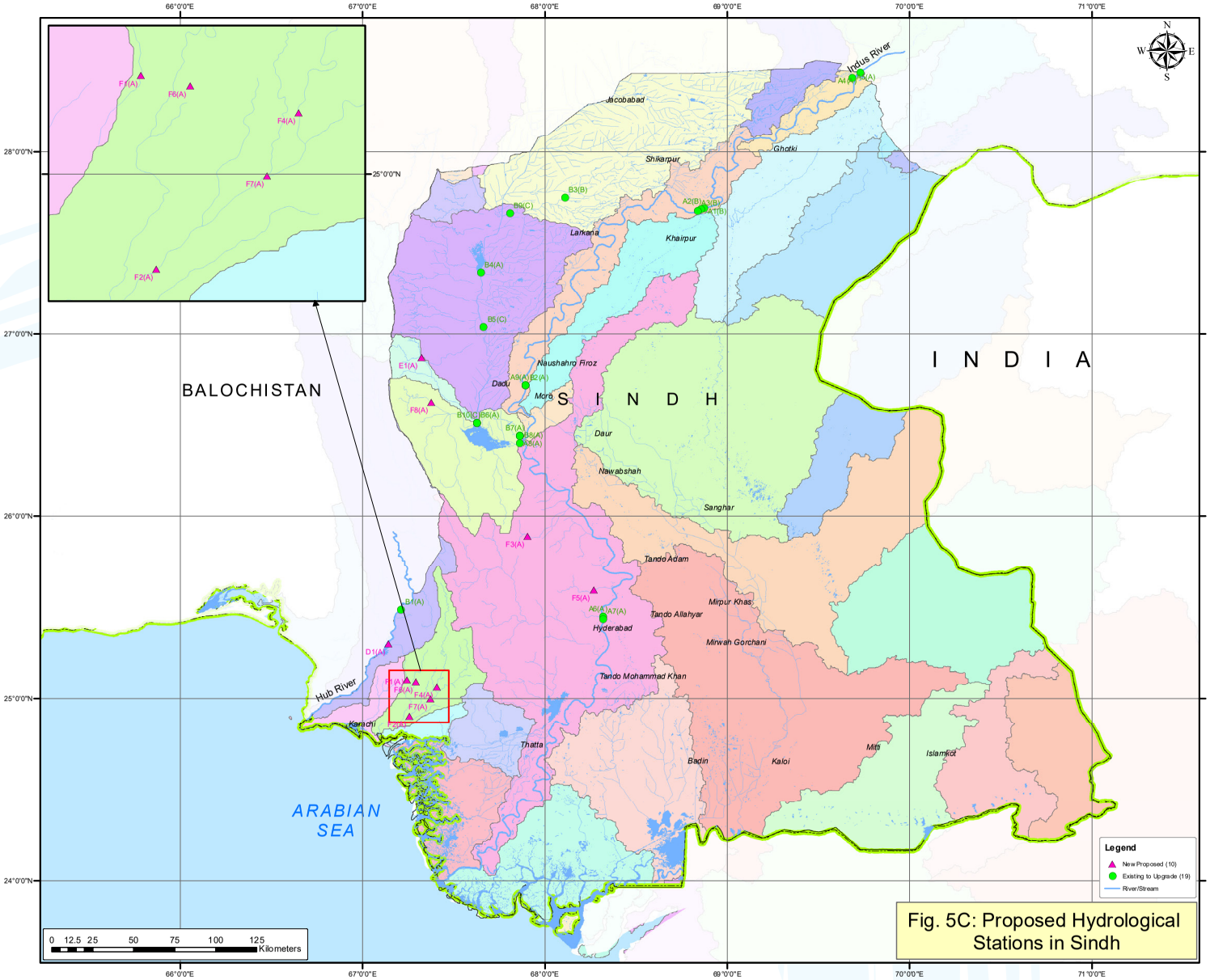

Fig. 5C: Proposed Hydrological Stations in Sindh

UPGRADATION OF EXISTING HYDROLOGICAL STATIONS	
Map Reference	Description
Upgradation of Existing (PID)	
A1	Sukkur Barrage 02 Km UpStream
A2	Sukkur Barrage 01 Km UpStream
A3	Sukkur Barrage 01 Km DownStream
A4	Guddu Barrage 01 Km UpStream
A5	Guddu Barrage 01 Km DownStream
A6	Kotri Barrage 01 Km UpStream
A7	Kotri Barrage 01 Km DownStream
A8	RD-48 MNVD UpStream Manchar Lake
A9	Daddu Moro Bridge
Upgradation of Existing (SWHP)	
B1	Hub River at Karpasanlwat
B2	Indus River at Dadu M.Bridge
B3	Miro Khan Main Drain near M.K.Z.P Site No.2
B4	M.N.V.D at Hamal Regulator Site No.6
B5	M.N.V.D at RD-277 Nr.Goth A.H.Chandio Site No.10
B6	Manchar Lake at RD 68
B7	Aral Wah at Head
B8	Aral Wah at Regulator near Sehwan Site No. 25
B9	Miro Khan Drain at Warah Canal Site No.18
B10	WNVD at Tail Site No. 28

NEW PROPOSED HYDROLOGICAL STATIONS	
New Proposed (JICA)	
D1	U/S of Hub Dam
New Proposed (TIKA)	
E1	NaiGaj Dadu district
New Proposed (FPSP-III)	
F1	Gadap Town
F2	Memon Goth
F3	Majhand
F4	Faqir Goth
F5	Petaro
F6	Mula Arazi Goth
F7	Malir
F8	Nai Gaj Dam

Table -5C

Proposed Hydrological Stations - Sindh

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
CATEGORY - A																
Upgradation of Existing (PID)	1	A4	Sindh	Indus/ Kashmore	Indus River	Guddu Barrage 01 Km UpStream	28.4321	69.7272	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation Dept Sindh	A
Upgradation of Existing (PID)	2	A5	Sindh	Indus/ Kashmore	Indus River	Guddu Barrage 01 Km DownStream	28.4025	69.687	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation Dept Sindh	A
Upgradation of Existing (PID)	3	A6	Sindh	Indus/ Hyderabad	Indus River	Kotri Barrage 01 Km UpStream	25.4481	68.3186	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation Dept Sindh	A
Upgradation of Existing (PID)	4	A7	Sindh	Indus/ Hyderabad	Indus River	Kotri Barrage 01 Km DownStream	25.4342	68.3206	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation Dept Sindh	A
Upgradation of Existing (PID)	5	A8	Sindh	Indus/ Daduu	MNVD	RD-48 MNVD UpStream Manchar Lake	26.4413	67.8603	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation Dept Sindh	A
Upgradation of Existing (PID)	6	A9	Sindh	Indus/ Nowshehro Feroz	Indus River	Daddu Moro Bridge	26.7181	67.8921	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation Dept Sindh	A
Upgradation of Existing (SWHP)	7	B1	Sindh	Hub	Indus	Hub River at Karpasaniwat	25.48555556	67.21138889	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	A
Upgradation of Existing (SWHP)	8	B2	Sindh	Indus	Indus	Indus River at Dadu M.Bridge	26.7175	67.89277778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	A
Upgradation of Existing (SWHP)	9	B4	Sindh	Indus	Indus	M.N.V.D at Hamal Regulator Site No.6	27.335	67.64833333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	A
Upgradation of Existing (SWHP)	10	B6	Sindh	Indus	Indus	Manchar Lake at RD 68	26.51083333	67.62472222	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	A
Upgradation of Existing (SWHP)	11	B7	Sindh	Indus	Indus	Aral Wah at Head	26.43972222	67.86083333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	A
Upgradation of Existing (SWHP)	12	B8	Sindh	Indus	Indus	Aral Wah at Regulator near Sehwan Site No. 25	26.4	67.86333333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	A
New Proposed (JICA)	13	D1	Sindh	Karachi	Hub River	U/S of Hub Dam	25.3	67.14	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	A
New Proposed (TIKA)	14	E1	Sindh	Dadu	NaiGaj Dam	NaiGaj Dadu district	26.87	67.32	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	A
New Proposed (FPSP-III)	15	F1	Sindh	Karachi	Malir River	Gadap Town	25.10167	67.24134	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	A
New Proposed (FPSP-III)	16	F2	Sindh	Karachi	Malir River	Memon Goth	24.9017	67.257	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	A
New Proposed (FPSP-III)	17	F3	Sindh	Jamshoro	Rani Kot River	Majhand	25.889	67.904	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	A
New Proposed (FPSP-III)	18	F4	Sindh	Karachi	Malir River	Faqir Goth	25.0632	67.4043	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	A
New Proposed (FPSP-III)	19	F5	Sindh	Jamshoro	Bajani Nadi	Petaro	25.5948	68.2662	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	A
New Proposed (FPSP-III)	20	F6	Sindh	Karachi	Thaddo Dam	Mula Arazi Goth	25.091	67.29167	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	A
New Proposed (FPSP-III)	21	F7	Sindh	Karachi	Malir River	Malir	24.998	67.37167	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	A

Table -5C

Proposed Hydrological Stations - Sindh

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed (FPSP-III)	22	F8	Sindh	Daduu	Nari River	Nai Gaj Dam	26.6248	67.3774	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	A
CATEGORY -B																
Upgradation of Existing (PID)	1	A1	Sindh	Indus/ Sukkur	Indus River	Sukkur Barrage 02 Km UpStream	27.6896	68.8723	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation Dept Sindh	B
Upgradation of Existing (PID)	2	A2	Sindh	Indus/ Sukkur	Indus River	Sukkur Barrage 01 Km UpStream	27.6839	68.855	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation Dept Sindh	B
Upgradation of Existing (PID)	3	A3	Sindh	Indus/ Sukkur	Indus River	Sukkur Barrage 01 Km DownStream	27.6739	68.8361	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation Dept Sindh	B
Upgradation of Existing (SWHP)	4	B3	Sindh	Indus	Indus	Miro Khan Main Drain near M.K.Z.P Site No.2	27.74666667	68.10888889	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	B
CATEGORY -C																
Upgradation of Existing (SWHP)	1	B5	Sindh	Indus	Indus	M.N.V.D at RD-277 Nr.Goth A.H.Chandio Site No.10	27.036389	67.662778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	C
Upgradation of Existing (SWHP)	2	B9	Sindh	Indus	Indus	Miro Khan Drain at Warah Canal Site No.18	27.66	67.808056	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	C
Upgradation of Existing (SWHP)	3	B10	Sindh	Indus	Indus	WNVD at Tail Site No. 28	26.510876	67.624737	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	C

Overlapping Stations

CATEGORY -OVERLAPPING																
New Proposed (PID)	1	C1	Sindh	Karachi	Malir River	Gadap Town	25.10167	67.24134	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irriigation Dept Sindh	Overlap
New Proposed (PID)	2	C2	Sindh	Karachi	Malir River	Memon Goth	24.9017	67.257	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irriigation Dept Sindh	Overlap
New Proposed (PID)	3	C3	Sindh	Jamshoro	Rani Kot River	Majhand	25.889	67.904	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irriigation Dept Sindh	Overlap
New Proposed (PID)	4	C4	Sindh	Karachi	Malir River	Faqir Goth	25.0632	67.4043	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irriigation Dept Sindh	Overlap
New Proposed (PID)	5	C5	Sindh	Jamshoro	Bajani Nadi	Petaro	25.5948	68.2662	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irriigation Dept Sindh	Overlap
New Proposed (PID)	6	C6	Sindh	Karachi	Thaddo Dam	Mula Arazi Goth	25.091	67.29167	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irriigation Dept Sindh	Overlap
New Proposed (PID)	7	C7	Sindh	Karachi	Malir River	Malir	24.998	67.37167	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irriigation Dept Sindh	Overlap
New Proposed (PID)	8	C8	Sindh	Dadu	Nari River	Nai Gaj Dam	26.6248	67.3774	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irriigation Dept Sindh	Overlap
New Proposed (JICA)	9	D2	Sindh	Qambar Shadad kot	Mula River	U/s of Naulong Dam	26.86	67.32	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	WAPDA	Overlap

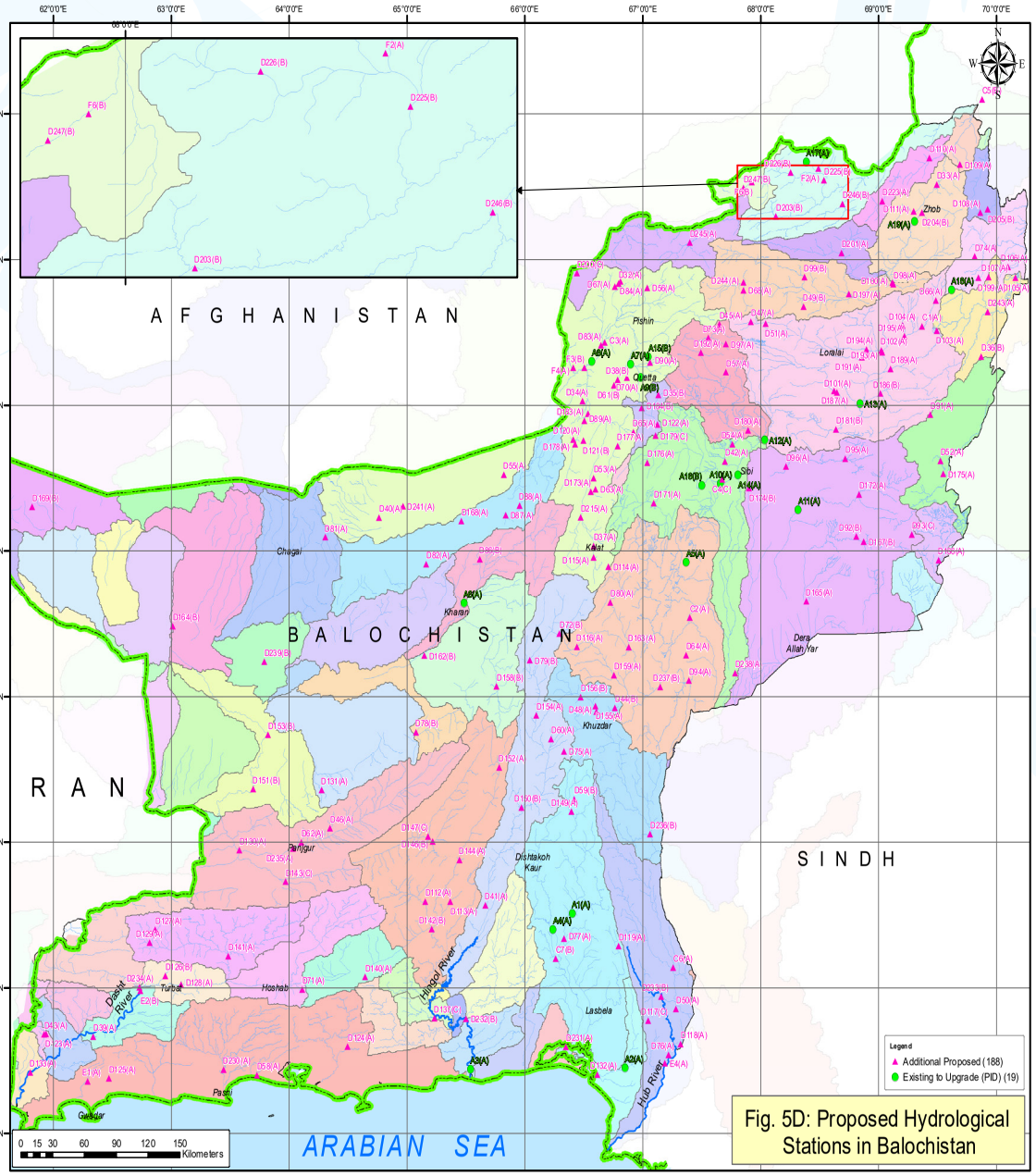

Fig. 5D: Proposed Hydrological Stations in Balochistan

UPGRADATION OF EXISTING HYDROLOGICAL STATIONS

Map Reference	Description	Map Reference	Description	Map Reference	Description	Map Reference	Description
Existing to Upgrade (PID)		A5	Naulang	A10	Gurk Tangi	A15	Chapper Rift
A1	Sinchi Bent	A6	Kili Karim Bakhsh	A11	Kundlani	A16	Mirani Dam
A2	Goth Amrun	A7	Check Post	A12	Babar Kach	A17	Qila Taimour
A3	Aghore	A8	Burj Aziz Khan	A13	Ghatti Bridge	A18	Mir Ali Khail
A4	Gundrani	A9	Brewery Bridge	A14	Nari Bridge	A19	Sharik Weir

ADDITIONAL PROPOSED HYDROLOGICAL STATIONS

Map Reference	Description	Map Reference	Description	Map Reference	Description	Map Reference	Description
New Proposed JICA H&R		D72	Rakhshan Rai	D 120	Ashkan - MG	D178	Patki Shahnawaz
C1	Loralai	D73	Zawa	D 121	Kirdgap MG	D179	Kolpur
C2	Naulang Dam	D74	Mirdadzai	D 122	Tallgundan - MG	D180	Sangan Khwar
C3	Pishion Lora	D75	Arambo	D 123	Shehzanik - GR	D181	Beji River
C4	Bolan River	D76	Kukar	D 124	Sooler GR	D183	Pishin
C5	Zhob River	D77	Jandra dam	D 125	Sur kaur GR	D184	Quetta
C6	Hub River	D78	Shamsi dam	D 126	Garuk KH Turbat	D186	Gumbaz
C7	Porali river	D79	Sultan abad dam	D 127	Madkol KH	D187	Duki
New Proposed FPSP-III (H&R)		D80	Sohinda Dam	D 128	Saman-e-kaur KH	D189	Lakhi Rud
D 32	Arambi Dam	D81	Balochapi CH	D 129	Tapok KH	D191	Loralai
D 33	Bahlool Dam	D82	Khakoi CH	D 130	Tank-e-Dap PR	D192	Ziarat
D 34	Barak Dam	D83	Dinar KA	D 131	Gorgon PR	D193	Mara Rud
D 35	Bostan Dam	D84	Lowe Arambai - KA	D 132	Winder Dhor	D194	Kahar Manda
D 36	Bund Dam	D86	Laruk NK	D 133	Dasht River	D195	Sehan Rud
D 37	Chapchal Dam	D87	Tafoi NK	D 137	Jhal Jahao	D197	Qal Saifullah
D 38	Chiltan Dam	D88	Tafoi NK2	D 140	Rod Khan	D199	Musakhel
D 39	Darwar Dam	D89	Laghab QT	D 141	Belgatar	D200	South Kadnai
D 40	Dramin Dam	D90	Srakhula - QT	D 142	Pirandhar	D201	Jogezai Rud
D 41	Jodair Dam	D91	Bibar Tak BK	D 143	Sari Parom	D203	Wali Murgha
D 42	Kumbri Dam	D92	Nerhal DB	D 144	Mustkai	D204	Zhob
D 43	Meskin Dam	D93	Pilawak DB	D 146	Sakun River	D205	Karher
D 44	Sasool Dam	D94	Dhoreri -JM	D 147	Kohna Kalat	D215	PISHIN LORA
D 45	Spezandi Dam	D95	Marjra KL	D 149	Wadh	D223	Chokhan Manda
D 46	Sur-e-Ab Dam	D96	Tall Tangi SB	D 150	Nal	D225	Kerezat
D 47	Surghund Dam	D97	Al hijirah ZT	D 151	Buzurug	D226	Girdao Zangal
D 48	Taigh Dam	D98	Ghaziai KS	D 152	Kodak	D230	GWADAR-ORMARA
D 49	Tor Kane Dam	D99	Nawar KS	D 153	Ladgasht	D231	PORALI
D 50	Uthandro Dam	D 100	Pewar Umerza KS	D 154	Surab	D232	HINGOL
D 51	Dargai	D 101	Duki LO	D 155	Baghwana	D233	HUB
D 52	Nahar Kot	D 102	Gadibar LO	D 156	Lakhurian	D234	DASHT
D 53	Zard ghulam jan	D 103	Ghuaya Tarh LO	D 158	Besima	D235	RAKHSHANI
D 54	Murgha Faqurzai	D 104	Nigong LO	D 159	Anjira	D236	GAJ
D 55	Kaluwal	D 105	Droog MK	D 162	Badoo Rud	D237	MULA
D 56	Manzarai	D 106	Tangi Sar - MK	D 163	Zehri	D238	KACHHI PLAIN
D 57	Sharag	D 107	Toisar - MK	D 164	Nok Kundi	D239	HAMUN-E-MASHKHEL
D 58	Roomro	D 108	Sangar SR	D 165	Chattar	D241	HAMUN-E-LORA
D 59	Lohi	D 109	Sherani SH	D 166	Shori Nala	D243	KAHA
D 60	Hushtri	D 110	Kibzai ZB	D 167	Dera Bugti	D244	ZHOB
D 61	Dulay Kanak	D 111	Tangi War ZB	D 168	Noshki	D245	KADNAI
D 62	Nivaro	D 112	Duraski AN	D 169	Saindak	D246	KUNDAR
D 63	Shashlok	D 113	PirandarAN	D 171	Nar Mouk	D247	KAND
D 64	Dhudur	D 114	Surkhaim KT	D 172	Kehan	New Proposed (SWHP)	
D 65	Asimabad	D 115	Zawa KT	D 173	Shirinab	E 1	akra Kaur Rier at WWPDA Jump
D 66	Dabara	D 116	Badhu Khusta KZ	D 174	Sibi Dhadar	E 2	Dasht River near Mirani Dam
D 67	Makhal	D 117	Garrah KZ	D 175	Rakhni	E 4	Hub River at Karpassaniwat
D 68	Malgagai	D 118	Bahoo LB	D 176	Mangocher	Transboundary	
D 70	Tang Nohisar	D 119	Kenraj LB	D 177	Mastung	F 2	Abdul Wahab River
D 71	Tark Kuluft					F 3	Ghori River
						F 4	Pishin Lora downstream of Burj Aziz Khan (Sargai)
						F 6	Kand River near Sahib Jan Kili

Table -5D

Proposed Hydrological Stations - Balochistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
CATEGORY - A																
Existing to Upgrade (PID)	1	A1	Balochistan	Porali	Porali River	Sinchi Bent	26.51	66.4	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Existing to Upgrade (PID)	2	A2	Balochistan	Pishin Lora	Windor Dora	Goth Amun	25.45	66.85	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Existing to Upgrade (PID)	3	A3	Balochistan	Hingol	Hingol River	Aghore	25.44	65.54	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Existing to Upgrade (PID)	4	A4	Balochistan	Porali	Kud River	Gundrani	26.4	66.24	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Existing to Upgrade (PID)	5	A5	Balochistan	Mula	Mula River	Naulang	28.92	67.37	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Existing to Upgrade (PID)	6	A6	Balochistan	Hamun e Mashkel	Baddo Rud	Killi Karim Bakhsh	28.64	65.48	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Existing to Upgrade (PID)	7	A7	Balochistan	Pishin Lora	Baleli Nullah	Check Post	30.28	66.9	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Existing to Upgrade (PID)	8	A8	Balochistan	Pishin Lora	Pishin Lora	Burj Aziz Khan	30.3	66.57	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Existing to Upgrade (PID)	9	A10	Balochistan	Kadnai	Lehri River	Gurk Tangi	29.46	67.66	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Existing to Upgrade (PID)	10	A11	Balochistan	Nari	Bolan River	Kundlani	29.28	68.32	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Existing to Upgrade (PID)	11	A12	Balochistan	Nari	Beiji River	Babar Kach	29.76	68.03	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Existing to Upgrade (PID)	12	A13	Balochistan	Kundar	Beiji River	Ghatti Bridge	30.01	68.84	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Existing to Upgrade (PID)	13	A14	Balochistan	Zhob	Nari River	Nari Bridge	29.52	67.81	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Existing to Upgrade (PID)	14	A17	Balochistan	Nari	Zhob River	Qila Taimour	31.67	68.39	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Existing to Upgrade (PID)	15	A18	Balochistan	Kaha	Zhob River	Mir Ali Khail	30.79	69.62	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
Existing to Upgrade (PID)	16	A19	Balochistan	Kundar	Zhob River	Sharik Weir	31.26	69.31	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed JICA H&R	17	C1	Balochistan			Loralai	30.54	69.37	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed JICA H&R	18	C2	Balochistan			Naulang Dam	28.54	67.4	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed JICA H&R	19	C3	Balochistan			Pishion Lora	30.43	66.68	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed JICA H&R	20	C6	Balochistan		Hub River	Hub River	26.14	67.26	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	21	D32	Balochistan	Pishin Lora	Arambi River	Arambi Dam	30.83416667	66.79616667	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	22	D33	Balochistan	Kaha	Khair Tangai	Bahlool Dam	31.51416667	69.49472222	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A

Table -5D

Proposed Hydrological Stations - Balochistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed FPSP-III (H&R)	23	D34	Balochistan	Nari	Barghar River	Barak Dam	30.0275	66.49	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	24	D37	Balochistan	Pishin Lora	Shrin Ab River	Chapchal Dam	29.03191111	66.58152778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	25	D39	Balochistan	Gwadar Ormara	Darwar Karor	Darwar Dam	25.665	62.3411111	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	26	D40	Balochistan	Hamun e Lora	Hamun e Lora	Dramin Dam	29.22797222	64.7638889	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	27	D41	Balochistan	Hingol	Nel River	Jodair Dam	26.56555556	65.66138889	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	28	D42	Balochistan	Pishin Lora	Mashkaf Nal	Kumbri Dam	29.6122222	67.7005555	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	29	D43	Balochistan	Porali	Shizaink Kaur	Meskin Dam	25.68027778	61.92116667	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	30	D45	Balochistan	Pishin Lora	Spera Ragha	Spezandi Dam	30.55394444	67.65122222	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	31	D46	Balochistan	Rakshani	Rakshani River	Sur-e-Ab Dam	27.09527778	64.34722222	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	32	D47	Balochistan	Zhob	Gurma Manda	Surghund Dam	30.5722222	67.9186111	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	33	D48	Balochistan	Gaj	Mahna Jhal	Taigh Dam	27.894444	66.6075	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	34	D50	Balochistan	Hub	Uthandro Dharora	Uthandro Dam	25.8527777	67.2836944	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	35	D51	Balochistan	Nari	Tarangi Lahar	Dargai	30.559503	68.0405944	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	36	D52	Balochistan	Nari	Jobbar Nala	Nahar Kot	29.6174194	69.5271761	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	37	D53	Balochistan	Pishin Lora	Push Thal	Zard ghulam jan	29.4983083	66.5846111	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	38	D54	Balochistan	Kachhi Plain	Kash	Murgha Faquirzai	29.7315472	67.7622333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	39	D55	Balochistan	Hamun e Lora	Zangi Nullah	Kaluwal	29.5224677	65.8187305	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	40	D56	Balochistan	Zhob	Mazari Karez	Manzarai	30.8062	67.04023	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	41	D57	Balochistan	Kadnai	Shahbrig Rud	Sharag	30.225063	67.706975	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	42	D58	Balochistan	Gwadar Ormara	Rumara Kaur	Roomro	25.3994641	63.7261	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	43	D60	Balochistan	Gaj	Patkhari Jhal	Hushtri	27.707052	66.22387	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	44	D62	Balochistan	Rakshani	Niwan Kaur	Nivano	26.999833	64.102755	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	45	D63	Balochistan	Pishin Lora	Ghulam Jan	Shashlok	29.422525	66.600175	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	46	D64	Balochistan	Kachhi Plain	Jhal Magsi	Dhudur	28.282737	67.369333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A

Table -5D

Proposed Hydrological Stations - Balochistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed FPSP-III (H&R)	47	D65	Balochistan	Pishin Lora	Jhal Pash	Asimabad	29.813956	66.917033	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	48	D66	Balochistan	Kaha	Sehan Rud	Dabara	30.718126	69.4899444	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	49	D67	Balochistan	Nari	Tabai	Makhal	30.812955	66.7647361	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	50	D68	Balochistan	Zhob	Sra Darga	Malgagai	30.7892394	67.8585433	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	51	D70	Balochistan	Zhob	Karanga Lora	Tang Nohisar	30.188311	66.865594	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	52	D71	Balochistan	Hingol	Teri Kaur	Tank Kuluft	25.988065	64.110136	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	53	D73	Balochistan	Zhob	Zahawi Nullah	Zawa	30.461053	67.557658	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	54	D74	Balochistan	Kundar	Leo Lahar Rud	Mirdadzai	31.019011	69.815027	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	55	D75	Balochistan	Gaj	Khud Din Jhal	Arambo	27.623046	66.3335	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	56	D76	Balochistan	Hub	Liari Dhora	Kukar	25.5400322	67.2166	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	57	D77	Balochistan	Porali River	Porali River	Jandra dam	26.33686	66.32877	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	58	D80	Balochistan	Kachhi Plain	Jauri Rud	Sohinda Dam	28.64471389	66.72664722	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	59	D81	Balochistan	Hamun e Lora	Dhadar Rud	Balochapi CH	29.0921944	64.30389722	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	60	D82	Balochistan	Kachhi Plain	Dal Nullah	Khakoi CH	28.90768056	65.16385278	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	61	D83	Balochistan	Pishin Lora	Pishin Lora River	Dinar KA	30.40986111	66.64773056	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	62	D84	Balochistan	Zhob	Arambi Rud	Lowe Arambai - KA	30.84846971	66.80893611	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	63	D87	Balochistan	Hamun e Lora	Tafoi Rud	Tafoi NK	29.24536111	65.83578611	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	64	D88	Balochistan	Hamun e Lora	Ahmed Wal	Tafoi NK2	29.31033333	65.95342778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	65	D89	Balochistan	Pishin Lora	Laghab Rud	Laghab QT	29.89185833	66.50255833	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	66	D90	Balochistan	Zhob	Srakhula Munda	Srakhula - QT	30.2905556	67.06	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	67	D91	Balochistan	Kaha	Han Nullah	Bibar Tak BK	29.9341277	69.4405083	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	68	D94	Balochistan	Mula	Karkh Nadi	Dhoreri -JM	28.10861111	67.39115278	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A

Table -5D

Proposed Hydrological Stations - Balochistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed FPSP-III (H&R)	69	D95	Balochistan	Kaha	Manjra Rud	Manjra KL	29.63111111	68.72	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	70	D96	Balochistan	Nari	Chhakar River	Tali Tangi SB	29.57769602	68.21678966	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	71	D97	Balochistan	Zhob	Rud	Al hijjrah ZT	30.41753611	67.7054611	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	72	D98	Balochistan	Zhob	Ghazlai Rud	Ghazlai KS	30.82915	69.1265611	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	73	D100	Balochistan	Nari	Ghazali Rud	Pewar Umerzai KS	30.83916573	69.11941822	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	74	D101	Balochistan	Zhob	Duki	Duki LO	30.0880333	68.6502972	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	75	D102	Balochistan	Nari	Loralai River	Gadibar LO	30.3740627	69.0185454	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	76	D103	Balochistan	Kaha	Anamber River	Ghuaya Tarh LO	30.50972112	69.49279368	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	77	D104	Balochistan	Kaha	Anamber River	Nigong LO	30.54624444	69.20415833	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	78	D105	Balochistan	Zhob	Lang Nadi	Droog MK	30.87281667	70.16458889	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	79	D106	Balochistan	Zhob	Tangi Sar	Tangi Sar - MK	30.9486111	70.0963888	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	80	D107	Balochistan	Zhob	Toisar	Toisar - MK	30.8786111	69.9347222	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	81	D108	Balochistan	Kand	Sangar Toi	Sangar SR	31.3229194	69.8611305	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	82	D109	Balochistan	Kand	Sherani Jhal	Sherani SH	31.64958333	69.69044722	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	83	D110	Balochistan	Kand	Sri Toi	Kibzai ZB	31.69692911	69.43301232	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	84	D111	Balochistan	Kundar	Surab Munda	Tangi War ZB	31.32902222	69.29908333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	85	D112	Balochistan	Rakshani	Dunaski Kaur	Duraski AN	26.59241111	65.15408056	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	86	D113	Balochistan	Rakshani	Lop River	Pirandar AN	26.59244444	65.36783889	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	87	D114	Balochistan	Kachhi Plain	Surkhaim Jhal	Surkhaim KT	28.89093611	66.70762222	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	88	D115	Balochistan	Hamun e Mashkel	Dhombhan Jhal	Zawa KT	28.95519722	66.58345833	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	89	D116	Balochistan	Kachhi Plain	Anjira Nullah	Badhu Khusta KZ	28.341825	66.43846111	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	90	D118	Balochistan	Hub	Bahoo Kaur	Bahoo LB	25.6132138	67.32105	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A

Table -5D

Proposed Hydrological Stations - Balochistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed FPSP-III (H&R)	91	D119	Balochistan	Gaj	Kenraj Kaur	Kenraj LB	26.28544722	66.79640556	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	92	D120	Balochistan	Hamun e Lora	Ashkan Kaur	Ashkan - MG	29.76265833	66.41072222	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	93	D122	Balochistan	Nari	Gishitri Nala	Tallgundan - MG	29.86506111	67.12759722	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	94	D123	Balochistan	Porali	Shehzanik Kaur	Shehzanik - GR	25.68267749	61.93337385	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	95	D124	Balochistan	Porali	Salur Kaur	Sooler GR	25.59471637	64.49857021	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	96	D125	Balochistan	Gwadar Ormara	Saur Kaur	Sur kaur GR	25.37661111	62.46988611	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	97	D127	Balochistan	Dasht	Simori Kaur	Madikol KH	26.39818889	62.86473889	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	98	D128	Balochistan	Dasht	Kech River	Saman-e-kaur KH	26.02132778	63.08023056	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	99	D129	Balochistan	Dasht	Gish Kaur	Tapok KH	26.30833333	62.81305556	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	100	D130	Balochistan	Rakshani	Rakshani River	Tank-e-Dap PR	26.94404167	63.57941389	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	101	D131	Balochistan	Rakshani	Mashkhel	Gorgon PR	27.35715	64.27231667	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	102	D132	Balochistan			Winder Dhor	25.40424	66.614341	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	103	D133	Balochistan			Dasht River	25.417851	61.80073	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	104	D140	Balochistan			Rod Khan	26.072296	64.644897	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	105	D141	Balochistan			Belgatar	26.216462	63.486008	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	106	D144	Balochistan			Mushkai	26.878129	65.441563	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	107	D149	Balochistan			Wadh	27.208129	66.391285	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	108	D152	Balochistan			Kodak	27.512018	65.78073	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	109	D154	Balochistan			Surab	27.869518	66.097674	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	110	D155	Balochistan			Baghwana	27.932851	66.597674	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	111	D159	Balochistan			Anjira	28.146462	66.755174	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	112	D163	Balochistan			Zehri	28.338129	66.879341	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A

Table -5D

Proposed Hydrological Stations - Balochistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed FPSP-III (H&R)	113	D165	Balochistan			Chattar	28.652573	68.385174	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	114	D166	Balochistan			Shori Nala	28.936205	69.50707	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	115	D168	Balochistan			Noshki	29.203129	65.461841	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	116	D171	Balochistan			Nar Mouk	29.326184	67.09323	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	117	D172	Balochistan			Kahan	29.386462	68.835452	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	118	D173	Balochistan			Shirinab	29.406184	66.55823	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	119	D175	Balochistan			Rakhni	29.52676	69.547347	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	120	D176	Balochistan			Mangochar	29.60474	67.041508	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	121	D177	Balochistan			Mastung	29.718684	66.783508	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	122	D178	Balochistan			Patki Shahnawaz	29.732296	66.422397	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	123	D180	Balochistan			Sangan Khwar	29.826184	67.891841	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	124	D183	Balochistan			Pishin	29.939796	66.534063	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	125	D187	Balochistan			Duki	30.097296	68.624341	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	126	D189	Balochistan			Lakhi Rud	30.248129	69.104619	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	127	D191	Balochistan			Loralai	30.328962	68.860452	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	128	D192	Balochistan			Ziarat	30.360907	67.491285	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	129	D193	Balochistan			Mara Rud	30.362018	69.031563	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	130	D194	Balochistan			Kahar Manda	30.38174	68.895452	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	131	D195	Balochistan			Sehan Rud	30.470907	69.219063	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	132	D197	Balochistan			Qial Saifullah	30.761184	68.746285	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	133	D199	Balochistan			Musakhel	30.874538	69.84457	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	134	D201	Balochistan			Jogezai Rud	31.045351	68.685174	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A

Table -5D

Proposed Hydrological Stations - Balochistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed FPSP-III (H&R)	135	D215	Balochistan			PISHIN LORA	29.228684	66.473785	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	136	D223	Balochistan			Chokhan Manda	31.399796	69.03323	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	137	D230	Balochistan			GWADAR-ORMARA	25.437594	63.441236	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	138	D231	Balochistan			PORALI	25.59424	66.35073	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	139	D234	Balochistan			DASHT	26.003684	62.732952	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	140	D235	Balochistan			RAKHSHANI	26.954816	64.030403	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	141	D238	Balochistan			KACHHI PLAIN	28.161184	67.785452	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	142	D241	Balochistan			HAMUN-E-LORA	29.30426	64.963181	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	143	D243	Balochistan			KAHA	30.639538	69.924847	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	144	D244	Balochistan			ZHOB	30.840907	67.853508	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed FPSP-III (H&R)	145	D245	Balochistan			KADNAI	31.115094	67.399292	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed (SWHP)	146	E1	Balochistan			akra Kaur Rier at WAPDA Jump	25.357493	62.288903	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
New Proposed (SWHP)	147	E4	Balochistan			Hub River at Karpassaniwat	25.480455	67.189127	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Transboundary	148	F2	Balochistan			Abdul Wahab River	31.62431115	68.49329231	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Transboundary	149	F4	Balochistan			Pishin Lora downstream of Burj Aziz Khan (Sargai)	30.25599044	66.4146644	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
CATEGORY - B																
Existing to Upgrade (PID)	1	A9	Balochistan	Pishin Lora	Sariab Lora	Brewery Bridge	30.19	66.98	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
Existing to Upgrade (PID)	2	A15	Balochistan	Gaj	Khost River	Chapper Rift	30.33	67.05	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
Existing to Upgrade (PID)	3	A16	Balochistan	Kadnai	Dasht River	Mirani Dam	29.45	67.5	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
New Proposed JICA H&R	4	C5	Balochistan		Zhob River	Zhob River	32.1	69.88	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed JICA H&R	5	C7	Balochistan		Porali river	Porali river	26.2	66.26	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	6	D35	Balochistan	Zhob	Tasagi Nullah	Bostan Dam	30.06972222	67.13333333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	7	D36	Balochistan	Kaha	Saran Lahar	Bund Dam	30.33361111	69.87572222	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B

Table -5D

Proposed Hydrological Stations - Balochistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed FPSP-III (H&R)	8	D38	Balochistan	Nari	Karanga Lora	Chiltan Dam	30.1756	66.78675	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	9	D44	Balochistan	Gaj	Karez Jhal	Sasool Dam	27.92194444	66.76555556	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	10	D49	Balochistan	Kaha	Garanga Manda	Tor Kane Dam	30.6761111	68.3622222	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	11	D59	Balochistan	Porali	Amber Jhal	Lohi	27.293129	66.419551	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	12	D61	Balochistan	Zhob	Karanga Lora	Dulay Kanak	30.136185	66.756686	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	13	D72	Balochistan	Mula	Tharki Nullah	Rakhshan Rai	28.429964	66.293919	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	14	D78	Balochistan	Rakshani	Besima Nullah	Shamsi dam	27.75481975	65.07438268	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	15	D79	Balochistan	Mula	Nal Kaur	Sultan abad dam	28.24830556	66.04444722	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	16	D86	Balochistan	Hamun e Lora	Chahsil Kaur	Laruk NK	28.943252	65.615099	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	17	D92	Balochistan	Nari	Siahaf Rud	Nerhai DB	29.097194	68.8094833	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	18	D99	Balochistan	Nari	Lunda Rud	Nawar KS	30.87765	68.368672	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	19	D121	Balochistan	Pishin Lora	Kirdgap Nala	Kirdgap MG	29.7566716	66.4928608	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	20	D126	Balochistan	Dasht	Kech River	Garuk KH Turbat	26.08025	62.95021111	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	21	D142	Balochistan			Pirandhar	26.403129	65.212674	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	22	D146	Balochistan			Sakun River	27.004518	65.216285	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	23	D150	Balochistan			Nal	27.237018	65.970174	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	24	D151	Balochistan			Buzurug	27.362851	63.691841	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	25	D153	Balochistan			Ladgasht	27.735629	63.820452	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	26	D156	Balochistan			Lakhurian	27.995351	66.476841	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	27	D158	Balochistan			Besima	28.068962	65.761008	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	28	D162	Balochistan			Badoo Rud	28.278684	65.146008	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	29	D164	Balochistan			Nok Kundi	28.483129	63.011841	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B

Table -5D

Proposed Hydrological Stations - Balochistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed FPSP-III (H&R)	30	D167	Balochistan			Dera Bugti	29.060907	68.872952	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	31	D169	Balochistan			Saindak	29.299969	61.821836	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	32	D174	Balochistan			Sibi Dhadar	29.429518	67.904063	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	33	D181	Balochistan			Beji River	29.834518	68.638785	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	34	D184	Balochistan			Quetta	29.97924	66.991008	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	35	D186	Balochistan			Gumbaz	30.078684	69.014897	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	36	D203	Balochistan			Wali Murgha	31.294816	68.130959	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	37	D204	Balochistan			Zhob	31.322851	69.368785	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	38	D205	Balochistan			Karher	31.34426	69.926236	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	39	D225	Balochistan			Karezat	31.542872	68.540959	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	40	D226	Balochistan			Girdao Zangal	31.597038	68.255959	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	41	D232	Balochistan			HINGOL	25.78674	65.499063	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	42	D233	Balochistan			HUB	25.938705	67.157625	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	43	D236	Balochistan			GAJ	27.053684	67.064341	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	44	D237	Balochistan			MULA	28.065629	67.147674	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	45	D239	Balochistan			HAMUN-E-MASHKHEL	28.237573	63.78823	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	46	D246	Balochistan			KUNDAR	31.380927	68.695959	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed FPSP-III (H&R)	47	D247	Balochistan			KAND	31.490927	67.853459	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed (SWHP)	48	E2	Balochistan			Dasht River near Mirani Dam	25.97881	62.738294	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	B
Transboundary	49	F3	Balochistan			Ghori River	30.25540346	66.50085185	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
Transboundary	50	F6	Balochistan			Kand River near Sahib Jan Killi	31.53130429	67.92917898	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
CATEGORY - C																
New Proposed JICA H&R	1	C4	Balochistan		Bolan River	Bolan River	29.49	67.67	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C

Table -5D

Proposed Hydrological Stations - Balochistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed FPSP-III (H&R)	2	D93	Balochistan	Kaha	Barkhana Nulla	Pilawak DB	29.1104333	69.2822972	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed FPSP-III (H&R)	3	D117	Balochistan	Hingol	Barki Jhal	Garrah KZ	25.7742694	67.0443916	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed FPSP-III (H&R)	4	D137	Balochistan			Jhal Jahao	25.789796	65.229897	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed FPSP-III (H&R)	5	D143	Balochistan			Sari Parom	26.727594	63.96707	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed FPSP-III (H&R)	6	D147	Balochistan			Kohna Kalat	27.037573	65.179897	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed FPSP-III (H&R)	7	D179	Balochistan			Kolpur	29.7894	67.107635	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C
New Proposed FPSP-III (H&R)	8	D200	Balochistan			South Kadnai	30.905372	66.441514	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	C

Overlapping Stations

CATEGORY - OVERLAPPING																
New Proposed (PID)	1	B1	Balochistan	Kadnai	Kadnai River	Kadanir	31.490927	67.853459	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	2	B2	Balochistan	Kundar	Kundar River	Karezat	31.542872	68.540959	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	3	B3	Balochistan	Kundar	Kundar River	Girdao Zangal	31.597038	68.255959	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	4	B4	Balochistan	Hamun e Mashkel	Hamun e Mashkel River	Mashkhel	28.237573	63.78823	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	5	B5	Balochistan	Kundar	Kundar River	Kunder	31.380927	68.695959	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	6	B6	Balochistan	Hamun e Mashkel	Hamun e Mashkel River	Nok Kundi	28.483129	63.011841	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	7	B7	Balochistan	Kundar	Kundar River	Wali Murgha	31.294816	68.130959	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	8	B8	Balochistan	Pishin Lora	Pishin Lora River	South Kadnai	30.905372	66.441514	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	9	B9	Balochistan	Rakshani	Rakshani River	Buzurug	27.362851	63.691841	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	10	B10	Balochistan	Rakshani	Rakshani River	Ladgasht	27.735629	63.820452	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	11	B11	Balochistan	Gaj	Gaj River	Khuzdar	27.053684	67.064341	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	12	B12	Balochistan	Hamun e Lora	Hamun e LoraRiver	Saindak	29.299969	61.821836	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed FPSP-III (H&R)	13	D1	Balochistan			Kadanir	31.490927	67.853459	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap

Table -5D

Proposed Hydrological Stations - Balochistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed FPSP-III (H&R)	14	D2	Balochistan			Karezat	31.542872	68.540959	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	15	D3	Balochistan			Girdao Zangal	31.597038	68.255959	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	16	D4	Balochistan			Mashkhel	28.237573	63.78823	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	17	D5	Balochistan			Kunder	31.380927	68.695959	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	18	D6	Balochistan			Nok Kundi	28.483129	63.011841	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	19	D7	Balochistan			Wali Murgha	31.294816	68.130959	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	20	D8	Balochistan			South Kadnai	30.905372	66.441514	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	21	D9	Balochistan			Buzurug	27.362851	63.691841	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	22	D10	Balochistan			Ladgasht	27.735629	63.820452	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	23	D11	Balochistan			Khuzdar	27.053684	67.064341	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	24	D12	Balochistan			Saindak	29.299969	61.821836	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	25	D13	Balochistan		Porali River	Sinchi Bent	26.51	66.4	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	26	D14	Balochistan		Windor Dora	Goth Amun	25.45	66.85	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	27	D15	Balochistan		Hingol River	Aghore	25.44	65.54	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	28	D16	Balochistan		Kud River	Gundrani	26.4	66.24	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	29	D17	Balochistan		Mula River	Naulang	28.92	67.37	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	30	D18	Balochistan		Baddo Rud	Killi Karim Bakhsh	28.64	65.48	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	31	D19	Balochistan		Baleli Nullah	Check Post	30.28	66.9	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	32	D20	Balochistan		Pishin Lora	Burj Aziz Khan	30.3	66.57	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	33	D21	Balochistan		Sariab Lora	Brewery Bridge	30.19	66.98	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	34	D22	Balochistan		Lehri River	Gurk Tangi	29.46	67.66	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	35	D23	Balochistan		Bolan River	Kundlani	29.28	68.32	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap

Table -5D

Proposed Hydrological Stations - Balochistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed FPSP-III (H&R)	36	D24	Balochistan		Beiji River	Babar Kach	29.76	68.03	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	37	D25	Balochistan		Beiji River	Ghatti Bridge	30.01	68.84	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	38	D26	Balochistan		Nari River	Nari Bridge	29.52	67.81	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	39	D27	Balochistan		Khost River	Chapper Rift	30.33	67.05	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	40	D28	Balochistan		Dasht River	Mirani Dam	29.45	67.5	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	41	D29	Balochistan		Zhob River	Qila Taimour	31.67	68.39	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	42	D30	Balochistan		Zhob River	Mir Ali Khail	30.79	69.62	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	43	D31	Balochistan		Zhob River	Sharik Weir	31.26	69.31	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	44	D69	Balochistan	Kaha	Sherani Rud	Mir Alikhel	31.64962861	69.68855556	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	45	D85	Balochistan	Hamun e Lora	Reka Rud	Injeri NK	29.30111196	65.96935593	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	46	D134	Balochistan			Coastal	25.437594	63.441236	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	47	D135	Balochistan			Bela	25.59424	66.35073	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	48	D136	Balochistan			Arra	25.78674	65.499063	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	49	D138	Balochistan			Hub	25.938705	67.157625	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	50	D139	Balochistan			Kech River	26.003684	62.732952	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	51	D145	Balochistan			Panjgur	26.954816	64.030403	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	52	D148	Balochistan			Khuzdar	27.053684	67.064341	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	53	D157	Balochistan			Mula River	28.065629	67.147674	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	54	D160	Balochistan			Bagh Nala	28.161184	67.785452	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	55	D161	Balochistan			Mashkhel	28.237573	63.78823	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	56	D170	Balochistan			Hamun i Lora	29.30426	64.963181	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	57	D182	Balochistan			Harnai	29.91174	68.087952	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap

Table -5D

Proposed Hydrological Stations - Balochistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed FPSP-III (H&R)	58	D185	Balochistan			Anambar Rud	29.997851	68.835452	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	59	D188	Balochistan			Dabbar	30.205907	68.546841	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	60	D190	Balochistan			Kuchlak	30.292573	66.901285	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	61	D196	Balochistan			Nokai	30.639538	69.924847	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	62	D198	Balochistan			Muslimbagh	30.840907	67.853508	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	63	D202	Balochistan			North Kadnai	31.115094	67.399292	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	64	D206	Balochistan			PORALI	25.59424	66.35073	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	65	D207	Balochistan			HINGOL	25.78674	65.499063	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	66	D208	Balochistan			HUB	25.938705	67.157625	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	67	D209	Balochistan			DASHT	26.003684	62.732952	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	68	D210	Balochistan			RAKHSHANI	26.954816	64.030403	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	69	D211	Balochistan			GAJ	27.053684	67.064341	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	70	D212	Balochistan			MULA	28.065629	67.147674	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	71	D213	Balochistan			KACHHI PLAIN	28.161184	67.785452	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	72	D214	Balochistan			HAMUN-E-MASHKHEL	28.237573	63.78823	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	73	D216	Balochistan			HAMUN-E-LORA	29.30426	64.963181	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	74	D217	Balochistan			NARI	29.834518	68.638785	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	75	D218	Balochistan			KAHA	30.639538	69.924847	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	76	D219	Balochistan			ZHOB	30.840907	67.853508	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	77	D220	Balochistan			KADNAI	31.115094	67.399292	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	78	D221	Balochistan			KUNDAR	31.380927	68.695959	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	79	D222	Balochistan			KAND	31.490927	67.853459	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap

Table -5D

Proposed Hydrological Stations - Balochistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed FPSP-III (H&R)	80	D224	Balochistan			Kadanir	31.490927	67.853459	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	81	D227	Balochistan			GWADAR-ORMARA	25.437594	63.441236	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	82	D228	Balochistan			Kalat	29.228684	66.473785	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	83	D229	Balochistan			Kunder	31.380927	68.695959	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	84	D240	Balochistan			PISHIN LORA	29.228684	66.473785	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed FPSP-III (H&R)	85	D242	Balochistan			NARI	29.834518	68.638785	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed (SWHP)	86	E3	Balochistan			Hingol Rier at Aghore	25.437929	65.546062	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	Overlap
New Proposed (SWHP)	87	E5	Balochistan			Beji Rier at Chatti Bridge	30.01	68.84	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	Overlap
New Proposed (SWHP)	88	E6	Balochistan			Khost River at Chapper Rift	30.33	67.05	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	Overlap
New Proposed (SWHP)	89	E7	Balochistan			Saraib Lora at Brewery Bridge	30.19	66.98	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	Overlap
New Proposed (SWHP)	90	E8	Balochistan			Beleli Jallah at Custom Check Post	30.28	66.9	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	Overlap
New Proposed (SWHP)	91	E9	Balochistan			Beji River at Babar Kach	29.76	68.03	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	Overlap
New Proposed (SWHP)	92	E10	Balochistan			Pashin Lora at Burj Aziz Khan	30.3	66.57	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	Overlap
New Proposed (SWHP)	93	E11	Balochistan			Bolan Rier at Kundlani	29.28	68.32	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	Overlap
New Proposed (SWHP)	94	E12	Balochistan			Nari River at Nari Bridge	29.52	67.81	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	Overlap
New Proposed (SWHP)	95	E13	Balochistan			Lehri River at Churk Tangi	29.46	67.66	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	Overlap
New Proposed (SWHP)	96	E14	Balochistan			Kud River at Mai Gundrani	26.4	66.24	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	Overlap
New Proposed (SWHP)	97	E15	Balochistan			Porali River at Sinchi Bent	26.51	66.4	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	Overlap
New Proposed (SWHP)	98	E16	Balochistan			Windor Dhora Near Goth Amun	25.45	66.85	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	Overlap
New Proposed (SWHP)	99	E17	Balochistan			Zhob River at Sheirk Weir	31.26	69.31	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	Overlap
New Proposed (SWHP)	100	E18	Balochistan			Zhob River at Mir Ali Khail	30.79	69.62	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	Overlap
Transboundary	101	F1	Balochistan			Pishin Lora (Bore Nullah) at Anam Bostan	30.40986111	66.64773056	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
Transboundary	102	F5	Balochistan			Kandar River at Sande	31.38046194	68.69165023	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
Transboundary	103	F7	Balochistan			Kadnai River at Domanda	31.11510794	67.39894673	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap

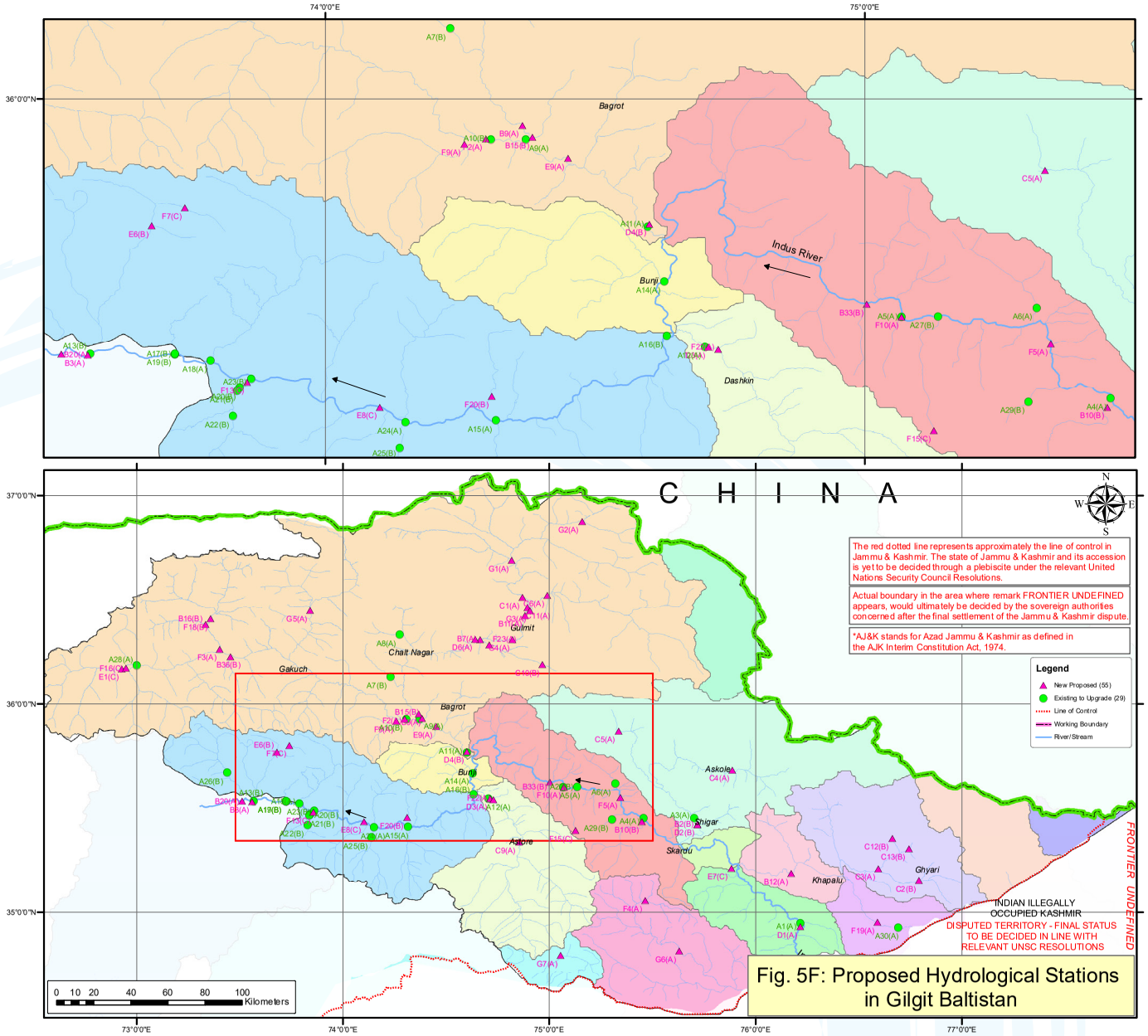

Fig. 5F: Proposed Hydrological Stations in Gilgit Baltistan

UPGRADATION OF EXISTING HYDROLOGICAL STATIONS

Map Reference	Monitoring Station Ref.
Existing to Upgrade (SWHP)	
A1	Indus river at Kharmong
A3	Shiger river at Shiger
A4	Indus river at Kachura
A5	Talu Nullah at Talu
A6	Tormic Nullah at Tormic
A7	Naltar Nullah at Naltar Bala
A8	Dahitar(Denter) Nullah at Bassin
A9	Hunza river at Dainyor
A10	Gilgit river at Gilgit
A11	Gilgit river at Alam bridge
A12	Astore river at Doyan
A13	Indus river at Shatial
A14	Indus river at Burji
A15	Indus River at Ganji Bridge
A16	Indus River at Thalichi Bridge

Map Reference	Monitoring Station Ref.
A17	Indus River D/S of Basha Dam
A18	Indus River at Khanbari
A19	Indus River at Dodishal
A20	Thor Nullah at Bridge
A21	Thor Nullah at Tail Race
A22	Thor Site at Shital
A23	Thor Site of D/S of Thor Colony
A24	Thak Nullah at Weir Site
A25	Thak Nullah at Tail Race Channel
A26	Tangir Nullah at Tangir
A27	Harpo Nullah at Harpo
A28	Ghizar River at Phandar
A29	Basho Lungma Nullah at Khar village
A30	Shyoke River at Chowar Near LOC

ADDITIONAL PROPOSED HYDROLOGICAL STATIONS

Map Reference	Monitoring Station Ref.
New Proposed (PID)	
B2	Shigar
B3	Shatial
B7	Ganish
B9	Daniyor
B10	Kachura
B11	Hussani
B12	Yugo
B15	Dainoyr
B16	Yaseen
B20	Sazin
B33	Ganji
B36	Gupis
New Proposed (GMRC)	
C1	Batura Glacier Snout
C2	Goma (Gyari Area)
C3	Dansum
C4	Biafo Glacier Snout
C5	Chongolungma Glacier Snout
C6	Shimshal Valley Mouth
C9	Astore at Ldgah
C10	Hispar Glacier Snout
C11	Pasu Glacier Snout
C12	Kondos Glacier Snout
C13	Sherpiang Glacier Snout
New Proposed WAPDA WCAP /DASU	
D1	Kharmang @ Indus River
D2	Shigar @ Shigar River
D3	Doiyan @ Astore River
D4	Alam Bridge @ Gilgit River
D6	Ganish @ Hunza River

Map Reference	Monitoring Station Ref.
New Proposed Dasu H&R	
E1	River Gilgit @ Phander
E6	Darel
E7	River Shyok @ Chowar
E8	River Indus @ Chilas
E9	Gilgit River @ Gilgit
New Proposed	
F2	Dainoyr
F3	Yaseen
F4	Deosi
F5	Tungus
F7	Darel River
F9	Basin
F10	Tallu
F13	Thor Nullah
F15	Harpo
F16	Phander
F18	Ghizer River
F19	Shyoke River
F20	Ganji
F22	Indus at Astore
F23	Nagar River
PROPOSED BY CONSULTANTS	
G1	Aliatabad
G2	Bara Khun
G3	Passu Suspension Bridge
G4	Atta Abad
G5	Barjangle
G6	Shigar River near Karbos
G7	Buzil Nar

Table -5F

Proposed Hydrological Stations - Gilgit Baltistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
CATEGORY - A																
Existing to Upgrade (SWHP)	1	A1	GB	Indus	Indus	Indus river at Kharmong	34.94722222	76.21694444	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	A
Existing to Upgrade (SWHP)	2	A3	GB	Indus	Indus	Shiger river at Shiger	35.45	75.69888889	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	A
Existing to Upgrade (SWHP)	3	A4	GB	Indus	Indus	Indus river at Kachura	35.45055556	75.45527778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	A
Existing to Upgrade (SWHP)	4	A5	GB	Indus	Tallu Nallah	Talu Nullah at Talu	35.5998321	75.0679318	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	A
Existing to Upgrade (SWHP)	5	A6	GB	Indus	Tormic Nallah	Tormic Nullah at Tormic	35.61638889	75.31805556	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	A
Existing to Upgrade (SWHP)	6	A8	GB	Indus	Denter Nallah	Dahitar(Denter) Nullah at Bassin	36.33166667	74.275	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	A
Existing to Upgrade (SWHP)	7	A9	GB	Indus	Indus	Hunza river at Dainyor	35.9250562	74.3712607	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	A
Existing to Upgrade (SWHP)	8	A11	GB	Indus	Indus	Gilgit river at Alam bridge	35.76527778	74.59777778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	A
Existing to Upgrade (SWHP)	9	A12	GB	Indus	Indus	Astore river at Doyan	35.545	74.70416667	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	A
Existing to Upgrade (SWHP)	10	A14	GB	Indus	Indus	Indus river at Bunji	35.665	74.62805556	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	A
Existing to Upgrade (SWHP)	11	A15	GB	Indus	Indus	Indus River at Ganji Bridge	35.40972222	74.3159347	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	A
Existing to Upgrade (SWHP)	12	A18	GB	Indus	Indus	Indus River at Khanbari	35.51972222	73.78666667	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	A
Existing to Upgrade (SWHP)	13	A24	GB	Indus	Indus	Thak Nullah at Weir Site	35.40666667	74.14805556	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	A
Existing to Upgrade (SWHP)	14	A28	GB	Indus	Indus	Ghizar River at Phandar	36.1837962	72.9987187	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	A
Existing to Upgrade (SWHP)	15	A30	GB	Chowar	Indus	Shyoke River at Chowar Near LOC	34.92611111	76.68888889	Army camp	Both	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
New Proposed (PID)	16	B3	Gilgit Baltistan	Chillas	Indus River	Shatial	35.53	73.56	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	17	B7	Gilgit Baltistan	Ganish	Hunza River	Ganish	36.308	74.6621	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	18	B9	Gilgit Baltistan	Gilgit	Hunza River	Daniyor	35.951	74.365	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	19	B11	Gilgit Baltistan	Hussani	Hunza River	Hussani	36.4231	74.8815	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	20	B12	Gilgit Baltistan	Yugo	Shyoke River	Yugo	35.1852	76.1716	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (PID)	21	B20	Gilgit Baltistan	Kohistan	Indus River	Sazin	35.5317	73.5099	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	A
New Proposed (GMRC)	22	C1	GB	UIB	Hunza	Batura Glacier Snout	36.511	74.87	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	GMRC	A

Table -5F

Proposed Hydrological Stations - Gilgit Baltistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed (GMRC)	23	C3	GB	UIB	Shyok	Dansum	35.208	76.593	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	GMRC	A
New Proposed (GMRC)	24	C4	GB	UIB	Shigar	Biafo Glacier Snout	35.682	75.887	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	GMRC	A
New Proposed (GMRC)	25	C5	GB	UIB	Shigar	Chongolungma Glacier Snout	35.869	75.334	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	GMRC	A
New Proposed (GMRC)	26	C6	GB	UIB	Hunza	Shimshal Valley Mouth	36.52	74.989	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	GMRC	A
New Proposed (GMRC)	27	C9	GB	UIB	Astore	Astore at Ldgah	35.336	74.851	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	GMRC	A
New Proposed (GMRC)	28	C11	GB	UIB	Hunza	Pasu Glacier Snout	36.462	74.893	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	GMRC	A
New Proposed WAPDA WCAP /DASU	29	D1	GB		Indus River	Kharmang @ Indus River	34.93	76.216	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Wapda WCAP	A
New Proposed WAPDA WCAP /DASU	30	D3	GB		Astore Rive	Doiyan @ Astore River	35.54436	74.71027	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Wapda WCAP	A
New Proposed WAPDA WCAP /DASU	31	D6	GB		Hunza River	Ganish @ Hunza River	36.31	74.64	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Wapda WCAP	A
New Proposed Dasu H&R	32	E9	GB		Gilgit River	Gilgit River @ Gilgit	35.89087	74.44969	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	A
New Proposed	33	F2	GB			Dainoyr	35.9265	74.2972	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	A
New Proposed	34	F3	GB			Yaseen	36.262	73.4014	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	A
New Proposed	35	F4	GB			Deosi	35.055	75.4637	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	A
New Proposed	36	F5	GB			Tungus	35.5505	75.3445	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	A
New Proposed	37	F9	GB			Basin	35.9169	74.2569	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	A
New Proposed	38	F10	GB			Tallu	35.5999	75.0685	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	A
New Proposed	39	F19	GB			Shyoke River	34.9506	76.5919	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	A
New Proposed	40	F22	GB			Indus at Astore	35.54	74.7273	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	A
New Proposed	41	F23	GB			Nagar River	36.2827	74.7085	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	A
PROPOSED BY CONSULTANTS	42	G1	GB			Afiatabad	36.68878782	74.81756804	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes		A
PROPOSED BY CONSULTANTS	43	G2	GB			Bara Khun	36.87419484	75.15668327	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes		A
PROPOSED BY CONSULTANTS	44	G3	GB			Passu Suspension Bridge	36.44741906	74.90296353	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes		A

Table -5F

Proposed Hydrological Stations - Gilgit Baltistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
PROPOSED BY CONSULTANTS	45	G4	GB			Atta Abad	36.30822688	74.82138808	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes		A
PROPOSED BY CONSULTANTS	46	G5	GB			Barjangle	36.44808154	73.84031829	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes		A
PROPOSED BY CONSULTANTS	47	G6	GB			Shigar River near Karbos	34.81327887	75.62725306	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes		A
PROPOSED BY CONSULTANTS	48	G7	GB			Buzil Nar	34.79217723	75.05333303	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	.	A
CATEGORY - B																
Existing to Upgrade (SWHP)	1	A7	GB	Indus	Nalter Nallah	Naltar Nullah at Naltar Bala	36.12916667	74.23111111	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	B
Existing to Upgrade (SWHP)	2	A10	GB	Indus	Indus	Gilgit river at Gilgit	35.9255353	74.3075403	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	B
Existing to Upgrade (SWHP)	3	A13	GB	Indus	Indus	Indus river at Shatial	35.53222222	73.56444444	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	B
Existing to Upgrade (SWHP)	4	A16	GB	Indus	Indus	Indus River at Thalichi Bridge	35.565	74.63316667	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	B
Existing to Upgrade (SWHP)	5	A17	GB	Indus	Indus	Indus River D/S of Basha Dam	35.53138889	73.72083333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	B
Existing to Upgrade (SWHP)	6	A19	GB	Indus	Indus	Indus River at Dodishal	35.53222222	73.72111111	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	B
Existing to Upgrade (SWHP)	7	A20	GB	Indus	Indus	Thor Nullah at Bridge	35.46972222	73.84072222	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	B
Existing to Upgrade (SWHP)	8	A21	GB	Indus	Indus	Thor Nullah at Tail Race	35.46416667	73.83694444	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	B
Existing to Upgrade (SWHP)	9	A22	GB	Indus	Indus	Thor Site at Shital	35.41777778	73.82888889	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	B
Existing to Upgrade (SWHP)	10	A23	GB	Indus	Indus	Thor Site of D/S of Thor Colony	35.48583333	73.86166667	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	B
Existing to Upgrade (SWHP)	11	A25	GB	Indus	Indus	Thak Nullah at Tail Race Channel	35.35888889	74.13805556	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	B
Existing to Upgrade (SWHP)	12	A26	GB	Indus	Indus	Tangir Nullah at Tangir	35.66944444	73.4375	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	B
Existing to Upgrade (SWHP)	13	A27	GB	Indus	Harpo Nallah	Harpo Nullah at Harpo	35.6004323	75.1360363	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	B
Existing to Upgrade (SWHP)	14	A29	GB	Indus	Indus	Basho Lungma Nullah at Khar village	35.44444444	75.30277778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	B
New Proposed (PID)	15	B2	Gilgit Baltistan	Shigar	Shigar River	Shigar	35.42094	75.717164	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
New Proposed (PID)	16	B10	Gilgit Baltistan	Skardu	Shigarthang Lungma	Kachura	35.4342	75.4489	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
New Proposed (PID)	17	B15	Gilgit Baltistan	Dainoyr	Danyor Nullah	Dainoyr	35.9294	74.3837	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
New Proposed (PID)	18	B16	Gilgit Baltistan	Sandhai	Yaseen Nullah	Yaseen	36.381	73.3317	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B

Table -5F

Proposed Hydrological Stations - Gilgit Baltistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed (PID)	19	B33	Gilgit Baltistan	Ganji	Indus River	Ganji	35.623	75.0031	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
New Proposed (PID)	20	B36	Gilgit Baltistan	Gupis	Gilgit River	Gupis	36.2263	73.4538	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	B
New Proposed (GMRC)	21	C2	GB	UIB	Shyok	Goma (Gyari Area)	35.151	76.79	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	GMRC	B
New Proposed (GMRC)	22	C10	GB	UIB	Hunza	Hispar Glacier Snout	36.188	74.967	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	GMRC	B
New Proposed (GMRC)	23	C12	GB	UIB	Shyok	Kondos Glacier Snout	35.353	76.66	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	GMRC	B
New Proposed (GMRC)	24	C13	GB	UIB	Shyok	Sherpiang Glacier Snout	35.304	76.742	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	GMRC	B
New Proposed WAPDA WCAP /DASU	25	D2	GB		Shigar River	Shigar @ Shigar River	35.42094	75.71716	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Wapda WCAP	B
New Proposed WAPDA WCAP /DASU	26	D4	GB		Gilgit River	Alam Bridge @ Gilgit River	35.77	74.6	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Wapda WCAP	B
New Proposed Dasu H&R	27	E6	GB			Darel	35.76681	73.67836	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	B
New Proposed	28	F18	GB			Ghizer River	36.4074	73.3564	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte. (TIKA)	B
New Proposed	29	F20	GB			Ganji	35.4541	74.3078	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	B
CATEGORY - C																
New Proposed Dasu H&R	1	E1	GB		Gilgit River	River Gilgit @ Phander	36.16768	72.92698	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	C
New Proposed Dasu H&R	2	E7	GB		Shyok River	River Shyok @ Chowar	35.21	75.88	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	C
New Proposed Dasu H&R	3	E8	GB		Indus River	River Indus @ Chilas	35.43415	74.101	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	C
New Proposed	4	F7	GB			Darel River	35.8	73.74	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte. (JICA)	C
New Proposed	5	F13	GB			Thor Nullah	35.4797	73.8557	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte. (TIKA)	C
New Proposed	6	F15	GB			Harpo	35.3913	75.128	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	C
New Proposed	7	F16	GB			Phander	36.1707	72.9493	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	C

Overlapping Stations

CATEGORY - OVERLAPPING																
Existing to Upgrade (SWHP)	1	A2	GB	Indus	Indus	Shyok river at Yogo	35.18527778	76.17166667	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP Wapda	Overlap

Table -5F

Proposed Hydrological Stations - Gilgit Baltistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed (PID)	2	B1	Gilgit Baltistan	Skardu	Indus River	Kharmang	34.9476	76.2171	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	3	B4	Gilgit Baltistan	Astore Valley	Astore Rive	Doiyan	35.54436	74.71027	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	4	B5	Gilgit Baltistan	Gilgit	Gilgit River	Alam Bridge	35.76	74.596	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	5	B6	Gilgit Baltistan	Jaglot	Indus River	Bunji	35.66	74.62	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	6	B8	Gilgit Baltistan	Phander	Phander Lake	Phander	36.17	72.95	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	7	B13	Gilgit Baltistan	Astore	Indus River	Talachi	35.5646	74.633	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	8	B14	Gilgit Baltistan	Gilgit	Gilgit River	Gilgit	35.9263	74.297	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	9	B17	Gilgit Baltistan	Deosi	Shatung	Deosi	35.0549	75.4639	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	10	B18	Gilgit Baltistan	Tungus	Tangus Nullah	Tungus	35.551	75.3478	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	11	B19	Gilgit Baltistan	Darel	Darel River	Darel	35.8	73.74	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	12	B21	Gilgit Baltistan	Naltar Valley	Naltar Nullah	Naltar Bala	36.1289	74.2311	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	13	B22	Gilgit Baltistan	Gilgit	Dentar Nullah	Basin	35.9169	74.257	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	14	B23	Gilgit Baltistan	Tallu	Tallu Nullah	Tallu	35.5999	75.068	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	15	B24	Gilgit Baltistan	Dasu	Tormic Nullah	Tomic	35.6163	75.3182	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	16	B25	Gilgit Baltistan	Kohistan	Indus River	Diamir Basha	35.5313	73.7207	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	17	B26	Gilgit Baltistan	Diamir	Thor Nullah	Thor Nullah	35.4861	73.8616	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	18	B27	Gilgit Baltistan	Diamir	Thak Nullah	Thak Nullah	35.3549	74.138	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	19	B28	Gilgit Baltistan	Diamir	Harpo Nullah	Harpo	35.39	75.14	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	20	B29	Gilgit Baltistan	Phander	Ghizar River	Phander	36.1755	72.9414	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	21	B30	Gilgit Baltistan	Sultanabad	Basho Nullah	Basho	35.4412	75.2988	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	22	B31	Gilgit Baltistan	Sandhai	Ghizar River	Ghizar	36.41	73.36	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	23	B32	Gilgit Baltistan	Piun	Shyoke River	Shyoke	34.9507	76.592	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap

Table -5F

Proposed Hydrological Stations - Gilgit Baltistan

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed (PID)	24	B34	Gilgit Baltistan	Astore	Indus	Astore	35.565	74.6331	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (PID)	25	B35	Gilgit Baltistan	Hunza	Nagar River	Nagar	36.2826	74.7086	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation depatt:	Overlap
New Proposed (GMRC)	26	C7	GB	UIB	Hunza	Hopper Valley Mouth	36.283	74.709	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	GMRC	Overlap
New Proposed (GMRC)	27	C8	GB	UIB	Chitral	Yarkhout Near Mastuj	36.288	72.512	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	GMRC	Overlap
New Proposed WAPDA WCAP /DASU	28	D5	GB		Indus River	Bunji @ Indus River	35.66	74.62	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Wapda WCAP	Overlap
New Proposed Dasu H&R	29	E2	GB		Indus River	River Indus @ Ganji	35.62305	75.0032	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	Overlap
New Proposed Dasu H&R	30	E3	GB		Hunza River	River Hunza @ Dainyor	35.92177	74.3723	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	Overlap
New Proposed Dasu H&R	31	E4	GB		Indus River	River Indus @ Kachura	35.45073	75.4554	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	Overlap
New Proposed Dasu H&R	32	E5	GB		Shyok River	River Shyok @ Yugo	35.189753	76.159619	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	Overlap
New Proposed	33	F1	GB			Gilgit	35.93	74.3	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	Overlap
New Proposed	34	F6	GB			Tormic	35.6163	75.3183	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	Overlap
New Proposed	35	F8	GB			Naltar Bala	36.13	74.23	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	Overlap
New Proposed	36	F11	GB			Tomic	35.6162	75.318	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	Overlap
New Proposed	37	F12	GB			Diamir Basha	35.5311	73.7206	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	Overlap
New Proposed	38	F14	GB			Thak Nullah	35.3507	74.1357	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	Overlap
New Proposed	39	F17	GB			Basho	35.44	75.3	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	Overlap
New Proposed	40	F21	GB			Indus at Bunji	35.6653	74.6282	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte	Overlap

UPGRADATION OF EXISTING HYDROLOGICAL STATIONS	
Map Reference	Description
Upgradation Existing (H&R)	
A1	Mangla
A3	Kund
A10	Jehlum Hattian Bala
Upgradation Existing (SWHP)	
B1	Kunhar river at Kaghan
B2	Kunhar river at Talhutta
B3	Gagai Nullah at Taobat
B4	Neelum River at Kamrabad
B5	Neelum river at Keil
B6	Neelum River at Dudhnial
B7	Neelum river at Muzaffarabad
B8	Jhelum river at Chakothi
B9	Jhelum river at Hattian Bala
B10	Jhelum river at Domel
B11	Jhelum river at Chattarklass
B12	Jhelum river at Azad Pattan
B13	Poonch river at Kotli
B14	Kanshi river near Palote
B15	Neelum River at Nausen
Upgradation Existing (NUHPC)	
C1	Taobat
C2	Sharda
C3	Islampura
C4	Karimabad

ADDITIONAL PROPOSED HYDROLOGICAL STATIONS	
New Proposed (FPSP-III)	
D2	Jehlum
D5	Chakothi
D7	Palote
D10	Bagh
D11	Daukhan
D12	Dhirkot
New Proposed Mangla H&R	
E1	Azadpattan
E3	Mangla Spillway
New Proposed by Consultants	
F1	Kotnial
F2	Baraloh
F3	Chak Ghian

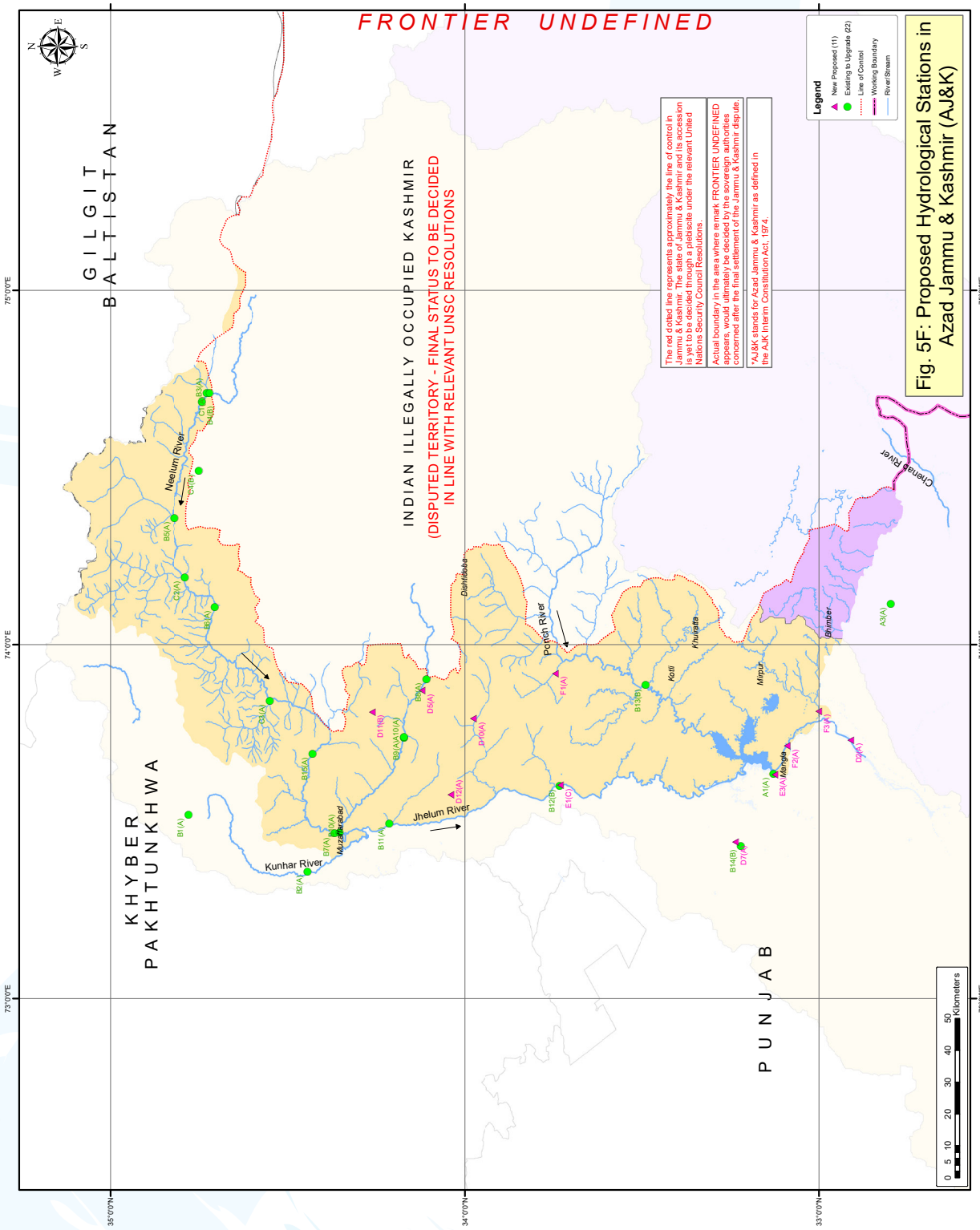

Fig. 5F: Proposed Hydrological Stations in Azad Jammu & Kashmir (AJ&K)

Table -5E

Proposed Hydrological Stations - Azad Jammu & Kashmir

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
CATEGORY - A																
Upgradation Existing (H&R)	1	A1	AJ&K	Mirpur	Jhelum	Mangla	33.12844	73.6343	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation Existing (H&R)	2	A3	AJ&K	Mirpur		Kund	32.79694444	74.11527778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation Existing (H&R)	3	A10	AJ&K	Muzaffarabad	Jhelum	Jehlum Hatain Bala	34.1716514	73.7374193	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation Existing (SWHP)	4	B1	AJ&K		Jhelum	Kunhar river at Kaghan	34.78	73.51972222	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation Existing (SWHP)	5	B2	AJ&K		Jhelum	Kunhar river at Talhutta	34.443867	73.35905	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation Existing (SWHP)	6	B3	AJ&K		Jhelum	Gagai Nullah at Taubat	34.7275	74.71055556	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation Existing (SWHP)	7	B5	AJ&K		Jhelum	Neelum river at Kel	34.81888889	74.35666667	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation Existing (SWHP)	8	B6	AJ&K		Jhelum	Neelum River at Dudhnial	34.70472222	74.10583333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation Existing (SWHP)	9	B7	AJ&K		Jhelum	Neelum river at Muzaffarabad	34.3675	73.46611111	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation Existing (SWHP)	10	B8	AJ&K		Jhelum	Jhelum river at Chakothi	34.10805556	73.9025	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation Existing (SWHP)	11	B9	AJ&K		Jhelum	Jhelum river at Hattian Bala	34.17138889	73.73944444	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation Existing (SWHP)	12	B10	AJ&K		Jhelum	Jhelum river at Domel	34.35361111	73.47055556	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation Existing (SWHP)	13	B11	AJ&K		Jhelum	Jhelum river at Chattarklass	34.2125	73.49444444	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation Existing (SWHP)	14	B15	AJ&K		Jhelum	Neelum River at Nauseri	34.42908611	73.692225	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	A
Upgradation Existing (NJHPC)	15	C1	AJ&K		Neelum	Taobat	34.72	74.71	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation Existing (NJHPC)	16	C2	AJ&K		Neelum	Sharda	34.79	74.19	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
Upgradation Existing (NJHPC)	17	C3	AJ&K		Neelum	Islampura	34.55	73.84	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed (FPSP-III)	18	D2	AJ&K		Jhelum	Jehlum	32.91	73.73	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed (FPSP-III)	19	D5	AJ&K		Jhelum River	Chakothi	34.12	73.87	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed (FPSP-III)	20	D7	AJ&K		Kanshi	Palote	33.235499	73.441921	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed (FPSP-III)	21	D10	AJ&K			Bagh	33.975	73.791	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A
New Proposed (FPSP-III)	22	D12	AJ&K			Dhirkot	34.039	73.577	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	A

Table -5E

Proposed Hydrological Stations - Azad Jammu & Kashmir

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed Mangla H&R	23	E3	AJ&K		Mangla	Mangla Spillway	33.1244	73.6333	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes		A
New Proposed by Conultants	24	F1	AJ&K			Kimial	33.74397495	73.91873872	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation Department	A
New Proposed by Conultants	25	F2	AJ&K			Baralah	33.08955862	73.71302871	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation Department	A
New Proposed by Conultants	26	F3	AJ&K			Chak Ghian	33.00041604	73.81178324	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	Irrigation Department	A
CATEGORY - B																
Upgradation Existing (SWHP)	1	B4	AJ&K		Jhelum	Neelum River at Karimabad	34.74194444	74.68416667	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	B
Upgradation Existing (SWHP)	2	B12	AJ&K		Jhelum	Jhelum river at Azad Pattan	33.73138889	73.60222222	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	B
Upgradation Existing (SWHP)	3	B13	AJ&K		Jhelum	Poonch river at Kotli	33.48888889	73.88472222	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	B
Upgradation Existing (SWHP)	4	B14	AJ&K		Jhelum	Kanshi river near Palote	33.22027778	73.43194444	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	SWHP	B
Upgradation Existing (NJHPC)	5	C4	AJ&K		Neelum	Karimabad	34.75	74.49	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
New Proposed (FPSP-III)	6	D11	AJ&K			Daukhan	34.261	73.81	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	B
CATEGORY - C																
New Proposed Mangla H&R	1	E1	AJ&K		Mangla	Azadpattan	33.7297	73.6028	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes		C

Overlapping Stations

CATEGORY - OVERLAPPING																
Upgradation Existing (H&R)	1	A2	AJ&K	Kotli	Ponch	Kotli	33.34	73.8775	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
Upgradation Existing (H&R)	2	A4	AJ&K	Sudhanoti		Plandri	33.71944	73.685	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
Upgradation Existing (H&R)	3	A5	AJ&K	Muzaffarabad		Shair Ka Kota	33.555	73.95111111	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
Upgradation Existing (H&R)	4	A6	AJ&K	Muzaffarabad	Jhelum	Chattar Kallas (Kohala)	34.20444444	73.498189	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
Upgradation Existing (H&R)	5	A7	AJ&K	Muzaffarabad	Jhelum	Domel	34.35422	73.470293	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
Upgradation Existing (H&R)	6	A8	AJ&K	Muzaffarabad	Neelum	Muzaffarbad	34.37416667	73.47027778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
Upgradation Existing (H&R)	7	A9	AJ&K	Muzaffarabad	Neelum	Neelum Nauseri	34.39138889	73.72027778	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed (FPSP-III)	8	D1	AJ&K		Gagi Nullah	Taobat	34.72	74.71	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap

Table -5E

Proposed Hydrological Stations - Azad Jammu & Kashmir

Status	No. of Stations	Map Reference	Province	Basin/ District	Name of River / Nallah / Stream	Monitoring Station Ref.	Latitude	Logitude	Water stage Recording Equipment (Manual/Automatic)	Flow/Velocity Measurment (Manual/Auto)	Additional Equipment (Manual /Auto)	Type of Communication	Equipment Type used for Flow Measurment	Frequency	Organization responsible for O&M	Category
New Proposed (FPSP-III)	9	D3	AJ&K		Kunhar	Kaghan	34.779961	73.519832	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed (FPSP-III)	10	D4	AJ&K		Kohala	ChattarKalas	34.21	73.5	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed (FPSP-III)	11	D6	AJ&K		Neelum	Kel	34.824	74.352	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed (FPSP-III)	12	D8	AJ&K		Neelum River	Dhudnial	34.7	74.108	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap
New Proposed (FPSP-III)	13	D9	AJ&K		Neelum	Taobat	34.72	74.71	Both	Auto	Auto rain Gauge, Tempaerature, Relative Humidty	Real time Communication	Flow/Velocity Sensor/ADCP	15 Minutes	H&R Dte.	Overlap

ANNEXURE - 6

JOB DESCRIPTIONS OF MANPOWER TO BE INDUCTED FOR ESTABLISHING REGIONAL OFFICES, DHDC & CO-DATA CENTER

ANNEX - 6

JOB DESCRIPTIONS OFFICERS AND OFFICIALS OF

REGIONAL DATA CENTERS IN PROVINCES
HOST DIGITAL HYDRO DATA CENTER DHDC, LAHORE
CO-HOST DATA CENTER IN ISLAMABAD

(SEPTEMBER– 2021)

JOB DESCRIPTIONS

TITLE: PROJECT DIRECTOR - BPS (19)

(In charge of the Flood Telemetry Project)

A) GENERAL

To deal with technical and other matters assigned by the Ministry of Water & Power, Federal Flood Commission and Flood Forecasting Bureau and to keep liaison with foreign agencies and suppliers of telemetry system/equipment.
To submit reports and PC-Proformas for new schemes. on Hydromet Investigation (Hydrological Operations and Water Management), Flood Warning and Flood Forecasts etc. to the Chief Engineer, Hydrology and Water Management, WAPDA, for approval and further processing.
To assist the CE (H&WM) in technical matters and in the preparation of technical reports, PC-Proforma for hydromet investigations.
To represent WAPDA in Federal/Provincial Flood Commission regarding hydrologic functions.

B) THE IMPROVEMENT OF RIVER FLOW FORECASTING & FLOOD WARNING PROJECT

1. To supervise works regarding O&M of the facilities established under FPSP-I & FPSP-II. Strengthening of the River Flow Forecasting and Flood Warning System for the Indus River Basin in Pakistan".under FPSP-III.

2. To manage, guide and supervise the basic Hydromet data observation programmes assigned to Field Section in connection with Designing and Planning of Water Resources Development Schemes in the country.

3. To deal with technical matters relating to automatic transmission of hydromet data, co-ordination with Director, Flood Forecasting & Warning Centre, Lahore and Federal and Provincial Government Representatives.

4. To dispose of technical and other matters assigned by the Ministry of Water and Power, Federal Flood Commission and Flood Forecasting and Warning Centre. Also to keep liaison with foreign agencies such as ADB.

5. To submit reports and PC-Proformas for new schemes on Hydromet Investigation, Water Resources Management Schemes, Flood Warning and Flood Forecasts etc. to the Chief Engineer, Hydrology and Water Management, WAPDA for approval and further processing.
6. o represent WAPDA in Federal/Provincial Flood Commission hydrologic functions.

TITLE : SENIOR ENGINEER — TELECOM / ELECTRONICS (BPS - 18)

(INCHARGE REGIONAL DATA CENTER)

Responsibilities:

A) GENERAL

To submit reports and PC-Proformas for new schemes. on Hydromet Investigation (Hydrological Operations and Water Management), Flood Warning and Flood Forecasts etc. to higher authorities for approval and further processing.
To assist Project Director in technical matters and in the preparation of technical reports, PC-Proforma for hydromet investigations. Short and long term planning, appraisal and evaluation of various water resource schemes and Federal and Provincial Flood Control etc.

B) THE IMPROVEMENT OF RIVER FLOW FORECASTING & FLOOD WARNING

7. To supervise works regarding O&M of the facilities established under flood telemetry networks for the River Flow Forecasting and Flood Warning System.
8. To deal with technical matters relating to automatic transmission of hydromet data, co-ordination with Director, Flood Forecasting & Warning Centre, Lahore and Federal and Provincial Government Representatives.
9. To prepare reports and PC-Proformas for new schemes on Hydromet Investigation, Water Resources Management Schemes, Flood Warning and Flood Forecasts.
10. To prepare detailed implementation plan for repair, maintain, install and inspect the telemetry sensors and supervise the field work of telemetry section including office work.
11. To impart training the Junior Engineer, Junior Telecommunication Officer, Supervisors, Technicians and other staff.
12. To supervise electronic workshop used for testing, calibrating, install and maintain the telemetry equipment as well as telemetry sensors.
13. To operate and maintain the telemetry network .
14. To maintain communication links.

15. To maintain climatologically and river level sensors installed on Flood telemetry Section.
16. To look after the affairs of Telemetry workshop, repair of telemetric equipment and petty repair of Telemetry equipment.
17. To keep liaison with other agencies for effective operation of telecommunication system for timely reception/transmission of rain and river data for Flood Forecasting and Warning purpose. Also to keep in touch with T&T department for wireless licenses allotment of frequencies and payment royalty and license fee

JUNIOR ENGINEER (ELECTRONICS) (BPS - 17)

1. To install, operate and maintain flood Telemetry Stations.
2. To submit monthly salary bills of staff and other returns required from time to time.
3. To Supervise maintenance and up-keep of T&P and stock accounts of field works and monitor store transactions with field parties.
4. To Assist Senior Engineer (M&C).
5. To prepare budget estimates for the section,
6. To maintain the casual leave account.

JUNIOR ENGINEER (CIVIL) (BPS - 17)

1. To construct operate and maintain the Hydromet and climatological stations in Hydromet section.
1. Supervise the office and field works.
2. To inspect the existing stations and new works particularly to condition of Hydrological structures.
3. To make Plans for regular maintenance of the Hydromet stations networks.
4. To supervise discharge measurements of various stations, downstream barrages and Nullah for high flows, medium flows and low flows every year.
5. To prepare the detailed implementation plan and design of hydrological and meteorological network.
6. To impart training to Sub Engineers, Hydrographers and gauging staff for discharge, gauge heights, climatological observations, data collection, analysis, checking, computation, tabulation, application and publication.
7. Obtain rating curves/rating tables for stations installed under Flood Telemetry Network where available from the agencies concerned and develop or update, where necessary, the rating curves/tables.
8. Analyze Flood Telemetry and Climate data.

ASSISTANT DIRECTOR (GIS/IT) (BPS - 17)

1. Glacial Mapping.
2. Snout survey reports.
3. Image processing.
4. Report generation.
5. Mass balance studies through remote sensing.

ASSISTANT MANAGER (ACCOUNTS & FUNDS) (BPS - 17)

Responsible for: (Subsidiary Drawings and Disbursing Officer)

1. To maintain accounts of expenditure being incurred in the office.
2. As a financial advisor assist Sr. Engineer, in charge of the Regional Data Center, on all financial matters.
3. Prepare and compile of budget for the data center.
4. Act as a primary auditor, being the representative of the higher offices, and exercise certain checks that the expenditure is being incurred in accordance with Financial rules and regulations.
5. Keep check on the subordinates official assignments

ACCOUNTS ASSISTANT/CASHIER (BPS - 16)

1. To make payments as per rules, both through cash as well as cheques.
2. To prepare schedules of Income Tax, Professional Tax, General Provident Fund, Group Life Insurance, Welfare Fund, House Building Advance, and other advances
3. To prepare Bank Reconciliation statements.
4. To maintain and up-keep of the cash books, MSL Cheque books register and duplicate keys register.
5. To keep cash vouchers whether old or current in custody.
6. To make payments through money orders to outstations.

DATA ENTRY OPERATOR (BPS - 15)

1. Perform duties with officers for Data entry into the computer as desired and update the data for smooth running of the office work.
2. Prepare special layouts /drawings for presentations
3. Data Management per used data basis
4. Assist higher officers in preparation of data based evaluation reports

SUB-ENGINEER (ELECTRONICS) (BPS - 14)

1. To install and maintain the hydromet stations under the directive of J.E/Sr. Engr.
2. To maintain the stores.
3. To prepare pay bills and estimates etc.
4. To collect hydro-meteorological data from the field and make computation.
5. To install gauges including surveys etc in this connection. -

SUB ENGINEERS (CIVIL) (BPS - 14)

1. To install and maintain the Hydromet metrological stations under the directive of Junior Engineer/Senior Engineer
2. To observe flood and ordinary discharge of different streams in hydromet Section.
3. To prepare the pay bills and estimates etc.
4. To collect hydro-meteorological data from the fold and make computation.
5. To install gauges including survey etc in this connection.
6. To maintain the store.

RADIO TECHNICIAN MECHANIC (RTM) (BPS - 14)

To repair and maintain the telemetry following equipment:

1. Transmitters
2. Receiver
3. Repeaters
4. Logic Board
5. Modem Board
6. Accumulator Board
7. Charging of Batteries.
8. Field Equipments maintenance and repairing
9. Repairing of aerial.
10. Repairing of VHF Transceiver sets

ANNEXURE - 7

PROPOSAL FOR ESTABLISHMENT OF HYDRO-MET TESTING, CALIBRATION AND ACCREDITATION LABORATORY

ANNEX - 7

PAKISTAN

WATER AND POWER DEVELOPMENT AUTHORITY

Proposal For

Establishment of "Hydromet Equipment Testing Calibration & Accreditation Laboratory" Under Wapda through H&R Directorate

GENERAL MANAGER (HRM),
WAPDA, 228-WAPDA HOUSE, LAHORE, PAKISTAN

November, 2019

JUNIOR CLERK (BPS - 9)

1. To work as a record keeper in the administration branch.
2. To enter newly received letters in the respective files and put up to Assistant and the Senior Superintendent for further action.
3. To look after the movement of files within and outside the office and keep a record of the same.
4. To prepare and issue reminders regarding replies due from lower and other formations.

HYDROGRAPHER (BPS-08)

1. Manage Discharge Measurements
2. Assist Junior Engineers and Sub Engineer during field visits.

GAUGE OBSERVERS (BPS - 6)

1. To record readings from manual gauges.
2. To help Hydrographer during floe measurements.
3. To keep the instruments clean/tidy and in working order.

DRIVERS(BPS - 6)

1. To drive the vehicles for local and field duty.
2. To maintain the vehicles as per WAPDA Transport Rules 1981 Chapter-VIII Section-II.

NAIB QASID (BPS - 1)

1. To clean the office files and furniture etc.
2. To assist the staff in handling office files and documents.
3. To deliver files/papers in various sections of the office.
4. To attend the officers/officials as and when required.

CHOWKIDARS (BPS - 1)

1. To look after/security of vehicles and office property etc shift wise round the clock

PROJECT PROPOSAL

FOR

Establishment of "Hydromet Equipment Testing Calibration & Accreditation Laboratory" Under Wapda through H&R Directorate, Lahore

1. H&R PROJECT INTRODUCTION

Hydrology and Research Directorate WAPDA established since 1981 has been entrusted to collect the real time flood data through telemetric network comprising of 44 remote stations installed in the Upper Catchments of Punjab, Azad Jammu Kashmir (AJK) and Khyber Pakhtunkhua (KPK) (Location map attached at **Annex-I**). Presently, real time hydro-meteorological data for two parameters i.e. for river gauge / level and catchment rainfall is collected and transmitted through this telemetric network to data processing center/master station and to the client workstation established in H&R Directorate and Flood Forecasting Division of PMD, Lahore. The data is transmitted to the Master Station / Client Workstation through various communication system i.e. using Meteor Burst, GSM and Satellite Communication Systems. The collected data is processed by H&R team comprising Electronic/Electrical Engineers and Civil Engineers and then supplied to Flood Forecasting Division (FFD) of Pakistan Meteorological Department (PMD) of Lahore for their use in computer models for timely issuance of Flood Warnings.

With the growing need of hydro-meteorological observations requirement due to climate change, the existing telemetric network (34 stations) is being up-graded besides, 12 Nos. manually operated climate stations are being automated into Automatic weather stations(AWS),for which the Contract amounting USD 1.59 Million is awarded to Siap+Micros S.P.A under WCAP- B1 Component funded by World Bank. Map indicating the Hydro-meteorological network/stations being upgraded/automated.

With implementation of the WCAP component Contract NO.WCAP-B1(AF)/H&R-C1(B), the existing telemetric network under the H&R Directorate will further be strengthened / upgraded and real time data with numeric models (hydrological, hydraulics and atmosphere) to measure below listed parameters will also be available for the reservoir management authorities i-e Tarbela, Cashma, Warsak, Wapda House, Flood Section at Wapda House and in FFD division of PMD Lahore for better assessment of the flows and reservoir operation.

i. Catchment Rainfall
ii. River level/ Gauge
iii. River flow/ Velocity
iv. Maximum/ Minimum temperature
v. Relative humidity
vi. Solar Radiation
vii. Wind speed and direction
viii. Evaporation

2. NAME OF PROJECT

Establishment of "Hydromet Equipment Testing Calibration & Accreditation Laboratory" Pakistan Hydromet Calibration Center (PHCC) under Wapda through H&R Directorate, Lahore.

3. PROJECT LOCATION

In this connection, Hydrology & Research Directorate, Wapda has developed a plan to Establishment of "Hydromet Equipment Testing Calibration & Accreditation Laboratory" Pakistan Hydromet Calibration Center (PHCC) under Wapda through H&R Directorate, Lahore. The proposed Hydromet calibration center should be located at suitable place of CMTL Building near Wapda Town.

4. PROPOSAL REQUIREMENTS

Wapda operates 269 Hydro meteorological sites for data collection, which contains 69 automatic stations/sites and while 200 are manually operated.
The manual stations established since 1959/60 are being operated by Surface Wapda for collection of data regarding surface flows i-e stream stage, discharge, sediment, water quality (Chemical analysis) and is being utilized for evaluation of hydropower potential, assessment of extremes for the construction of water resources and preparation of feasibility and design reports.

The existing setup of hydro metrological sites contain precious electronic equipments like water level/flow sensors for the measurement of water flow, water discharge, rain gauges, wind speed sensor etc. need calibration/testing with respect to their operational parameters after prescribed period (usually 2-3 years) to authenticate/verify operational efficiency of the said equipments as well as to optimize accurate results of forecasting data from these hydro metrological stations.

It merits mentioning that no calibration/testing lab facility for Hydromet equipments is available in Wapda Pakistan being pivotal department in view of forecasting, flood early warning and water management sector in Pakistan. Hence, there is a great need of establishment of high standard calibration, testing lab having full facilities of calibration, testing of new, repaired, used Hydromet sensors according to international Hydromet standards to mitigate problems of sudden non-functioning of installed equipments especially during high inflow seasons (summer season) in order to achieve maximum optimum results from the hydrological systems in Pakistan.

Since its inception, WAPDA's span of activities and national coverage have grown to encompass the entire national water and hydrological landscape of Pakistan.

In its daily operations, WAPDA requires various sensor streams from across the country to capture informatics data. A good majority of the sensors are directly owned, provisioned, managed and operated by the WAPDA. In addition, the WAPDA requires aerial drones & satellite data to capture geospatial imagery and data for localized monitoring on adhoc basis.

Over the past years WAPDA has also effectively positioned itself as a central source of data capture to and from adjunct agencies. In this way the WAPDA act as a central water data collaborator to support decision-making process for national water resources. With the need to combine multi agency data with its own data during, a technical data lab is required to harmonise and create a National Water and Weather Data dataset. Due to climate change challenges WAPDA is also looking to enrich this information set with data from an external source. This data, once put together, will enable enhanced calibration, research, analysis and decision support like never before, enabling Pakistan to truly tackle the water resources management challenges.

In this constant pursuit of improving and enhancing the Pakistan's hydrometrological ecosystem, WAPDA is also seeking to adopt modern technologies in the areas of Cloud technologies, Big Data, Advanced Analytics, AI, Machine learning tools and Visualization that will leverage the data available for analysis .

On the data workstream, WAPDA aims to:

- Establish national water dataset that gathers relevant data from own sensors, related agencies with the latest Big Data & AI tools
- Establish a data quality management capability to self-analyse the data and cleanse the data for decision support and other operational requirements.

WAPDA is keen to collaborate with international partners to build and integrate indigenous capability to achieve this vision. A collaborative approach will enable

- In-house capability development
- Adoption of the latest technologies as and when they become available
- Access to a large varied pool of technology and service providers

5. SUBMISSION OF PROPOSAL FOR APPROVAL BY PROJECT STEERING COMMITTEE (PSC) FOR WCAP

20th Meeting of Project Steering Committee of Water Capacity Building & Advisory Services Project was held on 11.07.2019 under the chairmanship of Secretary Ministry of Water Resources wherein Acting Member WAPDA put up the request that Wapda desire to establish a high standard Hydromet Equipment Testing /Calibration & Accreditation Laboratory under WAPDA to enhance working capabilities of existing hydro metrological stations in Pakistan. The proposal was principally agreed by the forum to be accommodated under WCAP.

5.1 APPROVAL OF THE PROJECT BY PROJECT STEERING COMMITTEE:

In the Minutes decision of 20th Project Steering Committee meeting of Water Sector Capacity Building and advisory Services Project (WCAP) held on July 11, 2019 in the committee Room of Project Management and Policy Implementation Unit (PMPIU), Islamabad, duly issued on 11th July, 2019 following decision was taken **(Annex-II).**

- PSC agreed that WAPDA may submit its proposal for inclusion in PC-II under revision by MOWR.

In the light of above decision made on 20th meeting of PSC, a comprehensive proposal has been prepared by H&R Directorate for Establishment of "Hydromet Equipment Testing Calibration & Accreditation Laboratory in order to calibrate/test existing Hydromet equipments in an effective and efficient manner.

6. ESTIMATED COST FOR THE PROPOSAL:

REQUESTED AMOUNT: US$ 2.5 Million (Detail breakup is attached at **Annex-III**)

7. DURATION OF PROJECT:

12 months (1 Year)

8. IMPLEMENTATION AGENCY:

General Manager(HRM) through Hydrology &Research Directorate Wapda.

9. PROPOSAL JUSTIFICATION:

There is international consensus that Pakistan immediately needs to improve its weather and water monitoring systems due to climate change and current unpredictability in weather patterns due to global warming.

Many donor agencies have already come forward to provide technical support. In coming years, there would be hundreds of more real time monitoring instruments and devices installed by WAPDA, IRSA, PMDC, and other agencies all over Pakistan.

The efforts in this regard are not new. In past, WAPDA has undertaken following projects to improve its monitoring capability.

a. 1960 - WAPDA established Hydro meteorological network for
   i. Monitoring Upper Indus Basin.
b. 1961-68- Conducted Snow surveys in Mangla Basin
c. 1985-89- Ground based research was carried out by WAPDA
   i. Pakistan Snow and Ice Hydrology Project (PSIHP) to
   ii. Understand the cryosphere and hydrologic conditions of UIB,
d. 1991- In Collaboration with the University of Colorado, Boulder, USA
   i. WAPDA studied Impact on the flows of River Indus due to
   ii. Climate Change.
e. 2011- WAPDA signed a MoU with ICIMOD as a collaboration partner
   i. in ICIMOD **Indus basin study for water resources Management.**

f. 2011-13 - Ablation gradient of Passu glacier.
g. 2017-21 - UIB Monitoring programme in progress.

Notwithstanding above, current quality of instrumentation and consequently data acquisition is not satisfactory. A major reason for this is sub standard induction of instrumentation, lack of repair facility and absence of a calibration lab, where regular checks can be conducted.

WAPDA can take a lead role in this regard as it has best human resource and financial muscle in the country. WAPDA is also best placed to convince donor agencies for assistance in this regard.

All the stream gauging stations(more then 269) shall be equipped with automatic/properly calibrated instruments/Sensors so that the measurements and observations of the surface velocity and river flows are accurate and precise enough to meet the needs of the modern era.

The existing setup of hydro metrological sites contain precious electronic equipments like water level/flow sensors for the measurement of water flow, water discharge, rain gauges, wind speed sensor etc. need calibration/testing with respect to their operational parameters after prescribed period to authenticate/verify operational efficiency of the said equipments as well as to optimize accurate results of forecasting data from these hydro metrological stations.

It merits mentioning that no calibration/testing lab facility for Hydromet equipments is available in Pakistan being pivotal department in view of forecasting, flood early warning and water management sector in Pakistan. Hence, there is a great need of establishment of high standard calibration, testing lab having full facilities of calibration, testing of new, repaired, used Hydromet sensors according to international Hydromet standards to mitigate problems of sudden non-functioning of installed equipments especially during high inflow seasons (summer season) in order to achieve maximum optimum results from the hydrological systems in Pakistan.

10. SPECIFIC OBJECTIVES

The overall objective of the project is to calibrate, test, verify as well as authenticate the working efficiency of existing hydro metrological equipments (Water level sensor, P.T , Wind sensor etc.) in hydro metrological stations in order to achieve maximum optimum results from the hydrological systems in Pakistan.

11. SCOPE OF WORK:

In its broadest sense, Hydro Metrology is the science of measurement and is concerned with standardization in measurement, calibration and inspection. During calibration service, the measurement values of tools and instruments are compared with a calibration standard of known accuracy. Dimensional inspection compares dimensions

of product features with design (List of Lab Testing Equipment is attached as **(Annex-IV).**

a) Areas of Calibration

- Electrical Calibration
- Level gauge sensors, Flow Sensor Calibration
- Global Radiation Calibration
- Humidity Calibration
- Rainfall amount and intensity Calibration.
- Temperature Calibration
- Wind Direction Calibration
- Wind speed Anemometers Calibration.

b) Services to be offered

- Calibration Services
- Training Services.
- Standardization and Inspection Services

12. List of Venders/Manufacturer

- SEBA Hydrometrie GmbH KG. Germany(Lead consultant and equipment supplier)
- Votsch
- E Lite – PCS-600
- CMP 22
- PUJKE
- KEITHLEY
- FLUKE
- YOKOGAVA
- OMICRON

Calibration Laboratories

Electrical Calibration Section

In the laboratory, data loggers and digital multimeters which are being used in automatic hydro metrological stations are calibrated with the parameters of DCV, ACV, DCA, ACA, Resistance and Frequency with comparison method. Calibrator is used as reference standard.

Devices it calibrates;

- DC Voltage measuring device
- DC Current measuring device
- Resistance measuring device
- AC Voltage measuring device
- AC Current measuring device
- Frequency measuring device
- Avometer
- Datalogger

Global Radiation (Pyranometer) Calibration Section

Pyranometers are calibrated by using CFR calibration system under constant light source of halogen lamb with 0-700 Watt/m2 light intensity and comparison method is applied.

Humidity Calibration Section

Electronic hygrometers with analog output, hygrometers with display are calibrated in the range from %10 to %95 relative humidity.

Humidity generator and climatic chamber are used to achieve desired relative humidity conditions (relative humidity calibration points).

Humidity generator and hygrometer with digital display are used as reference standards with comparison method.

Devices it calibrates;

- Hygrometers with Analog and Digital Display
- Analog Output Hygrometer Sensors
- Hygrographs

Rainfall Amount and Intensity Calibration Section

Tipping bucket and weighing rain gauges are calibrated in the range of 10-300 mm/s rain intensities simulated by using peristaltic pump. Electronic balance is the reference standard with comparison method.

Devices it calibrates;

- Tipping Bucket type
- Pluviometer
- Weighting type

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Temperature Calibration Section

Electronic sensors with analog output, liquid in glass thermometers and thermometers with display are calibrated in range from -40 °C to +50 °C and comparison method is applied.

Liquid calibration baths and climatic chamber are used to achieve desired temperature conditions (temperature calibration points).

Standard Platinum Resistance Thermometers are used as main reference of the laboratory. Laboratory can also make calibration at the triple point of water as the highest level of standard for temperature and at the melting point of water as a second level standard.

- Resistance Thermometers
- Liquid in Glass Thermometers
- Thermometers with Digital and Analog Display
- Analog Output Thermometer
- Thermocouples
- Thermographs

Wind Speed (Anemometer) Calibration Section

In the closed loop and open test area wind tunnel, we are able to make calibrations of electronic and mechanical anemometers (ultrasonic, cup and wane anemometers, pitot tubes with micro manometer and hotwires) in the range of 1.0 m/s – 35 m/s.

Pitot tube with micro manometer is used as reference standard with comparison method.

Devices we calibrate;

- Mechanical Anemometers
- Electronic Anemometers
- Cup Anemometers
- Ultrasonic Anemometers
- Hotwire Anemometers
- Propeller Anemometers
- Pitot Tube Anemometers
- Anemometers With Display

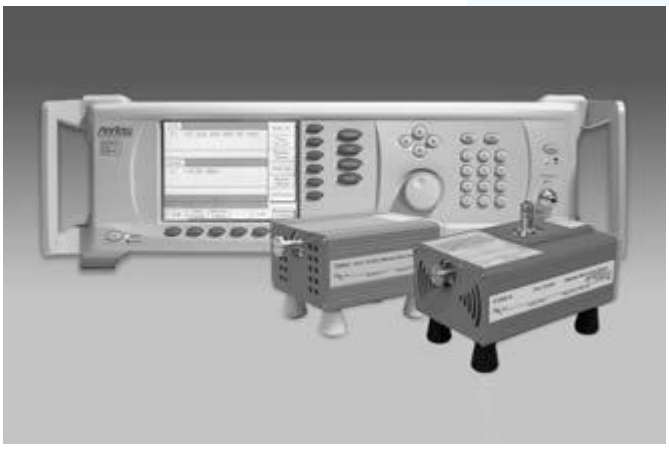
Spectrum Analyzer and Network Analyzer
Electronic – RF Calibration

Level Generator
Level Meter
Spectrum Master
RF Analyzer
PCM Test Set
Cable TV Analyzer
Transmission Analyzer
Site Master/ Analyzer
Audio Measurement Test Set

Cable & Antenna Analyzer

RF Power meter + Sensor

Frequency Counter



Signal Generator

Stopwatch Timer

Attenuator

Communication Test Set

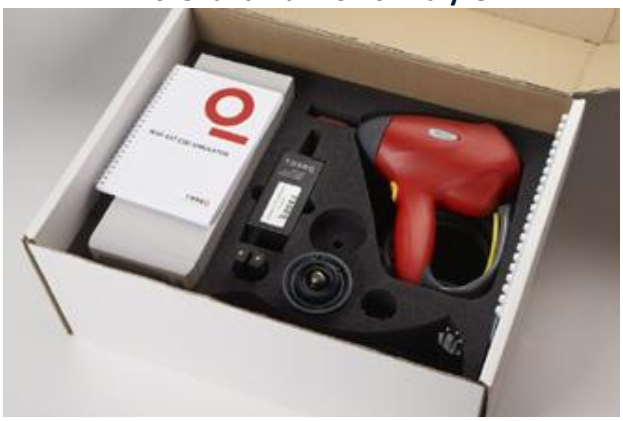
Site Master

Video Measurement Test Set

EMC Calibration

EMC/EMI Generator

Flicker and Harmonic Analyzer



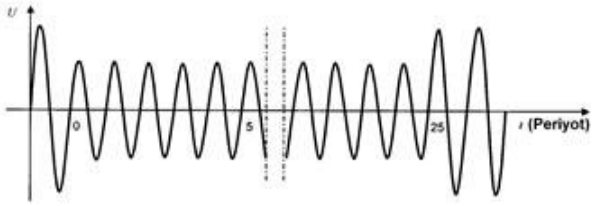
ESD Gun (TS EN IEC 61000-4-2)

Surge Generator (TS EN IEC 61000-4-5)

Burst (EFT) Generator (TS EN IEC 61000-4-4)

Ring Wave Generator (TS EN IEC 61000-4-12)

ESD Generator (TS EN IEC 61000-4-2)



DIPS Generator (TS EN IEC 61000-4-11

13. BENEFITS OF PROJECT:

By establishing calibration laboratory following benefits will be achieved;

- It would improve data acquisition / accuracy a great deal. It would positively contribute for overall water safety, weather monitoring and disaster management in the country.
- WAPDA will achieve fundamental goal in hydro metrology sector by establishing Hydromet calibration laboratory of international standard in Pakistan.
- Time saving and reduces sudden apprehensions of sudden failure of hydro metrological stations.

14. BASIS OF COST ESTIMATES:

The Cost estimate 2.5 Million USD. However, for detail cost estimation a feasibility study is required to be conducted through well reputed foreign consultants. The cost for necessary civil works shall also be included in the feasibility study/project scope. Accordingly, Wapda will arrange a space/building for establishment of Calibration Lab in the premises of CMTL Building area. The well reputed firms have been approached for obtaining budgetary quotation of the calibration lab.

15. O&M of Calibration Lab:

The O&M and requirements of additional human resources will be finalized under feasibility study process to be conducted through experts/consultants after approval of the proposal by World Bank.

16. Schedule of Proposal and Procurement Plan of Hiring Individual Consultants:

It is planned that engagement of Consultants for feasibility study will be done soon after approval of the Proposal by World Bank. The study will be completed within a period of 30 days in light of the approvals/ release of funds by World Bank. The overall schedule of implementation of Phase-I (Feasibility) and Phase-II (Implementation) will be 12 months after approval by World Bank.

17. Mechanism of Lab & Cost Comparison of expenditures with Manufacturers' available facility:

Presently, Wapda operates 269 Hydro meteorological sites for data collection, which contains 69 automatic stations/sites and while 200 are manually operated.

The manual stations established since 1959/60 are being operated by Surface Wapda for collection of data regarding surface flows i-e stream stage, discharge, sediment, water quality (Chemical analysis) and is being utilized for evaluation of hydropower potential, assessment of extremes for the construction of water resources and preparation of feasibility and design reports. All the manual gauging stations are to be automated for which funding through various donor agencies are approved/under approval i.e. through World Bank, JICA, AFD, TIKA KFW, ADB & EU.

In addition to that 150 new Automatic Hydromet Stations are also planned in Balochistan area and AJ&K, KPK under JICA/TIKA and hopefully will be completed within a period of 3-4 years depending upon the allocation of funds by JICA/TIKA.

The existing setup of hydro metrological sites contain precious electronic equipments like water level/flow sensors for the measurement of water flow, water discharge, rain gauges, wind speed sensor etc. need calibration/testing with respect to their operational parameters after prescribed period to authenticate/verify operational efficiency of the said equipments as well as to optimize accurate results of forecasting data from these hydro metrological stations.

The hydro metrological equipments likewise flow sensors, water level sensors etc. requires calibration after 2 years. The manufacturer's calibration lab facility is not currently available in Pakistan therefore; the project office will bear huge expenses in case of calibration/repair of these equipments from the manufacturer country.

It merits mentioning that no calibration/testing lab facility for Hydromet equipments is available in Pakistan being pivotal department in view of forecasting, flood early warning and water management sector in Pakistan. Hence, there is a great need of

establishment of high standard calibration, testing lab having full facilities of calibration, testing of new, repaired, used Hydromet sensors according to international Hydromet standards to mitigate problems of sudden non-functioning of installed equipments especially during high inflow seasons (summer season) in order to achieve maximum optimum results from the hydrological systems in Pakistan.

The implementation of the proposed project will not only be helpful for calibration of instruments/equipment under Wapda but also can provide facility to all Government Department PMD, PIDS, PDMA etc. who are using automatic equipment for flow measurement and AWS. Depending upon the request, the facility could generate funds for self support to some extent, however, will be detail analyzed during feasibility study.

ANNEXURE - 8

DETAILED ESTIMATE REGARDING COMPLETE IMPLEMENTATION OF FLOOD TELEMETRY MASTER PLAN

A - PRINCIPAL COST:

Procurement of Equipment & Establishment of Data Centre and Works Stations

PART - 1: QUIPMENT (Monitoring)

Sr. No.	Description	Unit	Qty	Unit Rate		Foreign Currency Component (USD)	Local Currency Component (PKR)
				Foreign (USD)	Local (PKR)		
1	2	3	4	6	7	8	9
1.1	**RTU/Data Loggers**						
1.1.1	Data logger- With screen Display, Hydro-Met Software, with GSM/GPRS(M2M) Modem supporting 02 no. SIMs including all accessories, antenna and cables etc., Serial Extension Board, Connection Terminals	No.	707	3,571		2,524,981	
	CCTV Camera including installation & all accessories	No.	707	653		461,604	
1.1.2	Satellite Modem (GOES/ Eumetsat/ Inmarsat/ Thuraya/ Iridium etc.)/ Radio (Meteor Burst) and Antenna alongwith accessories	No.	350	2,368		828,893	
1.1.3	**Solar panels and Rechargeable Battery**						
	Power supply (solar with battery), 80W / 72Ah with mounting including all accessories	No.	707	1,128		797,316	
1.1.4	**Armor Plated National Electrical Manufacturers Association (NEMA) or equivalent Enclosure** Stainless steel patch box (for data loggers, solar panel & battery powered station + Armor plating, must be IP66/IP67	No.	707	1,529		1,081,017	
1.1.5	Lightning Arrestor and Grounding Kit depending upon site requirements.	No.	707	630		445,410	
1.1.6	Sensor mast/pole with cross arms and suitable enclosure for housing the different sensors free from solar radiation etc.	No.	707	7,550		5,337,850	
Sub-Total-ST 1.1 (RTU / Data Loggers):						**11,477,071**	
1.2	**SENSORS**						
1.2.1	Combined Temperature and Relative Humidity probe with protective cap & standard shaft including installation and all accessories	No.	707	725		512,750	
1.2.2	Tipping bucket rain gauge, MR2, non-heated alongwith Column, for rain gauge with tipping bucket, H=2m (85% gauges non heated))	No.	600	1,511		906,778	
1.2.3	Tipping bucket rain gauge, MR2, heated alongwith Filament transformer for the precipitation gauge (15% gauges heated)	No.	107	1,480		158,394	
1.2.4	Water Flow measuring Sensors non-contact radar based velocity and Water Level measuring Sensors [Master Sensor] (Combined or individual sensors as per site requirement) including accessories alongwith 01 additional Slave sensor	No.	707	21,195		14,984,785	
	01 no. Additional Slave Sensors per site (in addition to Master Velcoity and level Sensor) required for Level measurement being large/ wide streams/ rivers including installation material and accesories	No.	707	7,272		5,141,528	
Sub-Total- ST 1.2 (Sensors):						**21,704,235**	

1.3	**SPARES**						
1.3.1	Data logger- With screen Display, Hydro-Met Software, with GSM/GPRS(M2M) Modem supporting 02 no. SIMs including all accessories, antenna and cables etc., Serial Extension Board, Connection Terminals	No.	100	3,571		357,140	
	CCTV Camera including installation & all accessories	No.	100	653		65,291	
1.3.2	Satellite Modem (GOES/ Eumetsat/ Inmarsat/ Thuraya/ Iridium etc.)/ Radio (Meteor Burst) and Antenna alongwith accessories	No.	50	2,368		118,413	
1.3.3	Combined Temperature and Relative Humidity probe with protective cap & standard shaft including installation and all accessories	No.	100	725		72,525	
1.3.4	Tipping bucket rain gauge, MR2, non-heated alongwith Column, for rain gauge with tipping bucket, H=2m	No.	100	1,511		151,130	
1.3.5	Tipping bucket rain gauge, MR2, heated alongwith Filament transformer for the precipitation gauge	No.	10	1,480		14,803	
1.3.6	Water Flow measuring Sensors non-contact radar based velocity and Water Level measuring Sensors [Master Sensor] (Combined or individual sensors as per site requirement) including accessories alongwith 01 additional Slave sensor	No.	100	21,195		2,119,489	
	01 no. Additional Slave Sensors per site (in addition to Master Velcoity and level Sensor) required for Level measurement being large/ wide streams/ rivers including installation material and accesories	No.	100	7,272		727,232	
Sub-Total- ST 1.3 (Spares):						**3,626,022**	
Total - (ST 1.1 +ST 1.2+ST 1.3) - CIP Price of Equipment:						**36,807,327**	
Add 40% for Custom & Duties on CIP Price of Equipment						**14,722,931**	
TOTAL - T1 (Price of Equipment):						**51,530,258**	
TOTAL - T1 (Price of Equipment in PKR 1 USD = PKR225)							**11,594,308,050**

PART - 2: EQUIPMENT for maintenance - (for 10 Nos. Field offices)

Sr. No.	Description	Unit	Qty	Unit Rate		Foreign Currency Component (USD)	Local Currency Component (PKR)
				Foreign (USD)	Local (PKR)		
1	2	3	4	6	7	8	9
2.1	**Operational Equipment**						
2.1.1	Hand held latest GPS	No.	10	1,100		11,000	-
2.1.2	Hand held Latest weather Meter	No.	10	1,450		14,500	-
2.1.3	Rain Gauge Calibration Kit as per WMO standard and system requirement	No.	10	1,800		18,000	-
2.1.4	Standard Relative Humidity Indicator as per WMO standard and system requirement	No.	10	900		9,000	
2.1.5	Automatic Sedimatent Sampler including all accessories	No.	10	10,000		100,000	
2.1.6	ADCP (9-Beam) sensor to be mounted on a Boat for Cross-Section/ Flow Measurement along with complete accessories	No.	10	67,790		677,900	

2.1.7	Non-Contact Radar Profiler, Mobile Measuring System for Discharge Measurement along with complete accessories. Discharge calculation needs to be based on Hydraulic Models (several calculation factors)	No.	10	10,605		106,050	
2.1.8	Motorized towing system for mobile measuring water flow or discharge. Including mounting for Non-contact radar Profiler and ADCP boat and accessories.	No.	10	15,944		159,440	
2.1.9	Autonomous Discharge measurement System (35 meter) for non-contact discharge measurement with integraded data logging and transmission	No.	10	17,330		173,300	
2.1.10	Digital Latest Standard Water Quality Monitoring Equipment as per WHO Standards including all accessories	No.	10	6,500		65,000	
2.1.11	Generator 10KVA (Auto-start Function)	No.	2	6,000		12,000	
2.1.12	Generator 2KVA(Self-start)	No.	10	1,500		15,000	
2.1.13	4-wheel Drive Double Cabins for field Activities by 10 Nos. Provincial Field Offices (@ 2 Nos. for each office)	No.	20		8,000,000		160,000,000
2.1.14	4-wheel Drive Double Cabins for Office Use by Central Data Centre at Lahore and Co-host at Islamabad (@ 2 Nos. for each office)	No.	4		8,000,000		32,000,000
2.1.15	Digital Camera of Standard Brand	No.	10	1,500		15,000	
Sub-Total- ST 2.1:						**1,376,190**	**192,000,000**

2.2	**Equipment for Testing and measurements**						
2.2.1	Digital Latest Multimeter of standard brand	No.	10	1,900		19,000	
2.2.2	Digital Latest Clamp Meter(AC & DC both) of standard brand	No.	10	1,200		12,000	
2.2.3	Digital Latest Battery Analyzer of standard brand	No.	10	8,000		80,000	
2.2.4	Tool kits	No.	10	9,900		99,000	
2.2.5	Latest LAPTOPS including all accessories, softs & data cables to connect with data logger for communication/ programming and site commissioning of standard brand	No.	10	4,160		41,600	
2.2.6	DUO Plus USB Type-C Flash Drive 256GB		10		8,000		80,000
2.2.7	Portable SSD USB 3.2 2TB with fingerprint and password security		10		16,000		160,000
2.2.8	Portable Oscilliscope 100 MHZ bandwidth of standard brand	No.	10	7,215		72,150	
Sub-Total- ST 2.2:						**323,750**	**240,000**
2.3	**Training & Documentation**						
2.3.1	Imparting Local Training to WAPDA personnels involved in the installation, configuration, Operational & Testing of Equipment	No.	0			Complimentary	
2.3.2	System Documentation (System circuit diagram, operation & maintenance, service manuals and any other documents of all the equipment installed (Hard copies) and CD's containing soft copies)	No.				Complimentary	
Sub-Total- ST 2.3:						**-**	
Total - (ST 2.1+ST 2.2+ ST 2.3) for O&M/Testing Equipment:						**1,699,940**	**192,240,000**
40% custom & duties on F.C - 17% Tax/Local Duties on O&M/Testing Equipment:						**679,976**	**32,680,800**

TOTAL -T2 (O&M/Testing Equipment with Taxes):	2,379,916	224,920,800
1USD = 225PKR	535,481,100	224,920,800
TOTAL - T2 (Estimated Cost in PKR of O&M/Testing Equipment):		**760,401,900**

3	**Related Services**						
3.1	**Installation, Testing & Commissioning**						
3.1.1	Cantilever Boom tower swivel type arm length 20 to 25 feet long or cable-way for sensors as per site requirement with base plates, anchor bolts, erection, installation, concreting work including transportation for installation of dual function sensors	No.	707		3,000,000		2,121,000,000
3.1.2	Galvanized chain link fence of site with gate and posts of G.I. 2" pipes heavy duty complete with posts U Bolts, anchor bars, concrete work, installation & transportation and levelling of site as per site requirement.	No.	707		400,000		282,800,000
3.1.3	Installation of Sites enclosure box, sensors and testing including all necessary installation material like GI Pipes, power cables, screws and bolts etc..	No.	707		350,000		247,450,000
3.1.4	Installation of Staff Gauge at site for measurement of Water Level	No.	707		147,864		104,539,848
3.1.5	Flow/Cross-Section measurement of River for incorporating in the software for calibration as per requirement	No.	707		300,000		212,100,000
3.1.6	Integration of New stations with Database management system.	No.	707	1500		1,060,500	
Sub Total- ST 3.1:						**1,060,500**	**2,967,889,848**
Total - (Related Services):						**1,060,500**	**2,967,889,848**
17% Tax/Local Duties on Related Services:							**504,541,274**
TOTAL -T 3 (Related Services with Taxes):						**1,060,500**	**3,472,431,122**
(1 USD = PKR225)						**238,612,500**	**3,472,431,122**
TOTAL - T3 (Related Services in Pak Rs.):							**3,711,043,622**

4- Establishment of Data Centers and official set-up for regional data centers

Sr. No.	Description	Unit	Qty	Unit Rate		Foreign Currency Component (USD)	Local Currency Component (PKR)
				Foreign (USD)	Local (PKR)		
1	2	3	4	6	7	8	9
4.1	**Establishment of Data Centre**						
4.1.1	Central Data Server Hardware	No.	1	10,250		10,250	
4.1.2	Hydro-Meteorological Software Web Based	No.	1	6,250		6,250	
4.1.3	KVM Console	No.	1	1,800		1,800	
4.1.4	TOR Switch for Networking	No.	1	6,900		6,900	

4.1.5	UPS 5KVA alongwith 05 no. Battery Modules.	No.	1	4,500		4,500	
4.1.6	Rack 42 U	No.	1	1,750		1,750	
4.1.7	DSL Internet Connection with static IP and one year charges	No.	1		191,974		191,974
4.1.8	Air Conditioner	No.	1		247,966		247,966
	Sub-Total- ST 4.1					**31,450**	**439,940**
4.2							**Client Workstation/ PC with 65" UHD display**
4.2.1	Latest computer of standard brand including accesories and registered softs.	No.	11		1,000,000		11,000,000
4.2.2	Data ports with Latest computer of standard brand including accesories and registered softs. For PMD offices (04 Nos.) IRSA (01 No.)	No.	5		1,000,000		5,000,000
4.2.3	Provision of Equipment/Allied Accessories for establishment of Data Centre/ Client Workstation Rooms	No.	11		1,000,000		11,000,000
Sub-Total- ST 4.2:							**27,000,000**
4.3	**Provision of office accessories for establishment of Master Station/data processing rooms and office setups**						
4.3.1	Provision of office accessories for establishment of Master Station/data processing rooms and office setups (e.g. office Tables, Racks, computer chairs, Wall Paneling/ paint, sitting arrangements, tiling & other furnishing accessories like air conditioners, fans, lights etc.) for Central Data Centre at WAPDA Lahore, Co-Data centres at FFC Islamabad, H&R Dte. WAPDA and 7 Regional Centres	No.	12		5,000,000		**60,000,000**
Sub-Total- ST 4.3:							**60,000,000**
4.4	**Provision of Land Compensation Cost**						
4.4.1	Provision of Land Compensation Cost for acquiring of land for installation of Stream Gauaging Stations Estimated @ 30 %	No.	200		500,000		**100,000,000**
Sub-Total- ST 4.4:							**100,000,000**
4.5	**Provision of Consultancy Cost**						
4.5.1	Provision of Consultancy Cost ,including Taxes,for the Project (Lump sum)	JOB	1		450,000,000		**450,000,000**
Sub-Total- ST 4.5:							**450,000,000**
Total- (ST 4.1 + ST 4.2 + ST4.3 + ST4.4 + ST4.5)						**31,450**	**637,439,940**
Add 40% for Custom & Duties on CIP Price of Equipment and 17% taxes on Local Equipment						**12,580**	**31,864,790**
TOTAL - T4 (Price of Equipment)						**44,030**	**669,304,729**
TOTAL - 4 (Price of Equipment in PKR 1 USD = PKR 225):							**679,211,479**
TOTAL - A , Tentative Principal Cost (T1+T2+T3+T4)							**16,744,965,051**

PART -B : ANNUAL O&M COST (Incremental Operating Charges)

Sr. No.	Description	Unit	Qty	Unit Rate		Foreign Currency Component (USD)	Local Currency Component (PKR)
				Foreign (USD)	Local (PKR)		
1	2	3	4	6	7	8	9

1	**Communication Services For Data Acquisition**						
1.1	Global System for Mobile Communication (GSM/GPRS for M2M services) Sims Connection+ yearly Sim Charges. (@ 50% Stations)	No.	357		20,000		7,140,000
1.2	Satellite Service Charges for 01 year /per site (@ 50% Stations)	No.	350		300,000		105,000,000
Sub-Total-ST1 Communication Services for Data Acquistion:							**112,140,000**

2	**Remuneration cost of Manpower per year**						
2.1	Deployment of security staff (local area person) at each site for 01 year @Rs.1000/- per day per chowkidar.	No.	707		365,000		258,055,000
2.2	Deployment of office staff for Operational Activities with each provincial office as per **(Table - 6.2)**	No.	10		16,527,900		165,279,000
2.3	Deployment of office staff at Central Data Centre at WAPDA Lahore **(Table - 6.3)**	No.	1		13,442,100		13,442,100
2.4	Centralized Payments @ 60 % of 2.2 and 2.3						107,232,660
2.5	T.A/ D.A for staff for field activities of 7 Regional Offices (Team of Five Members for 10 days) (10000X5X10X12)	No.	10		6,000,000		60,000,000
2.6	T.A/ D.A for staff of Central Data Center and Co- Host (Team of Two Members for 5 days) (10000X2X5X12)	No.	2		1,200,000		2,400,000
Sub-Total-ST2 (Remuneration cost of Manpower) :							**606,408,760**
3	**Miscellaneous Expenses (Per Year)**						
3.1	Office space for Central Data Centre, Co-Data Centre and sub Data Centres in the provinces would be provided by respective stake holder	-		-	-	-	-
3.2	POL/R&M of Vehciles under 10 units for field Activities during implementation and operational phase of the Project (02 No. Vehicles for each Unit). (3000 Km / Vehicle /month)	No.	20		600,000		12,000,000
3.3	POL/R&M of Vehciles under Central Data Center and Co- Host. for official Activities during implementation and operational phase of the Project (02 No. Vehicles for each). (1500 Km / Vehicle / month)	No.	4		300,000		1,200,000
3.4	Utility Bills (100000 x 12)=1,200,000 per year	No.	12		1,200,000		14,400,000
3.5	R&M Office (10000 x 12)= 120,000 per year	No.	12		120,000		1,440,000
3.6	R&M Field Equipment (100000 x 12)=1,200,000 per year	No.	10		1,200,000		12,000,000
3.7	Stationary & Printing (25000 x 12)=300,000 per year	No.	12		300,000		3,600,000
Sub-Total-ST3 (Miscellaneous Expenses):							**44,640,000**
Total (ST1+ST2+ST3) Incremental Operating Charges:							**763,188,760**
17% Tax/Local Duties (Item No. 1 & 3 only):							**26,652,600**
TOTAL -B, Annual O&M Cost:							**789,841,360**

COMPLETE MASTER PLAN - 707 STATIONS

PRINCIPAL COST (PK. RUPEES)

Sr. No	ITEMS	TOTAL COST	PUNJAB (2)	KP (2)	SIND (1)	BALOCH (3)	AJK (1)	G.B (1)	DHDC (1)	Co-DC (1)	PMD-IRSA
		707 SITES - 12 OFFICES	151(21%)	136 (19%)	46 (7%)	207 (29%)	83 (12%)	84 (12%)	WAPDA	FFC	Offices
1	**EQUIPMENT (Monitoring) Duty and taxes inclusive**	**11,594,308,050**	2,434,804,691	2,202,918,530	811,601,564	3,362,349,335	1,391,316,966	1,391,316,966			
2	**EQUIPMENT (O & M)**								-	-	
	Equip. (Operation) (12 Units)	**501,642,750**	93,388,550	93,388,550	46,694,275	140,082,825	46,694,275	46,694,275	17,350,000	17,350,000	
	Equipment (Testing) (10 Units)	**73,083,750**	14,616,750	14,616,750	7,308,375	21,925,125	7,308,375	7,308,375			
	Taxes and Duties	**185,675,400**	35,831,080	35,831,080	17,915,540	53,746,620	17,915,540	17,915,540	3,260,000	3,260,000	
3	**RELATED SERVICES**										
	Install, Test, Comm	**3,206,502,348**	673,365,493	609,235,446	224,455,164	929,885,681	384,780,282	384,780,282			
	Taxes	**504,541,274**	105,953,668	95,862,842	35,317,889	146,316,970	60,544,953	60,544,953			
4	**ESTAB. OF DATA CENTERS**										
	Central Data Center	**7,516,190**							7,516,190		
	Regional Data centers (11 Units) + PMD Offices (4 No.), IRSA (01 NO.)	**27,000,000**	4,000,000	4,000,000	2,000,000	6,000,000	2,000,000	2,000,000		2,000,000	5,000,000
	Office Furniture etc (12 Units)	**60,000,000**	10,000,000	10,000,000	5,000,000	15,000,000	5,000,000	5,000,000	5,000,000	5,000,000	
	Land Compens. (200 Sites)	**100,000,000**	21,000,000	19,000,000	7,000,000	29,000,000	12,000,000	12,000,000			
	Consultancy Cost incl.Taxes	**450,000,000**							450,000,000		
	Duties & Taxes	**34,695,290**	5,950,000	5,610,000	2,380,000	8,500,000	3,230,000	3,230,000	3,755,290	1,190,000	850,000
	TOTAL	**16,744,965,052**	**3,398,910,231**	**3,090,463,198**	**1,159,672,807**	**4,712,806,555**	**1,930,790,391**	**1,930,790,391**	**486,881,480**	**28,800,000**	**5,850,000**
	TOTAL (Million)	**16,744**	**3,398**	**3,090**	**1,160**	**4,712**	**1,931**	**1,931**	**487**	**29**	**6**

COMPLETE MASTER PLAN - 707 STATIONS

OPERATION & MAINTENANCE COST (PK. RUPEES))

Sr. No	ITEMS	TOTAL COST	PUNJAB (2)	KP (2)	SIND (1)	BALOCH (3)	AJK (1)	G.B (1)	DHDC (1)	Co-DC (1)
		707 SITES - 12 OFFICES	151 (21%)	136(19%)	46 (7%)	207 (29%)	83 (12%)	84 (12%)	WAPDA	FFC
1	**COMMUNICATION SERVICES FOR DATA ACQUISITION**									
	GSM & Satellite Fee Charges	**112,140,000**	23,549,400	21,306,600	7,849,800	32,520,600	13,456,800	13,456,800		
2	**REMUNERATION COST**									
	Staff (Security) (707 sites)	**258,055,000**	54,191,550	49,030,450	18,063,850	74,835,950	30,966,600	30,966,600	-	-
	Staff (Regional Offices) (10 Nos)	**165,279,000**	33,055,800	33,055,800	16,527,900	49,583,700	16,527,900	16,527,900	-	-
	Staff (CHDC Lahore)	**13,442,100**	-	-	-	-	-	-	13,442,100	
	Centralized Payment @ 60%	**107,232,660**	19,833,480	19,833,480	9,916,740	29,750,220	9,916,740	9,916,740	8,065,260	
3	**T.A / D.A**									
	Regional Offices Staff	**60,000,000**	12,000,000	12,000,000	6,000,000	18,000,000	6,000,000	6,000,000	-	-
	CHDC & Co- Data Center	**2,400,000**	-	-	-	-	-	-	1,200,000	1,200,000
4	**Miscellaneous Expenses**									
	POL/R&M Vehicles Regional Office	**12,000,000**	2,400,000	2,400,000	1,200,000	3,600,000	1,200,000	1,200,000		
	POL/R&M Veh. CHDC & Co Center	**1,200,000**	-	-	-	-	-	-	600,000	600,000
	Utility Bills (12 units)	**14,400,000**	2,400,000	2,400,000	1,200,000	3,600,000	1,200,000	1,200,000	1,200,000	1,200,000
	R&M Office	**1,440,000**	240,000	240,000	120,000	360,000	120,000	120,000	120,000	120,000
	R&M Field Equipment	**12,000,000**	2,400,000	2,400,000	1,200,000	3,600,000	1,200,000	1,200,000	-	-
	Stationary & Printing	**3,600,000**	600,000	600,000	300,000	900,000	300,000	300,000	300,000	300,000
5	**TAXES on Item 1 & 4 @ 0.17**	**26,652,600**	**5,370,198**	**4,988,922**	**2,017,866**	**7,578,702**	**2,971,056**	**2,971,056**	**377,400**	**377,400**
	TOTAL	**789,841,360**	**156,040,428**	**148,255,252**	**64,396,156**	**224,329,172**	**83,859,096**	**83,859,096**	**25,304,760**	**3,797,400**
	TOTAL (Million)	**790**	**156**	**148**	**64**	**224**	**84**	**84**	**26**	**4**

ANNEXURE - 9

SUPPORTING DOCUMENTS / QUOTATIONS TO PROVIDE BASIS OF ESTIMATES

Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
1.2.9.3	19425	RQ-30d Auxiliary System for non-contact discharge measurement 35m with additional analog output and summary calculation System to measure flow velocity, water level and simultaneous calculation to discharge quantities in l/s or m³/s. Technical specifications: - Measuring element/-principle flow velocity: Radar / Doppler shift - Measuring element/-principle water level: Radar / delay time - Measuring range flow velocity: 0,1 - 15 m/s, with direction recognition, Resolution: 1 mm/s, minimum wave height 3mm - Measuring range water level: 0 - 35 m; Resolution: 1 mm, Beam angle 10° - Field of application: -35 - + 60 °C - Interface: RS-485, SDI-12 and Modbus plus analog output 4 x 4 – 20 mA - Supply: 6 - 30 V DC - Power consumption: about 140 mA at 12 V DC / per measurement plus analog output max. 4 x 30 mA - Protection type: IP 67 - Casing: LxHxW 338x333x154 Material: powder-coated aluminium Installation: bracket for pipe Ø 34 - 48 mm	2	pc(s)	10.340,00	20.680,00
1.2.10.	18009	Level sensor, RL-35, with housing, radar, range: 35 m, output: 4-20 mA Non-contact radar-sensor for continuous recording of the water level of open waters using a horn antenna (K-band) Technical specifications: - Measuring element/-principle: horn antenna / Radar - Measuring range: 35 m; Accuracy: ±2 mm, Blocking distance 0,5m, Beam angle 10° - Field of application: -40 - +80 °C - Output: 4 - 20 mA / HART - Supply: 9,6 - 36 V DC - Sensor Protection type: IP 66 / 67 - **Vandalism Proof housing** - Housing Powder-coated, WxHxD mm - Installation: bracket for pipe Ø 34 - 48 mm	34	pc(s)	2.489,00	84.626,00
1.2.10.	10235	Cable, for measurement signal of RL-35 , H05BQ-F K35 2 x 0,75	340	m	4,29	1.457,11
(Pos. 1.3.1.1 - Pos. 1.3.16.0)		**Operational equipment**				**214.100,16**
1.3.1.1	90001	1.3.1 -1.3.6 we can not deliver	1	pc(s)		0,00
1.3.7.1	90007	Sediment Sampler including all accessories	1	pc(s)		0,00

Quotation no.	Person in charge	Date	Page
2021-14702	Michael Sommer	21 Oct 2020	2

Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
1.1.1.2	20181	Readout cable for MRL and PD-x RS-232 to USB converter cable with push-pull connector for MRL-6, MRL-7, PD-3 and PD-5. Length 1.8 m	20	pc(s)	148,51	2.970,24
1.1.2.1	21110	SATMO - 6100 - Satellite modem Satellite network: INMARSAT - data rates are in a separate position (not included) - Two-way satellite communication; Unidirectional build-in antenna - Reliable for extreme condtitions; Ruggedized and versatile housing - IoT solutions; Exceptional low elevation angle performance - Perfect for stations or emergency deployment units - with a full MDS licence for data forwarding (included for 3 years) - Energy-saving sensor operation - Satellite service: two-way, Global, IsatData Pro - Power Supply: 9 ... 32 VDC - incl. 10m cable - Power consumption (typical average @12V DC, 22° C): IDP Receive: 65 mA; - GPS/Glonass/Beidou Receive: 22 mA; Transmit: 0.65 A; Sleep: 100 µA - Operating temperature: -40°C to +85°C - Interfaces: Serial: RS-232; RS-485; Inputs/outputs: 4 analog or digital in/out - Dust and water ingress: IP67 - Vibration: SAE J1455 (Sec 4.9.4.2 fig 6-8); MIL-STD -810G (Sec 514.6); Shock: MIL-STD-810G (Sec 516.6) - Frequenzy: Rx: 1518.0 to 1559.0 MHz; Tx: 1626.5 to 1660.5 MHz; 1668.0 to 1675.0 MHz - Dimensoins: 12.6 cm x 12.6 cm x 4.9 cm; Material: Anodized aluminium; Weight: 1,2 kg - Certifi cation: Regulatory: CE, FCC, IC, Anatel, RCM Mark, Mexico; Pending: FFA, MSS Russia, SRRC, Philippines, Korea, IEC 60945, C1D2	20	pc(s)	1.995,00	39.900,00
1.1.2.2	21116	SATMO - 6100 - Satellite modem data rates (INMARSAT), 200KB per Month Data transmission costs for one modem **NO DISCOUNT applicable** **data amount per 3 years 200KB per Month for 3 years** **200KB 2500EUR 5-8 parameter** Option: 500KB 4260EUR 8-14 parameter 700KB 5335EUR 14-17 parameter	20	pc(s)	2.500,00	50.000,00
1.1.3.1	20705	Power supply (solar with battery), 80W / 72Ah with mounting for Ø=60mm; for ART: 20703 - 80W Solar panel - solar charger 14A - 5m cable - Mounting for DM 60mm - Solar panel reenforcement - 72Ah Battery	20	pc(s)	950,00	19.000,00
1.1.4.1	20541	Switch cabiniet AE1008 with Mounting for DM60	20	pc(s)	838,03	16.760,64
1.1.4.2	90004	Switch cabinet work, terminals and electrical drawing	20	pc(s)	450,00	9.000,00
1.1.5.1	90001	Lightning Arrestor will be done locally	20	pc(s)		0,00

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Quotation no.	Person in charge	Date	Page
2021-14702	Michael Sommer	21 Oct 2020	3

Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
1.1.6.1	90001	Sensor mast/pole with cross arms will be done locally	20	pc(s)		0,00
1.1.8.1	90008	**SPARE:** MRL-7E - data logger with integrated telemetry with 2G / 3G (extended version) Input: - 12 x analogue 0 ... 2,5 V (thereof 1 x PT-100 4-wire connection, 1 x NTC, 1 x 0 ... 0,3 V) - 5 x counter - 2 x frequency input for wind speed and wind gust - 2 x potentimeter input for wind direction - 2 x RS 485 (various ASCII protocols) - 2 x SDI-12 (Vers. 1.3) Output: - SDI-12 - RS 485 - 5 x Analog 4-20mA (option) - 3 switch contact (6 more option- Impulse possible) Supply: - battery external: max. 12 V, 50 Ah (not included) - external power supply: 6 ... 30 V - integrated solar charge controller for solar panel, max. 40 W Interface: - 1 x communication interface: RS 232; 9,6 ... 115 kBd - 1 x USB host (only for readout of data on USB flash drive) - 1 x Bluetooth additional: - up to 99 channels - illuminated display	2	pc(s)	2.560,00	5.120,00
1.1.8.1	21110	**SPARE:** SATMO - 6100 - Satellite modem Satellite network: INMARSAT - Two-way satellite communication; Unidirectional build-in antenna - Reliable for extreme condtitions; Ruggedized and versatile housing - IoT solutions; Exceptional low elevation angle performance - Perfect for stations or emergency deployment units - with a full MDS licence for data forwarding (included for 3 years) - Energy-saving sensor operation - Satellite service: two-way, Global, IsatData Pro - Power Supply: 9 ... 32 VDC - incl. 10m cable - Power consumption (typical average @12V DC, 22° C): IDP Receive: 65 mA; - GPS/Glonass/Beidou Receive: 22 mA; Transmit: 0.65 A; Sleep: 100 µA - Operating temperature: -40°C to +85°C - Interfaces: Serial: RS-232; RS-485; Inputs/outputs: 4 analog or digital in/out - Dust and water ingress: IP67 - Vibration: SAE J1455 (Sec 4.9.4.2 fig 6-8); MIL-STD -810G (Sec 514.6); Shock: MIL-STD-810G (Sec 516.6) - Frequenzy: Rx: 1518.0 to 1559.0 MHz; Tx: 1626.5 to 1660.5 MHz; 1668.0 to 1675.0 MHz - Dimensoins: 12.6 cm x 12.6 cm x 4.9 cm; Material: Anodized aluminium; Weight: 1,2 kg - Certifi cation: Regulatory: CE, FCC, IC, Anatel, RCM Mark, Mexico; Pending: FFA, MSS Russia, SRRC, Philippines, Korea, IEC 60945, C1D2	2	pc(s)	2.986,00	5.972,00

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Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
1.1.8.2	20181	Readout cable for MRL and PD-x	2	pc(s)	148,51	297,02
		RS-232 to USB converter cable with push-pull connector for MRL-6, MRL-7, PD-3 and PD-5. Length 1.8 m				
1.1.9.1	20705	**SPARE:** Power supply (solar with battery), 80W / 72Ah with mounting for Ø=60mm; for ART: 20703	2	pc(s)	950,00	1.900,00
		- 80W Solar panel - solar charger 14A - 5m cable - Mounting for DM 60mm - Solar panel reenforcement - 72Ah Battery				
1.1.9.2	20541	**SPARE:** Switch cabiniet AE1008 with Mounting for DM60	2	pc(s)	838,03	1.676,06
1.1.9.3	90004	**SPARE:** Sensor mast/pole with cross arms will be done locally	2	pc(s)		0,00
(Pos. 1.2.1.1 - Pos. 1.2.10.2)		**Sensors**				**934.296,60**
1.2.1.1	20649	Humidity/temperature sensor, HC2A-S3, range 0-100 % rF, -40-60 °C, output: 0-1V	20	pc(s)	501,00	10.020,00
		Technical specifications: - Long-term stability < 1 % rF Drift / year - Temp. sensor PT100 1/3 DIN - Power supply 3,2-5 V DC - Accuracy: ±0.8 %rF, ±0.1 K, at 23 °C ±5 K - Range: -50…100 °C / 0…100 %rF - Output: 0…1 V = -40…60 °C / 0…100 %rF - Justiert bei 23 °C und 10, 35, 80 %rF				
1.2.1.2	19438	Radiation protection shelter, for humidity and temperature sensors: HC2-S3, EE06	20	pc(s)	190,94	3.818,88
		Mounting set (ART: 19534) is not included				
1.2.1.3	14535	Cable, for Humidity/temperature sensor HC2-S3, lenght: 5m, supply: 5V	20	pc(s)	153,82	3.076,32
1.2.1.4	19534	Mounting set for pipe arms (including V-bolts, nuts and washers)	20	Set	19,38	387,60
		25 - 51 mm				
1.2.2.1	10332	Tipping bucket rain gauge, MR2, non-heated Collecting area: 200 cm²; Resolution: 0.2 mm, Output: Pulse	20	pc(s)	870,00	17.400,00
		Technical specifications: - Measuring element/-principle: Tipping bucket - Collecting area: 200 cm²; Resolution: 0,2 mm - Output: Pulse (relay output) - Protection type: IP 65 - Dimensions: ø 180 mm; Height 270 mm - Installation: on support column or bracket				
1.2.2.1	15344	Column, for rain gauge with tipping bucket, H=2m	20	pc(s)	403,10	8.062,08
		Technical specifications: - Collection height: 2m - Material: hot-dip galvanised steel - incl. baseplate				

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Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
1.2.3.1	90006	MM - GMX200 - Wind, WIND SPEED Range 0.01 m/s to 60 m/s Accuracy ± 3% to 40 m/s, ± 5% to 60 m/s Resolution m/s 0.01 Starting Treshold 0.1 m/s Sampling Rate 1 Hz Units m/s, km/hr, mph, kts, ft/min WIND DIRECTION Range 0-359° Accuracy ± 3° to 40 m/s ± 5° to 60 m/s Resolution 1° Sampling Rate 1 Hz Units Degrees OUTPUTS Output rate 1/s, 1/min, 1/hr Digital Comms Modes Serial RS232, RS422, RS485, SDI-12, NMEA, MODBUS, ASCII Analogue Outputs Available via separat POWER Power Supply 5 to 30 Vdc Power (Nominal)12 Vdc: 25 mA continuous high mode. 0. mA eco-power mode (1 hour polled)	6	pc(s)	1.400,00	8.400,00
1.2.4.1	10384	Evaporation Sensor, VDM-100, for evaporation measurement, measuring range: 100 mm, High resolution of 0.1 mm, Output: 4-20mA - Easy to mount and operate - Pipe system ø 25mm for hanging - measuring range 100 mm, Operation temperature range 0 - 50 °C - Resolution 0,1 mm - Output 4-20 mA = 100 - 0 mm - Power Supply 12 VDC +/-5%	6	pc(s)	2.408,00	14.448,00
1.2.4.2	90001	Evaporation pan	6	pc(s)	1.400,00	8.400,00
1.2.5.1	21321	Air pressure sensor, 61402V, for radiation-protected installation, measuring range: 500-1100 hPa, output: 0 -5VDC, RS232	30	pc(s)	1.230,00	36.900,00
1.2.5.2	19438	Radiation protection shelter, for humidity and temperature sensors: HC2-S3, EE06 Mounting set (ART: 19534) is not included	30	pc(s)	190,94	5.728,32
1.2.5.3	19534	Mounting set for pipe arms (including V-bolts, nuts and washers) 25 - 51 mm	30	Set	19,38	581,40

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Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
1.2.6.1	19425	RQ-30d System for non-contact discharge measurement 35m with additional analog output and summary calculation System to measure flow velocity, water level and simultaneous calculation to discharge quantities in l/s or m³/s. Technical specifications: - Measuring element/-principle flow velocity: Radar / Doppler shift - Measuring element/-principle water level: Radar / delay time - Measuring range flow velocity: 0,1 - 15 m/s, with direction recognition, Resolution: 1 mm/s, minimum wave height 3mm - Measuring range water level: 0 - 35 m; Resolution: 1 mm, Beam angle 10° - Field of application: -35 - + 60 °C - Interface: RS-485, SDI-12 and Modbus plus analog output 4 x 4 – 20 mA - Supply: 6 - 30 V DC - Power consumption: about 140 mA at 12 V DC / per measurement plus analog output max. 4 x 30 mA - Protection type: IP 67 - Casing: LxHxW 338x333x154 Material: powder-coated aluminium Installation: bracket for pipe Ø 34 - 48 mm	20	pc(s)	10.340,00	206.800,00
1.2.6.2	17276	RG-30d System for non-contact velosity measurement with summary calculation System to measure flow velocity Technical specifications: - Measuring element/-principle flow velocity: Radar / Doppler shift - Measuring range flow velocity: 0,1 - 15 m/s; Resolution: 1 mm/s, minimum wave height 3mm - Field of application: -35 - + 60 °C - Interface: RS-485, SDI-12 and Modbus plus analog output 4 – 20 mA - Supply: 5,5 - 30 V DC - Power consumption: about 130 mA / per measurement - Protection type: IP 67 - Casing: LxHxW 241x246x154 Material: powder-coated aluminium Installation: bracket for pipe Ø 34 - 48 mm	40	pc(s)	5.569,20	222.768,00

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2021-14702	Michael Sommer	21 Oct 2020	7

Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
1.2.6.3	19425	RQ-30d Auxiliary System for non-contact discharge measurement 35m with additional analog output and summary calculation System to measure flow velocity, water level and simultaneous calculation to discharge quantities in l/s or m³/s. Technical specifications: - Measuring element/-principle flow velocity: Radar / Doppler shift - Measuring element/-principle water level: Radar / delay time - Measuring range flow velocity: 0,1 - 15 m/s, with direction recognition, Resolution: 1 mm/s, minimum wave height 3mm - Measuring range water level: 0 - 35 m; Resolution: 1 mm, Beam angle 10° - Field of application: -35 - + 60 °C - Interface: RS-485, SDI-12 and Modbus plus analog output 4 x 4 – 20 mA - Supply: 6 - 30 V DC - Power consumption: about 140 mA at 12 V DC / per measurement plus analog output max. 4 x 30 mA - Protection type: IP 67 - Casing: LxHxW 338x333x154 Material: powder-coated aluminium Installation: bracket for pipe Ø 34 - 48 mm	20	pc(s)	10.340,00	206.800,00
1.2.6.4	20470	Software, Q-Commander V1.0, Software; for parameterisation and discharge calculation for the RQ -30 / SQ incl. RS485 to USB adapter and cable	8	pc(s)	831,30	6.650,40
1.2.6.5	18712	20m Cable, for RQ-30 / RG-30, LiYCY 12x0,25mm² incl. configuration and testing	80	pc(s)	185,64	14.851,20
1.2.7.1	20649	**SPARE:** Humidity/temperature sensor, HC2A-S3, range 0-100 %rF, -40-60 °C, output: 0-1V Technical specifications: - Long-term stability < 1 % rF Drift / year - Temp. sensor PT100 1/3 DIN - Power supply 3,2-5 V DC - Accuracy: ±0.8 %rF, ±0.1 K, at 23 °C ±5 K - Range: -50…100 °C / 0…100 %rF - Output: 0…1 V = -40…60 °C / 0…100 %rF - Justiert bei 23 °C und 10, 35, 80 %rF	2	pc(s)	501,00	1.002,00
1.2.7.2	19438	**SPARE:** Radiation protection shelter, for humidity and temperature sensors: HC2-S3, EE06 Mounting set (ART: 19534) is not included	2	pc(s)	190,94	381,89
1.2.7.3	14535	**SPARE:** Cable, for Humidity/temperature sensor HC2-S3, lenght: 5m, supply: 5V	2	pc(s)	153,82	307,63
1.2.7.4	19534	**SPARE:** Mounting set for pipe arms (including V-bolts, nuts and washers) 25 - 51 mm	2	Set	19,38	38,76

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Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
1.2.7.5	10332	**SPARE:** Tipping bucket rain gauge, MR2, non-heated Collecting area: 200 cm²; Resolution: 0.2 mm, Output: Pulse Technical specifications: - Measuring element/-principle: Tipping bucket - Collecting area: 200 cm²; Resolution: 0,2 mm - Output: Pulse (relay output) - Protection type: IP 65 - Dimensions: ø 180 mm; Height 270 mm - Installation: on support column or bracket	2	pc(s)	870,00	1.740,00
1.2.7.6	15344	**SPARE:** Column, for rain gauge with tipping bucket, H=2m Technical specifications: - Collection height: 2m - Material: hot-dip galvanised steel - incl. baseplate	2	pc(s)	403,10	806,21
1.2.8.1	90006	**SPARE:** MM - GMX200 - Wind, WIND SPEED Range 0.01 m/s to 60 m/s Accuracy ± 3% to 40 m/s, ± 5% to 60 m/s Resolution m/s 0.01 Starting Treshold 0.1 m/s Sampling Rate 1 Hz Units m/s, km/hr, mph, kts, ft/min WIND DIRECTION Range 0-359° Accuracy ± 3° to 40 m/s ± 5° to 60 m/s Resolution 1° Sampling Rate 1 Hz Units Degrees OUTPUTS Output rate 1/s, 1/min, 1/hr Digital Comms Modes Serial RS232, RS422, RS485, SDI-12, NMEA, MODBUS, ASCII Analogue Outputs Available via separat POWER Power Supply 5 to 30 Vdc Power (Nominal)12 Vdc: 25 mA continuous high mode. 0. mA eco-power mode (1 hour polled)	1	pc(s)	1.400,00	1.400,00
1.2.8.2	10384	**SPARE:** Evaporation Sensor, VDM-100, for evaporation measurement, measuring range: 100 mm, High resolution of 0.1 mm, Output: 4-20mA - Easy to mount and operate - Pipe system ø 25mm for hanging - measuring range 100 mm, Operation temperature range 0 - 50 °C - Resolution 0,1 mm - Output 4-20 mA = 100 - 0 mm - Power Supply 12 VDC +/-5%	1	pc(s)	2.408,00	2.408,00
1.2.8.3	90001	**SPARE:** Evaporation pan	1	pc(s)	1.400,00	1.400,00

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2021-14702	Michael Sommer	21 Oct 2020	9

Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
1.2.9.1	19425	**SPARE:** RQ-30d System for non-contact discharge measurement 35m with additional analog output and summary calculation System to measure flow velocity, water level and simultaneous calculation to discharge quantities in l/s or m³/s. Technical specifications: - Measuring element/-principle flow velocity: Radar / Doppler shift - Measuring element/-principle water level: Radar / delay time - Measuring range flow velocity: 0,1 - 15 m/s, with direction recognition, Resolution: 1 mm/s, minimum wave height 3mm - Measuring range water level: 0 - 35 m; Resolution: 1 mm, Beam angle 10° - Field of application: -35 - + 60 °C - Interface: RS-485, SDI-12 and Modbus plus analog output 4 x 4 – 20 mA - Supply: 6 - 30 V DC - Power consumption: about 140 mA at 12 V DC / per measurement plus analog output max. 4 x 30 mA - Protection type: IP 67 - Casing: LxHxW 338x333x154 Material: powder-coated aluminium Installation: bracket for pipe Ø 34 - 48 mm	2	pc(s)	10.340,00	20.680,00
1.2.9.2	17276	**SPARE:** RG-30d System for non-contact velosity measurement with summary calculation System to measure flow velocity Technical specifications: - Measuring element/-principle flow velocity: Radar / Doppler shift - Measuring range flow velocity: 0,1 - 15 m/s; Resolution: 1 mm/s, minimum wave height 3mm - Field of application: -35 - + 60 °C - Interface: RS-485, SDI-12 and Modbus plus analog output 4 – 20 mA - Supply: 5,5 - 30 V DC - Power consumption: about 130 mA / per measurement - Protection type: IP 67 - Casing: LxHxW 241x246x154 Material: powder-coated aluminium Installation: bracket for pipe Ø 34 - 48 mm	4	pc(s)	5.569,20	22.276,80

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Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
1.2.9.3	19425	RQ-30d Auxiliary System for non-contact discharge measurement 35m with additional analog output and summary calculation System to measure flow velocity, water level and simultaneous calculation to discharge quantities in l/s or m³/s. Technical specifications: - Measuring element/-principle flow velocity: Radar / Doppler shift - Measuring element/-principle water level: Radar / delay time - Measuring range flow velocity: 0,1 - 15 m/s, with direction recognition, Resolution: 1 mm/s, minimum wave height 3mm - Measuring range water level: 0 - 35 m; Resolution: 1 mm, Beam angle 10° - Field of application: -35 - + 60 °C - Interface: RS-485, SDI-12 and Modbus plus analog output 4 x 4 – 20 mA - Supply: 6 - 30 V DC - Power consumption: about 140 mA at 12 V DC / per measurement plus analog output max. 4 x 30 mA - Protection type: IP 67 - Casing: LxHxW 338x333x154 Material: powder-coated aluminium Installation: bracket for pipe Ø 34 - 48 mm	2	pc(s)	10.340,00	20.680,00
1.2.10.	18009	Level sensor, RL-35, with housing, radar, range: 35 m, output: 4-20 mA Non-contact radar-sensor for continuous recording of the water level of open waters using a horn antenna (K-band) Technical specifications: - Measuring element/-principle: horn antenna / Radar - Measuring range: 35 m; Accuracy: ±2 mm, Blocking distance 0,5m, Beam angle 10° - Field of application: -40 - +80 °C - Output: 4 - 20 mA / HART - Supply: 9,6 - 36 V DC - Sensor Protection type: IP 66 / 67 - **Vandalism Proof housing** - Housing Powder-coated, WxHxD mm - Installation: bracket for pipe Ø 34 - 48 mm	34	pc(s)	2.489,00	84.626,00
1.2.10.	10235	Cable, for measurement signal of RL-35 , H05BQ-F K35 2 x 0,75	340	m	4,29	1.457,11
(Pos. 1.3.1.1 - Pos. 1.3.16.0)		**Operational equipment**				**214.100,16**
1.3.1.1	90001	1.3.1 -1.3.6 we can not deliver	1	pc(s)		0,00
1.3.7.1	90007	Sediment Sampler including all accessories	1	pc(s)		0,00

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Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
1.3.7.2	21124	SOMQUALITY-TSS Probe, SDI-12, 15m cable (bare wire) Digital TTS meter allows you a simplicity and a total confidence in your Turbidity, Sludge Blanket and measuremnet of SS readings thanks to the MES Optical IR sensor Main advantages : - Wide range : SS: 0...50g/l ; Turbidity: 0...400FAU ; Sludge Blanket: 0...100% - Resolution: SS: 0,01g/l; Turbidity: 0.01-1FAU ; Sludge Blanket: 0,01...0,1% - Accuracy: SS: <10%; Turbidity: +/-5% (range -200-4000FAU) ; Sludge Blanket: +/-2% - Working temp 0°C - 50°C; IP68; - Power supply: 5-28VDC - Response time <35s - SDI-12 - Ready to measure : Plug and Play digital probe and Autodiagnostic. - High performances : 100 000 points datalogger - USB connection to PC, Intuitive menus - WinTEK viewer software - Cost effective : without spare - Dimensions: DM 27mm, Length: 170mm - Weight: 750g (sensor) - Material:DELRIN - Max. pressure: 5Bars - Incl. 15m cable (bare wire)	20	pc(s)	2.805,00	56.100,00
1.3.7.3	19294	SOMMER USB to RS485 Embedded Converter +USB-Stick RoHS: Einzelheiten Typ: UART Convert Cable Cable length: 1.8 m Color: Black Voltage: 5 VDC	20	pc(s)	100,98	2.019,60
1.3.8.1	16007	River Surveyor, Funk/ External Power/ SonTek RTK-GPS Modul - Interface Bluetooth (Class 1 (200m range) for connection with a laptop or smart phone) - External power supply (2 battery packs) - RTK-GPS receiver (RTK SonTek modules) with 900 MHz radio modem for communication with the RTK base station - Waterproof housing - 1-m Kable for connection to the system S5 or M9 - USB Bluetooth base station (for connection to laptop) - charger	1	pc(s)	23.029,00	23.029,00
1.3.8.2	16008	River Surveyor, Hydroboard für S5 und M9 ADP Systeme - Length 91 cm	1	pc(s)	3.260,00	3.260,00
1.3.8.3	19891	GPS and RTK GPS Antenna cable, RiverSurveyor M9/S5	1		100,00	100,00

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Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
1.3.8.4	16006	River Surveyor, M9 System	1	pc(s)	29.722,00	29.722,00
		Portable Acoustic Doppler Profiler 3.0 with 9 transformers MHz / 1.0 MHz 0.5 MHz MHz Mobile Abflussmessystem - For use in shallow channels - For mounting on a floating body - Delring case, diameter 13 cm - 4 in x 3.0 MHz and 4 x 1.0 MHz transducer for measuring speed Dual Janus configuration - Kompass/2-axiger tilt sensor - Temperature sensor - 8 GB of data recorder Tool kit, power supplies and hard case - Features: bottom tracking, internal discharge calculation, RiverSurveyor Live! Windows for laptop and PDA, bathymetry and computed discharge measurements, DGPS interface				
1.3.8.5	16009	River Surveyor, soft carrying case for Hydroboard	1	pc(s)	383,00	383,00
		- Padded nylon carrying case - 2 outside pockets with zipper				
1.3.8.6	17325	Supply and interface cable, 36-0001-010	1	pc(s)	693,00	693,00
1.3.9.1	18778	RP-30 Radar Profiler	1	pc(s)	8.600,00	8.600,00
		Mobile and contact free measurement of surface velocity profile on rivers specially under flood conditions Including Software RP-Commander Calculation of discharge with known water level and cross section profile Technical specifications - Measuring element/-principle flow velocity: Radar / Doppler shift - Measuring range flow velocity: 0,1 - 15 m/s; Resolution: 1 mm/s, minimum wave height 3mm - Field of application: -35 - + 60 °C - Interface: Bluetooth (Transfer distance up to 150m) - Supply: 9 pcs Ni-Mh 1,2V/2500mAh AA/Mignon (not included by air freight) - Power consumption: about 150 mA / per measurement (preliminary data) - Protection type: IP 67 - Casing: LxHxW 445 x 154 x 226 mm Material: powder-coated aluminium Installation: - Prepared for use on cable ways - Traveller for Handrails (included) - Tripod Mount (Tripod not included) incl. Charger and Custom made flight case You tube video: https://youtu.be/aQVFWcMF9BM				
1.3.9.2	20269	Tripod for RP-30 - Complete	1	pc(s)	344,76	344,76
		Tripod for RP-30 * Plate * Screw				

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Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
1.3.10.	90003	Cable fox remote control adcp towing system for a main cable diameter of 10 mm to 14mm (3/8" to 9/16") cable operation complete with carry case (This price includes the 1 x 12 Volt DC Powered Drive Carriage, 1 x Battery Box, 1 x Remote Hand Controller c/w Plug Pack Mains Charger and power cable all packed in Carry Case. Please stipulate main cable diameter at time of order. 12V SLA battery not included. Hoist included.)	1	pc(s)	13.450,00	13.450,00
1.3.15.	90001	1.3.11 -1.3.15 we can not deliver (exempt of the ADMS)	1	pc(s)		0,00
1.3.15.	20787	RQ-30 ADMS 35m Autonomous Discharge measurement System for non-contact discharge measurement with integraded data logging and transmission RQ-30 Autonomous Discharge measurement System: - Velocity measurment: 0,1 - 15 m/s, with direction recognition, Resolution: 1 mm/s, minimum wave height 3mm - Level measurment: Radar pulse, 0....35 m, Beam angle 10° - Calculation of Discharge - everything in one housing - housing is powder coded - MRL-7 data logger - 3G Modem inside the MRL-7 - Measuring and storage interval from 1 s....24 h - 4 MB Memory (equivalent up to 500.000 measured values) - SD Card up to 32 GB (SD card not included) - Planar antenna - Power supply: Accumulator 2x 12V/12 Ah (not included), Connection to Solar panel - No batteries included - Battery charger is included Outputs/parameterisation: USB/RS 232 or Bluetooth for Logger, RS 485 for sensor Long-range transmission Quadband EGSM 850/900/1800/1900 MHz net Data transmission CSV- or XHydro over FTP, CSV over HTTP Licence R&TTE, CE, GCF, PTCRB, IC, Anatel Including Software Q-Commander, Auslesekabel für MRL-6 und MRL-7	5	pc(s)	14.320,80	71.604,00
1.3.15.	10085	Storage battery, LC-RA1212P, 12 VDC / 12 Ah Maintenance-free, fully sealed lead storage battery with a battery life of up to 6 years Technical data: - Capacitance: 12 Ah; Voltage: 12 VDC - Field of application: -15 - 50°C - Dimensions: 151 x 100 x 98 mm (WxHxD) - Weight: 3,8 kg	10	pc(s)	149,00	1.490,00

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Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
1.3.15.	20989	Power supply 50W (ADMS), 50W with mounting for Ø=60mm; for ART: 20787 & 20786 - 50W Solar panel - 5m cable - Mounting for DM 60mm - Solar panel reenforcement	5	pc(s)	660,96	3.304,80
1.3.16.	90001	1.3.16 -1.3.27 we can not deliver	1	pc(s)		0,00
(Pos. 90 - Pos. 91)		**Shipping**				**105,00**
90	10461	Shipping charges Shipping charges only after written customer request Requst from:_____ date:_____	open	pc(s)		0,00
91	20555	Customs paperwork for deliveries outside the European Union	1	pc(s)	105,00	105,00

Total net:	EUR	1.352.297,73
+ 20 % VAT:	EUR	0,00
Grand Total:	**EUR**	**1.352.297,73**

0% VAT according to §10 USTG.

Delivery conditions:
EXW Koblach (Incoterm 2010)
Date of delivery: According to the agreement.

Payment conditions:
Payment in advance

Offer validity: 3 months

General Terms and Conditions of Business of SOMMER Messtechnik GmbH, A-6842 Koblach, Austria (hereinafter referred to as "SOMMER")

1. Validity of these GTC

1.1 The following General Terms and Conditions (hereinafter referred to as "GTC") shall apply to all contracts concluded by SOMMER as seller or service provider with its Customers.

1.2 By placing an order, the Customer declares that he is in agreement with these GTC. The GTC shall apply exclusively unless they are amended or supplemented by an express written individual agreement. The application of the Customer's own General Terms and Conditions shall be excluded in any case, unless SOMMER has expressly agreed to this in writing.

2. Conclusion of the Contract, Prices and Terms of Payment

2.1 All offers in sales documents of SOMMER, on the SOMMER website www.sommer.at and the like are made "without commitment" and are an invitation to the Customer to make an offer. If the Customer orders products or services, he submits a binding offer to conclude a contract with SOMMER.

2.2 The contract with SOMMER is only concluded when SOMMER accepts the Customer's offer by submitting a corresponding declaration of acceptance to the Customer or by sending the ordered product to the Customer.

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2.3 All prices are subject to change without notice and do not include value added tax or shipping packaging.
2.4 Payment shall be made in the invoiced currency and free of charges and deductions.
2.5 The invoice amounts are due for payment in advance unless other payment agreements have been made.
2.6 In the event of default, the Customer undertakes to reimburse SOMMER for the reminder and collection charges incurred. In the event of default in payment, an additional 12 % default interest shall be payable.
2.7 All payments shall be made directly and exclusively to SOMMER; payments made by third parties shall not discharge the debt. vicarious agents such as subcontractors and commercial agents are not entitled to collect debts.
2.8 If the Customer's financial situation deteriorates (e.g. judicial debt collection, execution or insolvency proceedings etc. are pending) or if the agreed payment deadline is not met, SOMMER shall be entitled to demand immediate payment of all claims, to withdraw from the contract and shall furthermore be released from the duty of further deliveries and services.
2.9 The Customer may neither withhold payments nor offset counterclaims of any kind whatsoever.

3. Delivery, Transfer of Risk
3.1 Costs and risk shall be borne in accordance with the INCOTERM clause agreed in each case, as amended from time to time. If no other INCOTERM clause is agreed, goods shall be delivered ex works (EXW).
3.2 Delivery periods shall be calculated from the replacement times stated by SOMMER (sum of the standard production and standard procurement periods) and shall always refer ex works (EXW). If delivery dates are specified, delivery shall be effected by the last working day of the calendar week in which the delivery date lies.
3.4 Operational disruptions and events of force majeure such as technical disruptions, strikes, natural catastrophes or natural disasters, war, interruptions or delays in the supply of raw materials, shortages of raw materials and similar cases both at SOMMER and at suppliers of SOMMER or service providers commissioned in the transport chain shall extend the delivery times accordingly.
3.5 SOMMER shall endeavour to comply with the specified delivery dates, but does not guarantee them.
3.6 Unless otherwise agreed, delivery shall be made at the expense and risk of the Customer.

4. Retention of Title
4.1 SOMMER retains title to the delivered products until payment of all outstanding claims (including interest, expenses and costs) arising from the business relationship is made.
4.2 If the Customer is in default of payment, the Customer shall, upon Sommer's request and at Sommer's option, either return the delivered products immediately or send them to an address specified by SOMMER at the Customer's expense.
4.3 If the validity of the retention of title in the country of destination is linked to special conditions or formal requirements, the Customer is obliged to find out about these and to fulfil them.

5. Warranty and Damages
5.1 Notification of defects shall be made within 10 (ten) working days after delivery or after the defect has become apparent, otherwise the right shall be lost.
5.2 Place of performance for warranty claims is always the place of delivery (EXW Koblach).
5.3 The warranty period shall be 24 months from delivery by SOMMER and shall only apply to the free material replacement of the defective part; should the end customer of the Customer (consumer) assert any further claims against SOMMER in accordance with local law, the Customer shall fulfil such claims or indemnify SOMMER. This limitation shall also apply in the event of a claim for damages and in the event of recourse by the Customer. For repairs and assemblies, the period is limited to 6 months.
5.4 The liability of SOMMER, as well as that of SOMMER's suppliers, with the exception of personal injury claims within the scope of application of the Product Liability Act, shall only exist in the event of intent or gross negligence. Claims for damages shall expire within 6 (six) months after knowledge of the damage and the injuring party. Liability for slight negligence is excluded, as is compensation for consequential damage and financial loss, lost profits, loss of interest and damage from third-party claims against the Customer. SOMMER as well as SOMMER's suppliers shall not be liable for product damage resulting from product liability suffered by a business. These limitations of liability shall also apply in the event of delay or partial delay in delivery as well as for regress claims.
5.5 The Customer shall be obliged to exempt itself effectively for the benefit of SOMMER and its suppliers vis-à-vis its customers within the meaning of points 5.3 and 5.4.
5.6 All ancillary costs incurred in connection with remedying the defect (e.g. for installation and removal, transport, disposal, travel costs, helicopter flights, etc.) shall be borne by the Customer. Invoices from the Customer or third parties for repair work shall only be accepted if this work has been approved in writing by SOMMER in advance.

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5.7 Warranty claims and/or claims for damages arising from the combination of SOMMER products with third-party products are expressly excluded. The Customer is obliged to inform his customers of this as well.
5.8 In the event of a warranty/guarantee, SOMMER shall, at its own discretion, remedy the defect, make a replacement delivery, reduce the price or rescind the contract. The warranty and guarantee do not include wearing and consumable parts.
5.9 Warranty and guarantee claims are excluded if the Customer himself or a third party has modified, repaired or maintained the delivered products, changed the technical specifications or carried out other interventions. The same shall apply in the event of improper handling or use of unsuitable data carriers and if the defect is not notified immediately.
5.10. SOMMER shall not be liable for indirect or consequential damages of any kind whatsoever. SOMMER shall in no case be liable for slight negligence.
5.11. For warranty work on the Customer's premises, the necessary auxiliary staff, lifting equipment, scaffolding and small materials etc. must be provided. Replaced parts become the property of SOMMER.
5.12. If a product is manufactured by SOMMER on the basis of construction data, drawings, models or other specifications of the Customer, the liability of SOMMER shall only extend to the execution in accordance with the conditions.
5.13. In all cases, the liability of SOMMER and its vicarious agents shall be limited in amount to the value of the respective individual contract.

6. Software Licenses
6.1 SOMMER grants the Customer a non-exclusive and non-transferable right of use to the software product for which the Customer acquires a license from SOMMER. If the Customer gives a device to a third party, the use of the associated software is also permitted.
6.2 The licence rights granted to the Customer by SOMMER may not be assigned, transferred, pledged, leased or passed on in any other form to third parties, transferred or shared with third parties by the Customer.
6.3 With the exception of a backup copy, any type of reproduction of the software product, documentation or parts thereof shall only be permitted with the prior written consent of SOMMER.
6.4 Without the prior written consent of SOMMER, Customer may not modify, transfer (whether electronically or otherwise), translate, disassemble, decompile or otherwise reverse engineer the Software Product or the accompanying documentation.

7. Repairs
If a device is sent to SOMMER for repair, all work will be carried out at SOMMER's facilities or certified repair centres. The Customer is obliged to ship the device properly with a repair order at his own expense. SOMMER will return the device CIP (Incoterms 2010) after the service has been completed. However, SOMMER does not assume any liability for the return costs for transport loss or transport damage.

8. Secrecy
The Customer as well as SOMMER shall treat all information which they mutually receive in connection with their business relationship and its processing confidentially and shall not make it accessible to third parties. However, SOMMER is entitled to use customer data for marketing purposes, e.g. references.

9. Intellectual Property Rights
SOMMER is entitled to the intellectual property rights to all devices, programs and services as well as all copyrights, patents, trademarks and proprietary rights associated therewith and shall remain with SOMMER undivided.

10. Technical Installation and Commissioning
The work for assembly and commissioning as well as the training of the operating personnel for the operation of the plant and/or evaluation of the measurement data on PC are invoiced according to the actual expenditure at the stated travel costs and hourly rates. The daily rate for on-site technical support for installation, set-up, commissioning and calibration can be found in the quotation. The costs include daily allowance, board and lodging if necessary. Travel expenses will be invoiced separately. The Customer must request the service technician at least three weeks before.

11. Not included in the Scope of Delivery
In order to avoid misunderstandings, it is stated that the following items are not included in the scope of delivery, unless

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expressly stated in the offer:
1. making the foundations, fixtures and mountings or assembly devices for the products
2. installation, setup and calibration of the sensors
3. legal clarifications (e.g. permits, operating licences)
4. earthworks or landscaping measures
5. power supply including earthing and fuse protection
6. transport or removal of sensors, systems, tools etc. from and to the measuring point
7. transport of the service technician and his tools and materials required for installation and commissioning from and to the construction site

12. Framework Conditions for Flat-rate Commissioning
The following requirements must be met by the Customer for a flat-rate commissioning:
1. the commissioning work can be carried out without interruption.
2. all legal clarification and approval procedures for the installation of the measuring station(s) have been concluded with final effect.
3. the consent of all property owners has been obtained.
4. any agreed provision and assembly of constructions for the recording of sensors according to SOMMER's specifications have been completed.
5. carrying out all earthmoving and planting work.
6. if any, provision of power supplies with appropriate fuses for the supply of the measuring and acquisition stations.
7. installation of the required measuring signal and supply cables from the measuring point to the acquisition station.
8. assembly support during the assembly of the measuring station.
9. transport of all equipment and assembly personnel to and from the assembly site (e.g. at mountain stations).
10. outward and return transport as well as free access to the measuring stations for service purposes according to appointment coordination

13. Final Provisions
13.1 Regarding all disputes arising from the contracts, offers and deliveries and services or relating to their violation, dissolution or invalidity both SOMMER and the Customer shall first seek an out-of-court solution, e.g. through mediation, If no agreement is reached within four weeks, these disputes shall, at the discretion of SOMMER, be finally settled either by the competent court in A-6800 Feldkirch or by an arbitral tribunal in accordance with the Rules of Arbitration and Conciliation of the International Arbitral Tribunal of the Austrian Federal Economic Chamber in Vienna (Vienna Rules) by one or more arbitrators appointed in accordance with these rules. The place of arbitration is Feldkirch. The language of arbitration is German. The 4-week period begins with the receipt of a written request from a contracting partner to resolve a dispute.
13.2 Austrian law shall apply to the exclusion of national and supranational reference legal provisions (IPRG and ROME I-Regulation) and the United Nations Convention on Contracts for the International Sale of Goods (CISG).
13.3 Place of performance for delivery and payment for both parties is exclusively Koblach, unless another place of performance is specified in the individual order.
13.4 Amendments and supplements to these GTC and all contracts concluded on the basis thereof may only be made in writing. This shall also apply to the agreement to depart from the requirement of written form.
13.5 Should one or more provisions of these GTC be invalid in whole or in part or lose their validity at a later date, the validity of the remaining provisions of these GTC shall not be affected thereby. The contracting parties shall replace the legally ineffective or unenforceable provision with an effective and enforceable provision that comes as close as possible to the content and purpose of the legally ineffective or unenforceable provision.

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We do hope that our quotation will meet with your approval. Should you require any further information or assistance, please do not hesitate to contact us at any time.
All orders, deliveries and services are carried out exclusively on the basis of the our gerneral business terms and conditions. (attached at the end)
If you do not have our gerneral business terms and conditions please call +43 5523 55989 or download form http://www.sommer.at

With kind regards
Sommer GmbH

Michael Sommer

drawn up electronic, valid without signature

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SOMMER GmbH

Sommer GmbH, Strassenhäuser 27, 6842 Koblach, Austria

Hydrology and Research Directorate WAPDA Lahore
Mr. Aamir Mughal
Block A, CMTL building, Raiwind Road, Lahore,
Lahore
Pakistan

transfer to: pdhnrwapda@yahoo.com

Date: 07 Apr 2021	Quotation no.: 2122-15522
Contact person: Michael Sommer	Your VAT no.:
Phone: +43552355989	Fax: +43 5523 55989 19
E-mail: michael.sommer@sommer.at	P-NR: 9407 K-NR: 6827

QUOTATION NO. 2122-15522

1 x Snow station for PK Flood Master Plan (for price estimation) / Your reference: Flood Master Plan

Dear Mr. Mughal!

We thank you very much for your inquiry and are pleased to send you our offer for your kind consideration as follows below. All orders, deliveries and services are carried out exclusively on the basis of our general business terms and conditions. (attached at the end)
If you do not have our general business terms and conditions please call +43 5523 55989 or download form http://www.sommer.at

Pos.	Item No.	Description	Quantity Unit	Price per unit	Total
(Pos. 1.1.1.1 - Pos. 1.1.6.1)		**RTU / Data logger**			**10.781,54**
1.1.1.1	90008	MRL-7IE - data logger with integrated telemetry with 2G / 4G (extended version) Input: - 12 x analogue 0 ... 2,5 V (thereof 1 x PT-100 4-wire connection, 1 x NTC, 1 x 0 ... 0,3 V) - 2 x counter - 2 x frequency input for wind speed and wind gust - 2 x potentimeter input for wind direction - 2 x RS 485 (various ASCII protocols) - 2 x SDI-12 (Vers. 1.3) Output: - SDI-12 - RS 485 - 5 x Analog 4-20mA (option) - 3 switch contact (6 more option- Impulse possible) Supply: - battery external: max. 12 V, 50 Ah (not included) - external power supply: 6 ... 30 V - integrated solar charge controller for solar panel, max. 40 W Interface: - 1 x communication interface: RS 232; 9,6 ... 115 kBd - 1 x USB host (only for readout of data on USB flash drive) - 1 x Bluetooth additional: - up to 99 channels - illuminated display	1 pc(s)	2.860,00	2.860,00

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Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
1.1.1.2	20181	Readout cable for MRL and PD-x RS-232 to USB converter cable with push-pull connector for MRL-6, MRL-7, PD-3 and PD-5. Length 1.8 m	1	pc(s)	148,51	148,51
1.1.1.3	21740	MRL Camera Bundle 2 MP Serial Camera (RS 485) with Universal Pole Mount Bracket Works only with GSM or on SD card	1	pc(s)	550,00	550,00
1.1.2.1	21110	SATMO - 6100 - Satellite modem Satellite network: INMARSAT - data rates are in a separate position (not included) - Two-way satellite communication; Unidirectional build-in antenna - Reliable for extreme condtitions; Ruggedized and versatile housing - IoT solutions; Exceptional low elevation angle performance - Perfect for stations or emergency deployment units - with a full MDS licence for data forwarding (included for 3 years) - Energy-saving sensor operation - Satellite service: two-way, Global, IsatData Pro - Power Supply: 9 ... 32 VDC - incl. 10m cable - Power consumption (typical average @12V DC, 22° C): IDP Receive: 65 mA; - GPS/Glonass/Beidou Receive: 22 mA; Transmit: 0.65 A; Sleep: 100 µA - Operating temperature: -40°C to +85°C - Interfaces: Serial: RS-232; RS-485; Inputs/outputs: 4 analog or digital in/out - Dust and water ingress: IP67 - Vibration: SAE J1455 (Sec 4.9.4.2 fig 6-8); MIL-STD -810G (Sec 514.6); Shock: MIL-STD-810G (Sec 516.6) - Frequenzy: Rx: 1518.0 to 1559.0 MHz; Tx: 1626.5 to 1660.5 MHz; 1668.0 to 1675.0 MHz - Dimensoins: 12.6 cm x 12.6 cm x 4.9 cm; Material: Anodized aluminium; Weight: 1,2 kg - Certifi cation: Regulatory: CE, FCC, IC, Anatel, RCM Mark, Mexico; Pending: FFA, MSS Russia, SRRC, Philippines, Korea, IEC 60945, C1D2	1	pc(s)	1.995,00	1.995,00
1.1.2.2	21116	SATMO - 6100 - Satellite modem data rates (INMARSAT), 200KB per Month Data transmission costs for one modem **data amount per 3 years 200KB per Month for 3 years** **200KB 2500EUR 5-8 parameter** Option: 500KB 4260EUR 8-14 parameter 700KB 5335EUR 14-17 parameter	1	pc(s)	2.990,00	2.990,00
1.1.3.1	20705	Power supply (solar with battery), 80W / 72Ah with mounting for Ø=60mm; for ART: 20703 - 80W Solar panel - solar charger 14A - 5m cable - Mounting for DM 60mm - Solar panel reenforcement - 72Ah Battery	1	pc(s)	950,00	950,00
1.1.4.1	20541	Switch cabiniet AE1008 with Mounting for DM60	1	pc(s)	838,03	838,03

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Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
1.1.4.2	90004	Switch cabinet work, terminals and electrical drawing	1	pc(s)	450,00	450,00
1.1.5.1	90001	Lightning Arrestor will be done locally	1	pc(s)		0,00
1.1.6.1	90001	Sensor mast/pole with cross arms will be done locally	1	pc(s)		0,00
(Pos. 1.2.1.1 - Pos. 1.2.8.1)		**Sensors**				**25.766,00**
1.2.1.1	21624	Air humidity / temperature sensor, SOMTEMP , SDI-12 Interface, 3,5m Kabel Enclosure Polycarbonate Filter Membrane Relative humidity : Accuracy1) at 20 °C (68 °F) and 12 V DC ±2 % RH (0...90 % RH) : ±3 % RH (90...100 % RH) Temperature dependence < (0.025 + 0.0003 x RH) [% RH/°C] Response time t90 < 15 s with metal grid filter at 20 °C (68 °F) Resolution 0.01 % RH Temperature : Resolution 0.01 °C Measuring interval 1s Digital interface SDI-12 serial digital interface V1.3 Supply 4.5...15 V DC Current consumption at 12 V DC, typ. < 600 µA during measurement cycle < 30 µA in idle mode Enclosure material Polycarbonate, RAL 7035 Protection class IP65 Connection 3.5 m PUR cable 3x0.10 mm², with flying leads Electromagnetic compatibility EN 61326-1:2013 EN 61326-2-3:2013 Industrial Environment Working range -40…80 °C (-40...176 °F) / 0…100 % RH Storage conditions -40…80 °C (-40...176 °F) / 0…90 % RH, non-condensing Configuration and adjustment Via SDI-12 extended commands	1	pc(s)	420,00	420,00
1.2.1.2	19438	Radiation protection shelter, for humidity and temperature sensors: HC2-S3, EE06, SOMTEMP Mounting set (ART: 19534) is not included	1	pc(s)	190,94	190,94
1.2.2.1	18918	Precipitation gauge (weigthing), NIWA-215 Collecting area 200 cm ² Capacity 1250 mm Accuracy of 0.05 mm / min max. Intensity of 120 mm / min Resolution 0.003 mm Supply 8 ... 24 VDC / 15 mA max Supply heating for 10 .. 15 VDC / 1...2 A Pulse output (1/0, 1/0, 01) Umax 30 V, Imax 300 mA interface RS485/SDI12 IP65 Ambient temperature -35 ° C .... 70 Dimensions ø 385 x 650 mm	1	pc(s)	3.500,00	3.500,00
1.2.2.2	15833	SOMMER Cable, for RQ-30 / RG-30 / SQ, 12x0,25 mm², up to 60m, price per meter ; Lime green (for NIWA)	15	m	4,60	69,00
1.2.2.3	15344	Column, for Precipitation gauge (weigthing) , H=2m Technical specifications: - Collection height: 2m - Material: hot-dip galvanised steel - incl. baseplate	1	pc(s)	275,00	275,00

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Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
1.2.3.1	20578	Snowmelt Analyzer, SMA-2, Impedance analyzer Calculates the contingents of ice, water and air into the snow pack by measuring the complex impedance. - Connection of 1 SMA- sensor - Measuring frequency: 10 kHz....180kHz - Range: capacitance 10pF....6000pF, Resistance 100 Ohm....10M Ohm - Power supply: 5...15VDC - Current: during measurement 50mA / 5 sec, sleep 1mA - Output: RS 485 / SDI-12 Snowmelt Analyzer, SMA, SMA- sensor 2,6 m, horizontal mounting SMA, Gearbox for Impedance analyzer - Gear box, stainless steel, 200 x 300 x 155mm, with certification, IP 66 Component integration for Impedance analyzer Integration power supply Lightning protection	1	pc(s)	6.500,00	6.500,00
1.2.3.2	15833	SOMMER Cable, for RQ-30 / RG-30 / SQ, 12x0,25 mm², up to 60m, price per meter ; Lime green (for SMA)	15	m	4,60	69,00
1.2.4.1	20757	Snow scale, SSG-2 2000, SDI-12, RS-485, 4-20 mA Intelligent scaling system for an automatic gathering of the snow water equivalent. Very good handling by the modular conception and a minimum self-weight (7-parts aluminium construction with sub-frame. Technical specifications: - Signal output: SDI-12, RS-485, 4-20 mA - Measurement range: 0 – 2000 kg/m² - Resolution: 0,1 kg/m² - Accuracy: 0,3 % FS - Measurement plot: 6,72 m² - Weight: 110 kg (16,37 kg/m²) - Dimensions (in mm): L= 2800, W= 2400, H= 103 - Pack size (in mm): 7 x L= 1200, W= 800, H= 40 Leverage L= 2800 - Power supply: 10 – 30 VDC - Power consumption: max. 70mA - Protection class: IP 68 - Range of application: -40 – 80°C - Max. inclination: 5° with 10m cable and reinforced protection tube incl. RS-485 - USB cabel Integrated overvoltage protection All specifications for weights and accuracies refer on standard-weights You Tube Video: https://youtu.be/OuPZE5VqCjE	1	pc(s)	7.780,00	7.780,00
1.2.4.2	20938	SSG-2 cable MAIN 20m 20m SSG-2 MAIN connection cable with M12 8-pin Protective metal conduit assemblied with conduit gland M16x1.5 thread 0.5m open cable end, for switch cabinet assembly	1	pc(s)	427,38	427,38

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Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
1.2.5.1	21069	Snow depth sensor, USH-9, Standard Bundle with 10m cable Non-contact ultrasonic sensor for recording snow depth with integrated temperature compensation Technical specifications: - Measuring element/-principle: ultrasonic - Measuring range: 0 - 10 m; accuracy: 0.1 %FS, max. +/-1cm - Dimensions (D x H): 180mm x 320mm; opening angle: 12° - Operating temperature : -40 - +60 °C - Output: SDI-12, RS-485 (ASCII, MODBUS RTU), 4 - 20 mA (configurable, snow and temperature) - Air-temp measurement: -40 - +60 °C; accuracy: 0,3°C; resolution: 0,01°C - Supply: 9 - 27 VDC - Power consumption: typ. 40mA (max peak 300mA for 0,05s) - Power consumption@ 12VDC: sleep <0,4mA - Protection type: housing: IP 66, ultrasonic head: IP 68 - 3 years warranty on the utrasonic membrane - incl. sensor mount for pipe 32-60mm - incl. 10m cable - incl. USB- RS-485 cable - You tube video: https://youtu.be/7dVZf_b6UlE	1	pc(s)	1.599,00	1.599,00
1.2.6.1	16677	Snow Surface Temperature Sensor, SIR, output: 4…20mA or 0...5V, measurement range: -50…+50 °C, 8 m cable connection Infrared sensor in radiation protection shelter with an 8 m cable connection to the amplifier (for installation in a gear box). Technical specifications: - Output: 4...20 mA (0…5 V, 0…10 V, thermo element J, K) - Measurement range: -50…+50 °C - Accuracy: ± 1% (FS) - Resolution: 0,1°C - Capture time: 0,15 s - Power supply: 8…36 VDC, max. 100 mA - Protection class: IP 65 - Sensor weight: 40 g - Amplifier weight: 420 g - Cable length: 8 m - Sensor bracket: with clamping bracket for pipes ømax 50 mm	1	pc(s)	1.199,00	1.199,00
1.2.7.1	10368	Star pyranometer 8101, spectral range: 0.3-3 µm, range: 0-1500 W/m², output: 15 µV/Wm² "First class" star pyranometer for professionally recording global radiation in compliance with WMO in the short-wave range Technical specifications: - Measuring element/-principle: Diff. temperature measurement - Measuring range: 0 - 1500 W/m²; Linearity: < 0,5 % - Spectral range: 0.3 - 3 µm - Field of application: -40 - +60 °C - Output: 15 µV/Wm² - Protection type: IP 65 - Dimensions: ø 159 mm; Height 75 mm	1	pc(s)	1.799,00	1.799,00

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Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
1.2.7.2	20121	Bracket for steel pipe mast Ø=114mm with Cantilever - bracket for radiation snensor: 8101, 8102 with ventilation 8106 material: hot-dip galvanised steel	1	pc(s)	238,68	238,68
1.2.8.1	10408	Wind speed/direction sensor, 05103, propeller anemometer, range: 0 - 100 m/s, Accuracy: ±0.3 m/s / ±3 °, output: frequency, Potentiometer, supply: 15 VDC Very robust propeller anemometer for use under extreme conditions (high mountain regions) Technical specifications: - Measuring element/-principle: Propeller anemometer - Measuring range: 0 - 100 m/s; Accuracy: ±0.3 m/s 0 - 360 °; Accuracy: ±3 ° - Start-up speed: 1.0 m/s - Field of application: -50 - +50 °C - Output: Frequency, Potentiometer - Supply: 15 VDC - Power consumption: max. 2 mA - Protection type: IP 65 - Dimensions: Propeller ø 180 mm; Length 550 mm - Installation: mountable on a mast ø 34 mm	1	pc(s)	1.699,00	1.699,00

Total net:	EUR	36.547,55
+ 20 % VAT:	EUR	0,00
Grand Total:	**EUR**	**36.547,55**

0% VAT according to §10 USTG.

Delivery conditions:
EXW Koblach (Incoterm 2010)
Date of delivery: According to the agreement.

Payment conditions:
Payment in advance

Offer validity: 3 months

General Terms and Conditions of Business of SOMMER Messtechnik GmbH, A-6842 Koblach, Austria (hereinafter referred to as "SOMMER")

1. Validity of these GTC

1.1 The following General Terms and Conditions (hereinafter referred to as "GTC") shall apply to all contracts concluded by SOMMER as seller or service provider with its Customers.

1.2 By placing an order, the Customer declares that he is in agreement with these GTC. The GTC shall apply exclusively unless they are amended or supplemented by an express written individual agreement. The application of the Customer's own General Terms and Conditions shall be excluded in any case, unless SOMMER has expressly agreed to this in writing.

2. Conclusion of the Contract, Prices and Terms of Payment

2.1 All offers in sales documents of SOMMER, on the SOMMER website www.sommer.at and the like are made "without commitment" and are an invitation to the Customer to make an offer. If the Customer orders products or services, he submits a binding offer to conclude a contract with SOMMER.
2.2 The contract with SOMMER is only concluded when SOMMER accepts the Customer's offer by submitting a corresponding declaration of acceptance to the Customer or by sending the ordered product to the Customer.
2.3 All prices are subject to change without notice and do not include value added tax or shipping packaging.
2.4 Payment shall be made in the invoiced currency and free of charges and deductions.
2.5 The invoice amounts are due for payment in advance unless other payment agreements have been made.
2.6 In the event of default, the Customer undertakes to reimburse SOMMER for the reminder and collection charges

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incurred. In the event of default in payment, an additional 12 % default interest shall be payable.
2.7 All payments shall be made directly and exclusively to SOMMER; payments made by third parties shall not discharge the debt. vicarious agents such as subcontractors and commercial agents are not entitled to collect debts.
2.8 If the Customer's financial situation deteriorates (e.g. judicial debt collection, execution or insolvency proceedings etc. are pending) or if the agreed payment deadline is not met, SOMMER shall be entitled to demand immediate payment of all claims, to withdraw from the contract and shall furthermore be released from the duty of further deliveries and services.
2.9 The Customer may neither withhold payments nor offset counterclaims of any kind whatsoever.

3. Delivery, Transfer of Risk
3.1 Costs and risk shall be borne in accordance with the INCOTERM clause agreed in each case, as amended from time to time. If no other INCOTERM clause is agreed, goods shall be delivered ex works (EXW).
3.2 Delivery periods shall be calculated from the replacement times stated by SOMMER (sum of the standard production and standard procurement periods) and shall always refer ex works (EXW). If delivery dates are specified, delivery shall be effected by the last working day of the calendar week in which the delivery date lies.
3.4 Operational disruptions and events of force majeure such as technical disruptions, strikes, natural catastrophes or natural disasters, war, interruptions or delays in the supply of raw materials, shortages of raw materials and similar cases both at SOMMER and at suppliers of SOMMER or service providers commissioned in the transport chain shall extend the delivery times accordingly.
3.5 SOMMER shall endeavour to comply with the specified delivery dates, but does not guarantee them.
3.6 Unless otherwise agreed, delivery shall be made at the expense and risk of the Customer.

4. Retention of Title
4.1 SOMMER retains title to the delivered products until payment of all outstanding claims (including interest, expenses and costs) arising from the business relationship is made.
4.2 If the Customer is in default of payment, the Customer shall, upon Sommer's request and at Sommer's option, either return the delivered products immediately or send them to an address specified by SOMMER at the Customer's expense.
4.3 If the validity of the retention of title in the country of destination is linked to special conditions or formal requirements, the Customer is obliged to find out about these and to fulfil them.

5. Warranty and Damages
5.1 Notification of defects shall be made within 10 (ten) working days after delivery or after the defect has become apparent, otherwise the right shall be lost.
5.2 Place of performance for warranty claims is always the place of delivery (EXW Koblach).
5.3 The warranty period shall be 24 months from delivery by SOMMER and shall only apply to the free material replacement of the defective part; should the end customer of the Customer (consumer) assert any further claims against SOMMER in accordance with local law, the Customer shall fulfil such claims or indemnify SOMMER. This limitation shall also apply in the event of a claim for damages and in the event of recourse by the Customer. For repairs and assemblies, the period is limited to 6 months.
5.4 The liability of SOMMER, as well as that of SOMMER's suppliers, with the exception of personal injury claims within the scope of application of the Product Liability Act, shall only exist in the event of intent or gross negligence. Claims for damages shall expire within 6 (six) months after knowledge of the damage and the injuring party. Liability for slight negligence is excluded, as is compensation for consequential damage and financial loss, lost profits, loss of interest and damage from third-party claims against the Customer. SOMMER as well as SOMMER's suppliers shall not be liable for product damage resulting from product liability suffered by a business. These limitations of liability shall also apply in the event of delay or partial delay in delivery as well as for regress claims.
5.5 The Customer shall be obliged to exempt itself effectively for the benefit of SOMMER and its suppliers vis-à-vis its customers within the meaning of points 5.3 and 5.4.
5.6 All ancillary costs incurred in connection with remedying the defect (e.g. for installation and removal, transport, disposal, travel costs, helicopter flights, etc.) shall be borne by the Customer. Invoices from the Customer or third parties for repair work shall only be accepted if this work has been approved in writing by SOMMER in advance.
5.7 Warranty claims and/or claims for damages arising from the combination of SOMMER products with third-party products are expressly excluded. The Customer is obliged to inform his customers of this as well.
5.8 In the event of a warranty/guarantee, SOMMER shall, at its own discretion, remedy the defect, make a replacement delivery, reduce the price or rescind the contract. The warranty and guarantee do not include wearing and consumable

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parts.
5.9 Warranty and guarantee claims are excluded if the Customer himself or a third party has modified, repaired or maintained the delivered products, changed the technical specifications or carried out other interventions. The same shall apply in the event of improper handling or use of unsuitable data carriers and if the defect is not notified immediately.
5.10. SOMMER shall not be liable for indirect or consequential damages of any kind whatsoever. SOMMER shall in no case be liable for slight negligence.
5.11. For warranty work on the Customer's premises, the necessary auxiliary staff, lifting equipment, scaffolding and small materials etc. must be provided. Replaced parts become the property of SOMMER.
5.12. If a product is manufactured by SOMMER on the basis of construction data, drawings, models or other specifications of the Customer, the liability of SOMMER shall only extend to the execution in accordance with the conditions.
5.13. In all cases, the liability of SOMMER and its vicarious agents shall be limited in amount to the value of the respective individual contract.

6. Software Licenses
6.1 SOMMER grants the Customer a non-exclusive and non-transferable right of use to the software product for which the Customer acquires a license from SOMMER. If the Customer gives a device to a third party, the use of the associated software is also permitted.
6.2 The licence rights granted to the Customer by SOMMER may not be assigned, transferred, pledged, leased or passed on in any other form to third parties, transferred or shared with third parties by the Customer.
6.3 With the exception of a backup copy, any type of reproduction of the software product, documentation or parts thereof shall only be permitted with the prior written consent of SOMMER.
6.4 Without the prior written consent of SOMMER, Customer may not modify, transfer (whether electronically or otherwise), translate, disassemble, decompile or otherwise reverse engineer the Software Product or the accompanying documentation.

7. Repairs
If a device is sent to SOMMER for repair, all work will be carried out at SOMMER's facilities or certified repair centres. The Customer is obliged to ship the device properly with a repair order at his own expense. SOMMER will return the device CIP (Incoterms 2010) after the service has been completed. However, SOMMER does not assume any liability for the return costs for transport loss or transport damage.

8. Secrecy
The Customer as well as SOMMER shall treat all information which they mutually receive in connection with their business relationship and its processing confidentially and shall not make it accessible to third parties. However, SOMMER is entitled to use customer data for marketing purposes, e.g. references.

9. Intellectual Property Rights
SOMMER is entitled to the intellectual property rights to all devices, programs and services as well as all copyrights, patents, trademarks and proprietary rights associated therewith and shall remain with SOMMER undivided.

10. Technical Installation and Commissioning
The work for assembly and commissioning as well as the training of the operating personnel for the operation of the plant and/or evaluation of the measurement data on PC are invoiced according to the actual expenditure at the stated travel costs and hourly rates. The daily rate for on-site technical support for installation, set-up, commissioning and calibration can be found in the quotation. The costs include daily allowance, board and lodging if necessary. Travel expenses will be invoiced separately. The Customer must request the service technician at least three weeks before.

11. Not included in the Scope of Delivery
In order to avoid misunderstandings, it is stated that the following items are not included in the scope of delivery, unless expressly stated in the offer:
1. making the foundations, fixtures and mountings or assembly devices for the products
2. installation, setup and calibration of the sensors
3. legal clarifications (e.g. permits, operating licences)

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4. earthworks or landscaping measures
5. power supply including earthing and fuse protection
6. transport or removal of sensors, systems, tools etc. from and to the measuring point
7. transport of the service technician and his tools and materials required for installation and commissioning from and to the construction site

12. Framework Conditions for Flat-rate Commissioning

The following requirements must be met by the Customer for a flat-rate commissioning:
1. the commissioning work can be carried out without interruption.
2. all legal clarification and approval procedures for the installation of the measuring station(s) have been concluded with final effect.
3. the consent of all property owners has been obtained.
4. any agreed provision and assembly of constructions for the recording of sensors according to SOMMER's specifications have been completed.
5. carrying out all earthmoving and planting work.
6. if any, provision of power supplies with appropriate fuses for the supply of the measuring and acquisition stations.
7. installation of the required measuring signal and supply cables from the measuring point to the acquisition station.
8. assembly support during the assembly of the measuring station.
9. transport of all equipment and assembly personnel to and from the assembly site (e.g. at mountain stations).
10. outward and return transport as well as free access to the measuring stations for service purposes according to appointment coordination

13. Final Provisions

13.1 Regarding all disputes arising from the contracts, offers and deliveries and services or relating to their violation, dissolution or invalidity both SOMMER and the Customer shall first seek an out-of-court solution, e.g. through mediation, If no agreement is reached within four weeks, these disputes shall, at the discretion of SOMMER, be finally settled either by the competent court in A-6800 Feldkirch or by an arbitral tribunal in accordance with the Rules of Arbitration and Conciliation of the International Arbitral Tribunal of the Austrian Federal Economic Chamber in Vienna (Vienna Rules) by one or more arbitrators appointed in accordance with these rules. The place of arbitration is Feldkirch. The language of arbitration is German. The 4-week period begins with the receipt of a written request from a contracting partner to resolve a dispute.
13.2 Austrian law shall apply to the exclusion of national and supranational reference legal provisions (IPRG and ROME I-Regulation) and the United Nations Convention on Contracts for the International Sale of Goods (CISG).
13.3 Place of performance for delivery and payment for both parties is exclusively Koblach, unless another place of performance is specified in the individual order.
13.4 Amendments and supplements to these GTC and all contracts concluded on the basis thereof may only be made in writing. This shall also apply to the agreement to depart from the requirement of written form.
13.5 Should one or more provisions of these GTC be invalid in whole or in part or lose their validity at a later date, the validity of the remaining provisions of these GTC shall not be affected thereby. The contracting parties shall replace the legally ineffective or unenforceable provision with an effective and enforceable provision that comes as close as possible to the content and purpose of the legally ineffective or unenforceable provision.

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Quotation no.	Person in charge	Date	Page
2122-15522	Michael Sommer	07 Apr 2021	10

Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total

We do hope that our quotation will meet with your approval. Should you require any further information or assistance, please do not hesitate to contact us at any time.
All orders, deliveries and services are carried out exclusively on the basis of our general business terms and conditions. (attached at the end)
If you do not have our general business terms and conditions please call +43 5523 55989 or download form http://www.sommer.at

With kind regards
Sommer GmbH

Michael Sommer

drawn up electronic, valid without signature

Sommer GmbH
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Sommer GmbH, Strassenhäuser 27, 6842 Koblach, Austria

Hydrology and Research Directorate WAPDA Lahore
Mr. Aamir Mughal
Block A, CMTL building, Raiwind Road, Lahore,
Lahore
Pakistan

transfer to: pdhnrwapda@yahoo.com

Date: 07 Apr 2021	Quotation no.: 2122-15520
Contact person: Michael Sommer	Your VAT no.:
Phone: +43552355989	Fax: +43 5523 55989 19
E-mail: michael.sommer@sommer.at	P-NR: 9407 K-NR: 6827

QUOTATION NO. 2122-15520

1 x AWS for PK Flood Master Plan (for price estimation) / Your reference: Flood Master Plan Pakistan

Dear Mr. Mughal!

We thank you very much for your inquiry and are pleased to send you our offer for your kind consideration as follows below. All orders, deliveries and services are carried out exclusively on the basis of our general business terms and conditions. (attached at the end)
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Pos.	Item No.	Description	Quantity Unit	Price per unit	Dis.	Total
(Pos. 1.1.1.1 - Pos. 1.1.6.1)		**RTU / Data logger**				**10.781,54**
1.1.1.1	90008	MRL-7IE - data logger with integrated telemetry with 2G / 4G (extended version) Input: - 12 x analogue 0 ... 2,5 V (thereof 1 x PT-100 4-wire connection, 1 x NTC, 1 x 0 ... 0,3 V) - 2 x counter - 2 x frequency input for wind speed and wind gust - 2 x potentimeter input for wind direction - 2 x RS 485 (various ASCII protocols) - 2 x SDI-12 (Vers. 1.3) Output: - SDI-12 - RS 485 - 5 x Analog 4-20mA (option) - 3 switch contact (6 more option- Impulse possible) Supply: - battery external: max. 12 V, 50 Ah (not included) - external power supply: 6 ... 30 V - integrated solar charge controller for solar panel, max. 40 W Interface: - 1 x communication interface: RS 232; 9,6 ... 115 kBd - 1 x USB host (only for readout of data on USB flash drive) - 1 x Bluetooth additional: - up to 99 channels - illuminated display	1 pc(s)	2.860,00		2.860,00

Quotation no.	Person in charge	Date	Page
2122-15520	Michael Sommer	07 Apr 2021	2

Pos.	Item No.	Description	Quantity	Unit	Price per unit	Dis.	Total
1.1.1.2	20181	Readout cable for MRL and PD-x	1	pc(s)	148,51		148,51
		RS-232 to USB converter cable with push-pull connector for MRL-6, MRL-7, PD-3 and PD-5. Length 1.8 m					
1.1.1.3	21740	MRL Camera Bundle	1	pc(s)	550,00		550,00
		2 MP Serial Camera (RS 485) with Universal Pole Mount Bracket Works only with GSM or on SD card					
1.1.2.1	21110	SATMO - 6100 - Satellite modem	1	pc(s)	1.995,00		1.995,00
		Satellite network: INMARSAT - data rates are in a separate position (not included) - Two-way satellite communication; Unidirectional build-in antenna - Reliable for extreme condtitions; Ruggedized and versatile housing - IoT solutions; Exceptional low elevation angle performance - Perfect for stations or emergency deployment units - with a full MDS licence for data forwarding (included for 3 years) - Energy-saving sensor operation - Satellite service: two-way, Global, IsatData Pro - Power Supply: 9 ... 32 VDC - incl. 10m cable - Power consumption (typical average @12V DC, 22° C): IDP Receive: 65 mA; - GPS/Glonass/Beidou Receive: 22 mA; Transmit: 0.65 A; Sleep: 100 µA - Operating temperature: -40°C to +85°C - Interfaces: Serial: RS-232; RS-485; Inputs/outputs: 4 analog or digital in/out - Dust and water ingress: IP67 - Vibration: SAE J1455 (Sec 4.9.4.2 fig 6-8); MIL-STD -810G (Sec 514.6); Shock: MIL-STD-810G (Sec 516.6) - Frequenzy: Rx: 1518.0 to 1559.0 MHz; Tx: 1626.5 to 1660.5 MHz; 1668.0 to 1675.0 MHz - Dimensoins: 12.6 cm x 12.6 cm x 4.9 cm; Material: Anodized aluminium; Weight: 1,2 kg - Certifi cation: Regulatory: CE, FCC, IC, Anatel, RCM Mark, Mexico; Pending: FFA, MSS Russia, SRRC, Philippines, Korea, IEC 60945, C1D2					
1.1.2.2	21116	SATMO - 6100 - Satellite modem data rates (INMARSAT), 200KB per Month	1	pc(s)	2.990,00		2.990,00
		Data transmission costs for one modem **data amount per 3 years 200KB per Month for 3 years** **200KB 2500EUR 5-8 parameter** Option: 500KB 4260EUR 8-14 parameter 700KB 5335EUR 14-17 parameter					
1.1.3.1	20705	Power supply (solar with battery), 80W / 72Ah with mounting for Ø=60mm; for ART: 20703	1	pc(s)	950,00		950,00
		- 80W Solar panel - solar charger 14A - 5m cable - Mounting for DM 60mm - Solar panel reenforcement - 72Ah Battery					
1.1.4.1	20541	Switch cabiniet AE1008 with Mounting for DM60	1	pc(s)	838,03		838,03

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Quotation no.	Person in charge	Date	Page
2122-15520	Michael Sommer	07 Apr 2021	3

Pos.	Item No.	Description	Quantity	Unit	Price per unit	Dis.	Total
1.1.4.2	90004	Switch cabinet work, terminals and electrical drawing	1	pc(s)	450,00		450,00
1.1.5.1	90001	Lightning Arrestor will be done locally	1	pc(s)			0,00
1.1.6.1	90001	Sensor mast/pole with cross arms will be done locally	1	pc(s)			0,00
(Pos. 1.2.1.1 - Pos. 1.2.4.3)		**Sensors**					**7.221,15**
1.2.1.1	90003	All in One sensor weather sensor	1	pc(s)	3.500,00		3.500,00

WIND SPEED
Range 0.01 m/s to 60 m/s
Accuracy ± 3% to 40 m/s,
± 5% to 60 m/s
Resolution m/s 0.01
Starting Threshold 0.01 m/s
Sampling Rate 1 Hz
Units m/s, km/hr, mph, kts, ft/min

WIND DIRECTION
Range 0-359°
Accuracy ± 3° to 40 m/s
± 5° to 60 m/s
Resolution 1°
Starting Threshold 0.01 m/s
Sampling Rate 1 Hz
Units Degrees

TEMPERATURE
Range -40°C to +70°C
Resolution 0.1
Accuracy ± 0.3°C @ 20°C
Sampling Rate 1 Hz
Units °C, °F, °K

HUMIDITY
Range 0-100%
Resolution 1%
Accuracy ± 2% @ 20¡C (10%-90% RH)
Sampling Rate 1 Hz
Units % Rh, g/m3

GLOBAL SOLAR RADIATION
Wavelength
Sensitivity
300 to 3000 nm
Output Range 0 to 1600 W/m2
Resolution 1 W/m2
DIN Standard ISO 9060 Second Class
Sampling Rate 1 Hz
Units W/m2

DEW POINT
Range -40°C to +70°C
Resolution 0.1
Accuracy ± 0.3°C @ 20°C
Units °C, °F, °K
Sampling Rate 1 Hz

PRESSURE
Range 300 to 1100 IQB
Resolution 0.1 hPa

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Quotation no.	Person in charge	Date	Page
2122-15520	Michael Sommer	07 Apr 2021	4

Pos.	Item No.	Description	Quantity	Unit	Price per unit	Dis.	Total
1.2.2.1	10332	Tipping bucket rain gauge, MR2, non-heated Collecting area: 200 cm²; Resolution: 0.2 mm, Output: Pulse Technical specifications: - Measuring element/-principle: Tipping bucket - Collecting area: 200 cm²; Resolution: 0,2 mm - Output: Pulse (relay output) - Protection type: IP 65 - Dimensions: ø 180 mm; Height 270 mm - Installation: on support column or bracket	1	pc(s)	870,00		870,00
1.2.2.2	10333	Tipping bucket rain gauge, MR2, **heated** Collecting area: 200 cm²; Resolution: 0.2 mm, Output: Pulse Technical specifications: - Measuring element/-principle: Tipping bucket - Collecting area: 200 cm²; Resolution: 0,2 mm - Output: Pulse (relay output) - Protection: IP 65 - Supply: 40 - 46 VAC, 50 VA - Dimensions: ø 180 mm; Height 270 mm - Installation: on support column or bracket **The 85% discount does not apply ! Only 15 % of stations need a heated rain sensor therefore for budgetary reason only 15 % of the cost apply to calculate the total cost of the network.**	1	pc(s)	1.172,00	85,0%	175,80
1.2.2.3	10340	Filament transformer for the precipitation gauge NIWA/MED-K505, supply: 230 VAC, output: 24 VAC, rating: 100 VA **The 85% discount does not apply ! Only 15 % of stations need a heated rain sensor therefore for budgetary reason only 15 % of the cost apply to calculate the total cost of the network.**	1	pc(s)	75,00	85,0%	11,25
1.2.2.4	15344	Column, for rain gauge with tipping bucket, H=2m Technical specifications: - Collection height: 2m - Material: hot-dip galvanised steel - incl. baseplate	1	pc(s)	403,10		403,10
1.2.4.1	21190	SOMMER pressure probe, 0-10m, SDI-12, with temperature Measurement and compensation - Casing materiall: 1.4435 - Accurancy: 0,05% - Preasure type : relative pressure - Range: 0 ... 10 mH2O - OverloadP 3 bar - Process interfacing closed - electrical connection PUR cabel, Level - Output SDI-12 - Supply 8 ... 30 V DC - Max. medium temperature 50°C -characteristic deviaton: <=+/- 0.1% FS - Temp.range kompensiert -5 ... 50°C - Temp. measurment integriert - Temperatur sensor TD PT 1000 - Gasket Viton - without cable	1	pc(s)	799,00		799,00

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.2	21191	SOMMER pressure probe – Cable for Art Nr: 21191; PUR black ø5.9 - 6x 0.22mm² - Price per meter	10 m	6,20	62,
.3	90001	Evaporation pan	1 pc(s)	1.400,00	1.400,
. 90 - Pos. 91)		**Shipping**			**105,**
	10461	Shipping charges	open pc(s)		0,
		Shipping charges only after written customer request Requst from:_____ date:_____			
	20555	Customs paperwork for deliveries outside the European Union	1 pc(s)	105,00	105,

Total net:	EUR	18.107,
+ 20 % VAT:	EUR	0,
Grand Total:	**EUR**	**18.107,**

0% VAT according to §10 UST

SOMMER GmbH

sommer MESSTECHNIK

Sommer GmbH, Strassenhäuser 27, 6842 Koblach, Austria

Hydrology and Research Directorate WAPDA Lahore
Mr. Aamir Mughal
Block A, CMTL building, Raiwind Road, Lahore,
Lahore
Pakistan

transfer to: pdhnrwapda@yahoo.com

Date: 14 Apr 2021	Quotation no.: 2122-15567
Contact person: Michael Sommer	Your VAT no.:
Phone: +43552355989	Fax: +43 5523 55989 19
E-mail: michael.sommer@sommer.at	P-NR: K-NR: 6827

QUOTATION NO. 2122-15567

Water level sensors Range / Your reference: Water level sensors price overview

Dear Mr. Mughal!

We thank you very much for your inquiry and are pleased to send you our offer for your kind consideration as follows below. All orders, deliveries and services are carried out exclusively on the basis of our general business terms and conditions. (attached at the end)
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Pos.	Item No.	Description	Quantity Unit	Price per unit	Total
(Pos. 10 - Pos. 23)		**Water level sensors**			**17.803,56**
10	21471	SOMLEVEL-8, cable on top, 4-20mA,, 8m, +/-5mm, with 10m Cable Non-contact radar-sensor for continuous recording the water level Technical specifications: -Measuring range up to 8 m (26.25 ft) -Deviation ≤ 5 mm -Beam angle 8° -Output signal 4 … 20 mA -Process fitting Thread G1½, 1½ NPT, R1½ -Mounting connection Thread G1, 1 NPT, R1 -Process pressure -1 … 3 bar (-100 … 200 kPa/-14.5 … 43.51 psig) -Process temperature -40 … +60 °C (-40 … +140 °F) -Ambient temperature -40 … +60 °C (-40 … +140 °F) -Operating voltage 12 … 35 V DC	1 pc(s)	700,70	700,70

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Quotation no.	Person in charge	Date	Page
2122-15567	Michael Sommer	14 Apr 2021	2

Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
11	21473	SOMLEVEL-15, cable on the side, 4-20mA,, 15m, +/-2mm, with 5m Cable Non-contact radar-sensor for continuous recording the water level Technical specifications: -Measuring range up to 15 m (49.21 ft) -Deviation ≤ 2 mm -Beam angle 8° -Measuring frequency W-band (80 GHz technology) -Output signal 4 … 20 mA/HART -Process fitting Thread G1½, 1½ NPT, R1½ -Mounting connection Ceiling adapter -Process pressure -1 … +3 bar (-100 … +200 kPa/-14.5 … +43.51 psig) -Process temperature -40 … +80 °C (-40 … +176 °F) -Ambient temperature -40 … +80 °C (-40 … +176 °F) -Operating voltage 12 … 35 V DC -Protection rating IP66/IP68 (3 bar) acc. to IEC 60529, Type 4P acc. to UL 50 -3 years warranty	1	pc(s)	994,50	994,50
12	21641	SOMPULS-15, cable on the side, SDI-12, 15m, +/-2mm, with 25m cable Non-contact radar-sensor for continuous recording the water level Technical specifications: -Measuring range up to 15 m (49.21 ft) -Deviation ≤ 2 mm -Beam angle 8° -Measuring frequency W-band (80 GHz technology) -Output signal SDI-12 -Process fitting Thread G1½, 1½ NPT, R1½ -Mounting connection Ceiling adapter (not included) -Process pressure -1 … +3 bar (-100 … +200 kPa/-14.5 … +43.51 psig) -Process temperature -40 … +80 °C (-40 … +176 °F) -Ambient temperature -40 … +80 °C (-40 … +176 °F) -Operating voltage 12 … 35 V DC -Protection rating IP66/IP68 (3 bar) acc. to IEC 60529, Type 4P acc. to UL 50 -3 years warranty	1		1.228,50	1.228,50
13	21664	SOMLEVEL-30, cable on top, 4-20mA,, 30m, +/-2mm, with 5m Cable Non-contact radar-sensor for continuous recording the water level Technical specifications: -Measuring range up to 30m -Deviation ≤ 2 mm -Beam angle 8° -Measuring frequency W-band (80 GHz technology) -Output signal 4 … 20 mA/HART -Process fitting Thread G1½, 1½ NPT, R1½ -Mounting connection Thread G1, 1 NPT, R1 -Process pressure -1 … +3 bar (-100 … +200 kPa/-14.5 … +43.51 psig) -Process temperature -40 … +80 °C (-40 … +176 °F) -Ambient temperature -40 … +80 °C (-40 … +176 °F) -Operating voltage 12 … 35 V DC -Protection rating IP66/IP68 (3 bar) acc. to IEC 60529, Type 4P acc. to UL 50 -2 years warranty	1	pc(s)	1.222,00	1.222,00

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Quotation no.	Person in charge	Date	Page
2122-15567	Michael Sommer	14 Apr 2021	3

Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
14	21665	SOMLEVEL-30, cable on top, SDI-12, 30m, +/-2mm, with 5m Cable Non-contact radar-sensor for continuous recording the water level Technical specifications: -Measuring range up to 30m -Deviation ≤ 2 mm -Beam angle 8° -Measuring frequency W-band (80 GHz technology) -Output signal SDI-12 -Process fitting Thread G1½, 1½ NPT, R1½ -Mounting connection Thread G1, 1 NPT, R1 -Process pressure -1 … +3 bar (-100 … +200 kPa/-14.5 … +43.51 psig) -Process temperature -40 … +80 °C (-40 … +176 °F) -Ambient temperature -40 … +80 °C (-40 … +176 °F) -Operating voltage 12 … 35 V DC -Protection rating IP66/IP68 (3 bar) acc. to IEC 60529, Type 4P acc. to UL 50 -2 years warranty	1	pc(s)	1.417,00	1.417,00
15	10354	Level sensor, SOMPULS-35 without housing, radar, range: 35 m, output: 4-20 mA Non-contact radar-sensor for continuous recording the water level of open waters using a horn antenna (K-band) Technical specifications: - Measuring element/-principle: horn antenna / Radar - Measuring range: 35 m; Accuracy: ±2 mm - Field of application: -40 - +80 °C - Output: 4 - 20 mA / HART - Supply: 9,6 - 36 V DC - Protection type: IP 66 / 67 - No cable included	1	pc(s)	2.380,00	2.380,00
16	18009	Level sensor, RL-35, with housing, radar, range: 35 m, output: 4-20 mA Non-contact radar-sensor for continuous recording of the water level of open waters using a horn antenna (K-band) Technical specifications: - Measuring element/-principle: horn antenna / Radar - Measuring range: 35 m; Accuracy: ±2 mm, Blocking distance 0,5m, Beam angle 10° - Field of application: -40 - +80 °C - Output: 4 - 20 mA / HART - Supply: 9,6 - 36 V DC - Sensor Protection type: IP 66 / 67 - Housing Powder-coated, WxHxD mm **- NO cable included** - Installation: bracket for pipe Ø 34 - 48 mm	1	pc(s)	2.920,00	2.920,00

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Quotation no.	Person in charge	Date	Page
2122-15567	Michael Sommer	14 Apr 2021	4

Pos.	Item No.	Description	Quantity	Unit	Price per unit	Total
17	20645	Level sensor, SOMPULS-75 without housing, radar, range: 75 m, output: 4-20 mA Non-contact radar-sensor for continuous recording the water level of open waters using a horn antenna Technical specifications: - Measuring element/-principle: horn antenna / Radar - Measuring range: 75m; Accuracy: ±5 mm - Field of application: -40 - +80 °C - Output: 4 - 20 mA / HART - Supply: 12 - 36 V DC - Protection type: IP66/IP67 - Cable Mount: M20x1,5 (ø5-9mm) - Mount: 300mm / 316L - No cable included	1	pc(s)	3.499,00	3.499,00
18	20643	Level sensor, SOMPULS-120 without housing, radar, range: 120 m, output: 4-20 mA Non-contact radar-sensor for continuous recording the water level of open waters using a horn antenna Technical specifications: - Measuring element/-principle: horn antenna / Radar - Measuring range: 120m; Accuracy: ±5 mm - Field of application: -40 - +80 °C - Output: 4 - 20 mA / HART - Supply: 12 - 36 V DC - Protection type: IP66/IP67 - Cable Mount: M20x1,5 (ø5-9mm) - Mount: 300mm / 316L - No cable included	1	pc(s)	3.399,00	3.399,00
23	10235	Cable, for SOMPULS, H05BQ-F K35 2 x 0,75	10	m	4,29	42,86
(Pos. 20 - Pos. 22)		**Accessories**				**400,61**
20	21640	Ceiling adapter for SOMLEVEL-15	1	pc(s)	63,70	63,70
21	21700	System housing for SOMLEVEL-30 ALU without level sensor Housing: Aluminum Mount: for Pipes with 32-60mm	1	pc(s)	193,70	193,70
22	14874	mounting unit for SOMPULS sensor 170mm	1	pc(s)	143,21	143,21
(Pos. 30 - Pos. 31)		**Shipping**				**105,00**
30	10461	Shipping charges Shipping charges only after written customer request Requst from:_____ date:_____	open	pc(s)		0,00
31	20555	Customs paperwork for deliveries outside the European Union	1	pc(s)	105,00	105,00

Total net:	EUR	18.309,16
+ 20 % VAT:	EUR	0,00
Grand Total:	**EUR**	**18.309,16**

0% VAT according to §10 USTG.

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CDigital
Security | Software | Network
www.cdigital.com.pk

Financial Quotation
"Installation Services for Hydromet Equipment"

Date: 13-08-2021

Ref.No: WAPDA/Hydromet/0821/01

To
WAPDA
WAPDA House Lahore

S.No.	Item	Qty.	Unit Price	Applicable Taxes	Total Price (Inclusive of all taxes)
1	2	3	4	5	6 4+5*3
1	Cantilever Boom tower swivel type arm length 20 to 25 feet long or cable-way for sensors as per site requirement with base plates, anchor bolts, erection, installation, concreting work including transportation for installation of dual function sensors	467	2,500,000.00		1,167,500,000.00
2	Galvanized chain link fence of site with gate and posts of G.I. 2" pipes heavy duty complete with posts U Bolts, anchor bars, concrete work, installation & transportation and levelling of site as per site requirement.	467	350,000.00		163,450,000.00
3	Installation of Sites enclosure box, sensors and testing including all necessary installation material like GI Pipes, power cables, screws and bolts etc..	467	320,000.00		149,440,000.00
4	Installation of Staff Gauge at site for measurement of Water Level	467	130,000.00		60,710,000.00
5	Flow/Cross-Section measurement of River for incorporating in the software for calibration as per requirement	467	280,000.00		130,760,000.00
6	Integration of New stations with Existing Database management system.	467	190,000.00		88,730,000.00
	GRAND TOTAL				**1,760,590,000.00**

TERMS & CONDITIONS:
Taxes: Prices are exclusive of all prevailing taxes.
Price Validity: 90 Days

Submitted by Sajid Hussain
Designation HOD Hydromet
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ANNEXURE - 10

REPLIES TO COMMENTS FROM FEDERAL FLOOD COMMISSION

ANNEX - 10

REPLIES TO FFC COMMENTS ON FLOOD TELEMETRY MASTER PLAN
(September 01, 2021)

Sr. No	COMMENTS	REPLY
1	Refer summary Table for PIDs/ FLAs (Annexure-III) and pars 2.6 at page-22, Chapter-2, I rational/ justification for categorization (A, B, C, etc.) of proposed telemetry stations be station provided in the Plan.	To establish a proper Telemetry Network, all the available stations need to be connected to the Central Data Center. However, conversion of a large number of stations under Proposed Telemetry Master Plan would require a huge money to convert all of those to telemetry stations in one go as well as add new ones. Therefore, the planned network has been further divided into three categories A, B & C keeping in view the followings; (i) degree of importance of the stations with regard to flood consideration (ii) already existing station to continue operation and upgraded to connect with the new system (iii) and ongoing sites for installation.
2	Even though WAPDA will operate & maintain the System, it must be ensured that the relevant technical staff of PIDs/ FLAs along with WAPDA (as indicated at pan 2.9, page-48, Chapter-2) gets the required & sufficient on-the-job training on the system.	Obviously WAPDA being experts would transfer the knowledge on operation and maintenance of the Telemetry System through on job training to PIDs/FLAs nominated staff.. However, this would depend upon the operational modalities agreed upon between WAPDA and the PIDs/FLAs, under the auspices of FFC.
3	Refer table 5.1 at page-46, Chapter-5, Job Description of the technical staff be given in the plan.	Incorporated as suggested. **Appended to report** as **Annex - 6.**

4	Refer page-60, Chapter-6, estimated O&M cost of the prole-t is 12.25°/ Q.e Rs. 0.993 billion against total cost of Rs. 8.106 billion) which is way beyond the permissible limit of Planning Commission of Pakistan. Accordingly, O&M cost cf the project be rationalized as Alt per the criteria of Planning Commission.	In Chapter - 6, complete estimate for the Proposal has been reviewed. The O&M cost rationalized and reduced from 12.5 to 06% of the Capital Cost. Further reduction will have severe impact on sustainability of the operational activities of the Project thus affecting accuracy and reliability of data In addition, Complete Estimate for in placing the whole Master Plan has also been added for ready reference. **(Annex - 8).**
5	One of the tasks under scope of National Master Plan for Telemetry is to "Establish the requirement for installation of telemetry system across the country based on gaps in existing system, hydrological condition of respective catchments/ sub-catchments fulfilling, international Data Standards/ requirements to ensure registering of flows in all main rivers, secondary and tertiary riven, small nullahs and streams": which is missing in true sense. information regarding hydrological condition of respective catchments/ sub- catchments fulfilling international Data Standards/ requirements needs to be provided in the Plan.	The Flood Telemetry Master Plan has been prepared on the basis of minimal monitoring requirement across rivers and important streams and nullahs which have been analyzed and recommended accordingly. WMO stream gauging guidelines -recommends one station for each 250 Sq.km catchment in flat terrain and one for each 50 Sq.km for hilly areas. This corresponds to over 1000 locations in Pakistan. Therefore, WMO standards are used as baseline to identify maximum possible sites and later rationalized based on current site and planned sites and later new sites proposed in the gaps and categorized in three for implementation Purpose. Extension of system to small streams and nullahs would require a huge study
6	One of the task under scope of National Master Plan for Telemetry is to provide " Recommendations to strengthen data infrastructure and linkages between organizations involve in the processing/ dissemination for effective utilization of data in the country" Is missing in the plan which needs to be provided.	This has been discussed in Para 2.2 wherein Digital Hydro Data Center (DHDC) has been recommended to be established with WAPDA as Host and FFC as Co-Host. In addition regional data center for each province/FLA with Data Port facility is recommended which could not be achieved without inter-organization linkages. Figure 2.1, The Schematic map, show the proposed inter-connected hydro-meteorological observation network, Proposed Data Centers and data communication /flow.

7	A methodology has been provided in the document for identification of observation locations (Refer Chapter-2, item-2.3). The point regarding "Hydrological conditioning of the satellite based Digital Elevation Model (DEM)" needs to be elaborated in detail. It should also address the following points:	--
	a. Explain the hydrological variables, their quality indication and output information	Hydrological /Hydraulic / Flood modeling are not within the scope of this Master Plan.
	b. How elevation models will be post-treated order to impose linear with drainage enforcement procedures in or polygonal entities, particularly to enforce flow direction.	Elevation models are used to extract drainage and perform tessellations of the land surface into smaller watersheds, which are sub-watersheds. Enforcing flow direction is required where there is a need to perform Hydrological/Hydraulic/Flood simulations.
	c. What kind of spectral information extracted from DEMs?	DEMs provide elevation information, not spectral information
	d. Will stereoscopic information with the spectral information be considered?	There is no purpose of considering spectral information. And, why would stereoscopic information be needed if elevation data is used.
	e. We know that there are some limitations if the terrain is flat, how you can overcome this issue using DEMs?	The plan only needs identification of observation sites: these correspond to catchment and sub-catchment sizes and outlet points only. Therefore, flat terrain limitations only become relevant when rainfall-runoff or hydrodynamic modeling is to be performed which is irrelevant for the purpose of this plan.

	f. Which DEM is considered such as SRTM, ASTER or GDEM with its resolution matrix?	SRTM hydro-conditioned (90m) and AlosAW3D30 (30m). were used for this study. SRTM (Shuttle Radar Topography Mission) is mounted on a Space Shuttle and obtains Earth surface data by remote sensing technology utilizing a synthetic aperture radar. The Shuttle Radar Topography Mission (SRTM) is an international research effort that obtained digital elevation models on a near-global scale to generate the most homogeneous, consistent and complete high-resolution digital topographic database of Earth. SRTM DEM has been widely used in various research fields since its release. Whereas, ALOS Global Digital Surface Model "ALOS World 3D - 30m (AW3D30)" · Complement missing tiles in land area with existing DEMs
	g. If it was found through DEM that some locations,' points lies under more than one sub-basins/ catchment, the guidelines regarding selection locations under particular sub-basin/ catchment is missing. The same be provided.	One outlet point can only correspond to one catchment since catchments are made first and their outlet points are result of the catchments.
8	Procedure adopted to remove redundancy of observation network/ data is missing in the document which needs to be provided (Refer Chapter-2, item-2.4).	There is no redundancy since the new sites are proposed ONLY where no-current and no-planned stations exist.
9	Detail of all main rivers. secondary and tertiary rivers, small nullahs and streams are missing in the plan on which requirement for installation of telemetry system across the country is based. It needs to be appended in the master plan.	All the maps i.e. for Existing, Planned, and Proposed show rivers and streams. This master plan is prepared under a short 15-days study in which the provinces/FLAs were selected as per the scope. Later, a large-scale study comprising of each catchment as a unit can be conducted if required.
10	Information received from Provinces' Agencies be appended in the document by mentioning its source for future updating purposes.	Appended as suggested **(Annex - 2)**

11	About existing 90 No. High Frequency Radio Based Network System 44 gauging of HRD & 20 No Automatic weather Station AWS of GMRC need to be separately provided in	Provided in the report (**Table 1.1 to 1.3**)
12	Establishing of a digital hydro Data Center (DHDC) with WAPDA in Lahore had been purposed along with Regional Data Centers in all the Provinces & FLA's for integrated data management (Refer Page-I0). It is very important to establish a centralized National Water Centre in the premise of O/o CEA & CFEC. MoWR to support WAA implementation and development of a national planning database which will enable the planning and development of water resources on a sustainable base, including effective management of hydro-metrological disasters. This is in line with the relevant clause of National Water Policy (NWP)	It is proposed that WAPDA will host DHDC while FFC / MoWR will be co-host. However, this could be altered and made vise-versa after Mutual Consultation.
13	The linkage of proposed Plan with NFPP-IV/ FPSP-III has been described in Sections 1.1 & 1.2 (Page-12). Investment Plan set under NWP-2018 also includes telemetric monitoring as one of major interventions required to be implemented by 2030 (refer Para 28.11 of NWP). Moreover. Implementation of proposed Plan also relates to the following provisions of NWP:	
	a. Real-time monitoring of river flows by IRSA through inter alia telemetric monitoring to maintain transparent water accounting system and to check the increasing trend of unaccounted-for water in the Indus System of Rivers /refer Para 28.4 (v) of NWP	Para added to the Report **(Page -12)**

	b. In order to maintain a reliable assessment of water resources in the country, federal and provincial water sector organizations would develop a standardized and uniform mechanism for data collection of various parameters of water resources including but not limited to rivers/canals gauge and discharge, rainfall/snowfall depth to groundwater table, surface/ subsurface water quality parameters, river canal and reservoir sedimentation {refer Para 28,4 (vi) of NWP}	Para added to the Report **(Page -12)**
14	NWP also recommends expansion of information technology-based monitoring network to cover those parts of catchments of the rivers that lie in Occupied Jammu & Kashmir and outside Pakistan besides to include secondary & tertiary tributary rivers (Refer Para 22.5 of NWP). The Plan under review has been titled as "National Plan". Therefore, it needs to be ensured that telemetric requirements of entire river network of the country have been covered in the Plan.	No current or planned stations of Pakistan lie in the Occupied Jammu and Kashmir, therefore it is impossible to conduct gap analysis to identify missing areas of observation. In addition, any data acquisition from IoK areas is a trans-boundary issue and has to be done through PCIW.
15	**Basis to categorize** the catchment areas of different rivers as basins, sub-basins need to be provided in the Plan under review (refer Section 1.5).	For this study, stream network tracing method through ***Pfafstetter*** tracing is used to find nodal points for this, catchment area demarcation is not required. **(Ref section 2.3)**
16	Please clarify whether the Plan identifies the requirements related to the installation of telemetric equipment for the purpose of water conservation (along the main canals and their distributaries etc.) in addition to those highlighted for flood management?	This study relates to monitoring of rivers and nullah for flood management only. Monitoring for water conservation along the canals and distributaries are beyond scope of this Assignment. Such a plan requires an independent in depth study that may include hundreds of more observation locations along the canals and distributaries.

17	*Pfafstetter tracing* has been indicated as one of the approaches used for identification of observatory locations (Section 2.3). The same need to be elaborated.	The Pfafstetter Coding system, developed by Otto Pfafstetter in 1989, is a methodology for assigning watershed IDs based on the topology of the land surface. The system is hierarchal, and watersheds are delineated from junctions on a river network. Level 1 watersheds correspond to continental scale watersheds. Higher levels (levels 2, 3, 4, etc.) represent ever-finer tessellations of the land surface into smaller watersheds. Each watershed is assigned a specific Pfafstetter Code based on its location within the overall drainage system and on the total drainage area upstream of the watersheds outlet.
18	Refer details provided in the Chapter-4 titled "Automated Observatory Hardware" regarding choice of the telemetric equipment proposed to be installed along the irrigation network, it must be ensured that the most appropriate technology which is economically viable has been selected and that the same has the proven record of performance.	It has been tried to utmost recommend the widely used telemetric equipment available in the Market. However, this plan also cater the requirements for future implementation as well. The technology could further evolve in the mean time. so the final selection of equipment will have to be done accordingly. The state of the art equipments with proven efficient and accurate technology will be installed to have reliable and sustainable data.
19	If deemed appropriate, necessary measures for ensuring security of classified data sets may also be considered and made part of the Plan. Data Centre may be targeted by cyber-attacks which could be detrimental and may have implications related to drinking water supply, flood risk reduction, electricity, and agriculture etc.	This is an obvious and implementation level requirement and will be met with during implementation and operation phase.
20	Under Chapter-6, cost estimate of 468 Telemetry Stations has been given without any basis of cost estimation. For proceeding further, the basis of cost estimation is very important, hence be provided.	The cost estimate is prepared on the basis of cost of selected equipment, Installation taken from ongoing Projects in WAPDA as well taking Quotations from the manufacturers . Back-up information is appended to the report as **Annex - 9.**

21	Huge number of manpower (36 No) has been mentioned against each Division (7 No.) (Page No. 46) for O&M after completion which, keeping in view the automation of gauges in shape of Telemetry does not seem logical. The involvement of manpower should be bare minimum after inclusion of innovative technology	The man power requirements reviewed and rationalized to bare minimum. Further reduction of man power would affect the accuracy and reliability of data
22	Huge number of monitoring equipment has been mentioned under Part-2 (operation and maintenance equipment) (Page-52), which must be rationalized to reduce the cost of O&M equipment.	The number of equipments required for operation and maintenance purpose have been reduced to bare minimum. Further reduction would affect the maintenance of the network, ultimately affecting the accuracy and reliability of the data
23	In the Inception Report, it was mentioned that the requirement of Telemetry in each basin will be analyzed as per WMO Standards, however, the same have not been mentioned in the Master Plan. Reference of WMO Standards with proper "Citation" may also be mentioned in the Final Report to validate the requirement with renowned world standards for proper justification of the project.	Citation added in the report; WHO Standards: Manual on Stream Gauging (2010). https://library.wmo.int/index.php?lvl=notice_display&id=539#.YRj71HzivZQ
24	Huge cost of installation, testing and commissioning of Rs. 2.40 billion has been mentioned without any detailed cost back-up and without any analysis. The installation cost seems on much higher side and not logical, hence, be rationalized.	The cost estimate is prepared on the basis of cost of selected equipment, Installation taken from ongoing Projects in WAPDA as well taking Quotations from the manufacturers . Back-up information is appended to the report. **(Annex - 9).**
25	There are some limitations in each Study, hence, limitations of the study may also be mentioned in the Report.	In order to optimize the station installation location, detailed studies for each major catchment can be undertaken in future to find catchment-ideal locations best fitting with the hydrological characteristics of each catchment.

26	As per WMO Standards "Guide to Hydrological Practices", (Chapter-20, WMO No. 168), minimum densities have been recommended for stream flow stations, evaporation station, precipitation station, sediment station and water quality stations, however, in the report, the provision of minimum number of Telemetric Stations seems much on the higher side as compared to the one provided in the WMO Standards. This may be looked into keeping in view the huge cost of Telemetric Stations and present financial constraints.	WMO stream gauging guidelines (Chapter No. 2) suggest one station for each 250 Sq.km catchment in flat terrain and one for each 50 Sq.km for hilly areas. This corresponds to over 1000 locations in Pakistan. Therefore, these standards were used to as baseline only and later rationalized to find gaps in current observations locations and propose missing sites as per hydrological significance.
27	Frequency of calibration of various instruments under Column-5.7 (Page-47) has been mentioned on annual or semi-annual basis. This must be correlated with the Equipment Manufacture Guidelines/ Manual instead of fixing generalized durations for calibration	These are the general calibration frequency for the monitoring of equipment. However, Manufacturers Guideline to be followed for the respective equipments.

28	Under the Column-5.2 (P-45), name of stakeholders from Sr. No. (v) to (xi) may be replaced with the following: a) irrigation Department, Government of Punjab b) Irrigation Department, Government of Sindh c) Irrigation Department, Government of KP d) Irrigation Department, Government of Balochistan e) Irrigation & Small Dams, Government of AJ&K f. Public Works Department, Government of Gilgit-Baltistan f) Merged Areas, Irrigation Department, Government of KP	Replaced as suggested
29	Title page of the document be given as per Annexure-I attached herewith	Replaced as suggested

Federal Flood Commission

GOVERNMENT OF PAKISTAN MINISTRY OF WATER RESOURCES

PAKISTAN NATIONAL MASTER PLAN FOR FLOOD TELEMETRY NETWORK