

BRAIN STORMING SESSION
ON
HYDROLOGICAL PROBLEMS AND PERSPECTIVES
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*Water Resources Development in Chenab
Basin : Hydro-meteorological Observations
and The Role of Central Water
Commission*

BY

S.C. Chadha & S.T. Hasnain
Central Water Commission
Jammu

WESTERN HIMALAYAN REGIONAL CENTER
NATIONAL INSTITUTE OF HYDROLOGY
JAMMU CANTT 180 003, INDIA

WATER RESOURCES DEVELOPMENT IN CHENAB BASIN : HYDRO-METEOROLOGICAL OBSERVATIONS AND THE ROLE OF CENTRAL WATER COMMISSION

S.C. Chadha
Director

S.T. Hasnain
Executive Engineer

Monitoring & Appraisal Directorate
Central Water Commission
Jammu

INTRODUCTION

1. Nature has gifted the State of Jammu and Kashmir with three big rivers namely; Chenab, Jhelum and Indus. The rivers have perennial flow and possess considerable Irrigation and Power potential. Central Water Commission has been Investigating the major Hydro Electric projects in remote and Inhospitable areas of Chenab basin and have prepared their feasibility reports, besides collecting hydro-meteorological data at a number of sites in Chenab basin which have been considered essential for proper planning and design of Water Resources projects. The design wing of Central Water Commission has provided design consultancy to a number of projects which are meeting the states needs for Irrigation and power.

2. River Chenab and its upper tributaries originate from snow bound mountain and have copious discharge all the year round. It flows from steep bed slopes with a series of loops and bends which can be harnessed for Hydel Power generation. To harness the vast Irrigation and power potential, the then Ministry of Irrigation and power entrusted the work of Hydrological observations and Investigation of various Hydel Power Projects in the Chenab basin to Central Water Commission.

- ✓ A. Hydro-Meteorological Data Collection.
- ✓ B. Flood data transmission through telegraphs/through All India Radio Broadcasts as per Indus Water Treaty requirements.
- C. Compilation of data and preparation of water year books.
- D. Investigation of Hydro-Electric projects and preparation of feasibility reports.
- E. Preparation of outline plan for Irrigation Development.
- F. Regional co-ordination for Hydrological data collection.
- G. Monitoring of Irrigation projects to provide assistance and report development in the field of water resources.
- H. Hydrological data of Jhelum basin.
- I. Investigation of Kirthai Hydro Electric Project Stage-I and Stage-II.
- J. Monitoring and Appraisal of Medium Irrigation projects under Central Assistance Scheme in the region of J&K.
- K. Snow Hydrology Studies.

HYDRO-METEOROLOGICAL OBSERVATIONS IN CHENAB BASIN

The prospects of Irrigation and Power Development in Chenab are vast and in appreciation to its development; the department of power, entrusted the work of collection of Hydro-meteorological data to Central Water Commission. A number of gauge, discharge, silt, rainfall stations have been installed in the basin since early sixties. The observations were started basically for planning and design of various Water Resources projects in the basin. The number of observations, sites were increased with time and also with the requirements of projects being investigated in the basin. A list of existing sites where hydrological observations were continued since their inception have been compiled along with dates since when the observations were started and presented in the Annexure-I. Year wise number of existing sites are also presented in Annexure II. Besides these observation sites; there are many more sites where observations were carried out in the past for specific investigation of project sites and are presented separately.

Daily discharge along with thrice daily gauges are being observed during lean season. However, during flood season hourly gauge, round the clock at main sites and hourly gauge during day time at other sites, along with daily discharges are observed. The data observed is of immense value for planning and design of various Irrigation and Hydro-electric projects. Besides, the data is useful for assessment of water resources, its distribution and analysis. The data is being regularly sent to Ministry of Water Resources and Central Water Commission for further processing and transmission.

Flood Transmission

Indus Water Treaty requirements and as per directions of the Ministry of Water Resources, the flood data for the River Chenab at Akhnoor, River Tawi at Jammu is observed hourly round the clock during the flood season from 1st July to 10th October every year. Flood data on Ravi at Madhopur is also being observed round the clock by Punjab Irrigation Department. The flood data through telegraphic messages as well as through all India Radio Broadcasts are transmitted on priority basis. Since, 1974 as per Indus Water Treaty requirements, Low medium and high flood discharges for the three rivers have been fixed by the Commissioner Indus, Ministry of Water Resources, New Delhi. For various floods, discharges at 6.0 hrs 12.00 hrs and 19.00 hrs are communicated to All India Radio, Jammu for broadcasts at 9.30 hrs, 14.30 hrs and 23.10 hrs respectively. Besides, the flood messages are conveyed to the concerned authorities in India and Pakistan by priority telegrams and during high floods the messages are conveyed at frequent intervals.

Snow Hydrology Studies

A pilot project on Snow Hydrology was set up under USAID programme. The project envisages observation of hydro-meteorological data is Chilla Khud Sub-basin (Near Batote). Under the project two snow observatories and two G&D sites have been established. The data collected from these sites

is proposed to be utilized for development snow melt run off relation for the catchment.

Water Year Books

Hydrometeorological data collected at various sites in Chenab basin is compiled processed and checked for its consistency. Important parameters ;such as 10-day daily flow, mean monthly and mean annual flows. Maximum and minimum discharges, peak annual flows. One day, two day, three day maximum annual rainfall values, mean monthly and annual rainfall and sediment values for various sites are worked out for presentation in the Water Year Books, these publications are prepared annually and processed further ;in the River Data Directorate of Central Water Commission as per guidelines for preparation of Water Year Books issued by Central Water Commission. A tentative format in conformity with the revised guidelines is presented in Annexure VI. The work to compile the revised Water Year Books is already in progress.

Investigation of Hydro-Electric Projects

River Chenab and its tributaries have huge Hydel Power potential which can be harnessed economically as already estimated by Central Electricity Authority.

The Northern Investigation Circle, Jammu (now renamed as Monitoring & Appraisal Directorate) has undertaken various Investigation works pertaining to the Water Resources Development in the State. The works include collection of Hydrometeorological data, Investigation, planning and design of Irrigation and Hydel Power Projects through specialized design Directorate of Central Water Commission besides preparation of feasibility reports. Some of the projects are listed in the annexure IV.

In view of the growing demand for power in the region; it has become necessary to develop Hydro Electric Projects in the basin. Most of the projects are located ;in the remote areas, far flung areas and inhospitable areas which are far away from civilized habitants and lack of amenities and facilities. Once these projects are taken up; mobility to these areas and the project activity will increase creating new employment opportunities in and around the project area. Most sites experience extreme climatic conditions and remain cut off during the winter months. However, these difficult works of Investigations of projects was completed well in time due to the team spirit and dedicated working by the Investigating teams of Central Water Commission.

Unfortunately, the Investigation of Hydro Electric Projects suffered major set back since 1989 onwards and it became more and more difficult to resume Investigation works due to the prevailing problems of Jammu and Kashmir. It resulted in severe set back. In the smooth functioning of the works and resulted in curtailment of further works in the valley. The Investigation works were merged with the work of Chenab Division, Jammu. However, the organizations has hopes that during

IXth Five Year Plan the situation improves and Investigation works resumed at the promising sites. The organization has also framed proposal for monitoring Water quality in Rivers and Nature lakes in J&K during IXth Five Year Plan.

List of Annexure

1. List of Hydro-meteorological observations sites and dates since when observations are being continued.
2. Year wise number of existing sites.
3. Graphical representation of year wise number of existing sites.
4. List of Investigated sites and continuing works.
5. List of Hydro-meteorological observation sites where observations were carried out for some specific periods.
6. Format for Water Year Book.

HYDRO-MET. OBSERVATION (EXISTING SITS) WITH EFFECT FROM THE DATS IN CHENAB BASIN
ANNEXURE-I

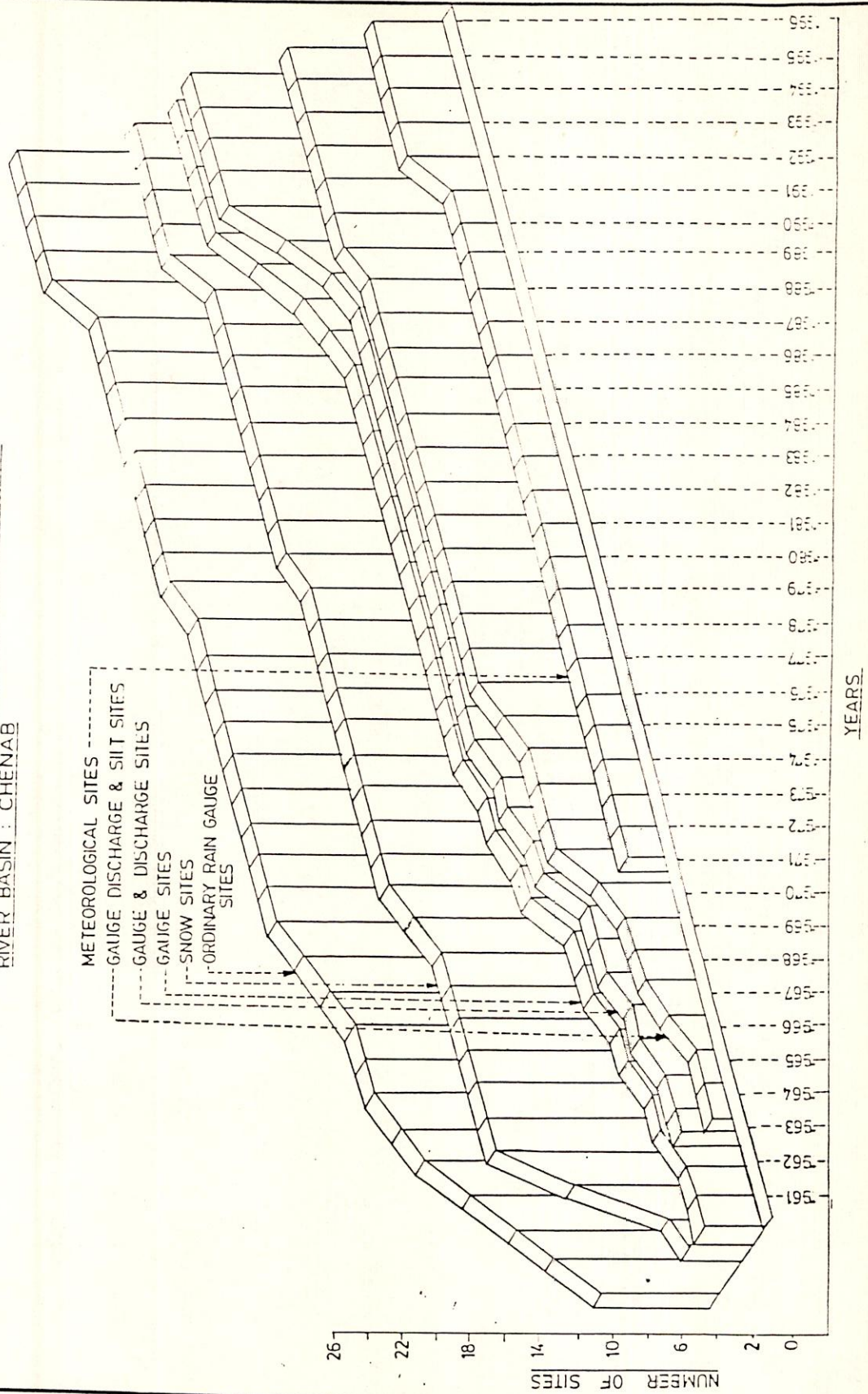
SL. NO.	NAME OF SITE & LOCATION (DIST.)	GAUGE	DISCHARGE	SEDIMENT	RAINFALL (ORG)	RAINFALL (SRRG)	SNOWFALL	METEOROLOGICAL
1.	2.	3.	4.	5.	6.	7.	8.	9.
1.	AKINMOOR (JAMMU)	23.11.69	23.11.69	11.02.71	01.03.71	15.10.68	-	-
2.	JAMMU TAWI (JAMMU)	01.11.76	01.11.76	01.11.76	-	-	-	-
3.	DIAMKUND (DODA)	01.07.61	01.07.61	01.06.64	03.10.64	03.10.64	-	17.01.71
4.	PREMAGAR (DODA)	27.10.67	27.10.67	27.10.67	-	-	-	-
5.	BENZWAR (DODA)	15.08.61	15.08.61	11.08.72	-	-	-	-
6.	KIDUR (DODA)	24.03.91	24.03.91	-	-	-	-	-
7.	GULABGARH (DODA)	01.07.90	01.07.90	01.07.90	-	-	-	-
8.	GULABGARH (BHUTNALLIAH) (DODA)	01.05.92	01.05.92	-	-	-	-	-
9.	LIDRARI (DODA)	29.07.89	-	-	-	-	-	-
10.	UDAIPIUR (KEYLONG H.P)	01.01.74	01.01.74	-	01.10.72	-	01.10.72	-
11.	UDAIPIUR (MIYAR NALLIAH) (KEYLONG H.P)	07.08.65	01.09.92	-	-	-	-	-
12.	TANDI (KEYLONG H.P)	21.08.72	21.08.72	09.06.77	01.12.73	-	01.12.73	-
13.	GHOUSAL (KEYLONG H.P)	20.08.72	20.08.72	11.11.72	-	-	-	-
14.	SIRSHI (DODA)	18.09.61	18.09.61	20.08.68	23.11.62	24.03.74	23.11.62	08.07.71
15.	LANDRI (DODA)	16.12.91	16.12.91	-	-	-	-	-
16.	NASSRI (DODA)	01.01.92	01.01.92	-	-	-	-	-
17.	CHILIA-TOP (DODA) (SNOW OBS.)	-	-	-	25.10.92	-	25.10.92	25.10.92
18.	BATOTE (DODA) (SNOW OBS.)	-	-	-	24.10.92	-	24.10.92	24.10.92
19.	SATIAL (UDHAMPUR)	-	-	-	01.10.68	15.10.68	-	-
20.	PAONI (UDHAMPUR)	-	-	-	09.05.67	-	-	-
21.	DAMNI (UDHAMPUR)	-	-	-	31.12.63	-	-	-
22.	PANDAN (RAJOURI)	-	-	-	23.12.64	-	-	-
23.	MOHU (DODA)	-	-	-	25.09.62	-	26.12.64	-
24.	HANIHAL (DODA)	-	-	-	15.11.62	20.12.68	14.08.65	-
25.	GOIRIA (DODA)	-	-	-	30.10.62	-	15.11.62	-
26.	BATOTE (DODA)	-	-	-	21.11.62	13.10.68	23.09.64	-
27.	ROT (DODA)	-	-	-	18.10.62	-	21.11.62	-
28.	DODA (DODA)	-	-	-	09.11.62	-	01.09.64	-
29.	BIADARWAH (DODA)	-	-	-	15.10.66	11.10.68	24.04.64	-
30.	DRABSHIA (DODA)	-	-	-	15.11.62	-	-	-
31.	KISHTWAR (-	-	-	01.07.65	15.11.65	01.07.65	-
32.	OHLI (DODA)	-	-	-	10.12.62	-	01.08.65	-
33.	NOV (DODA)	-	-	-	03.10.65	-	27.11.65	-
34.	FORKAR (KEYLONG) H.P	-	-	-	01.07.83	-	01.07.83	-
35.	CHINGAON (DODA)	-	-	-	21.01.63	-	01.10.64	-
36.	HAWEL (DODA)	-	-	-	14.09.66	-	15.05.63	-
37.	YUNOD (DODA)	-	-	-	19.11.62	-	19.11.62	-

RIVER BASIN : CHENAB
OBSERVATIONS ON EXISTING SITES
YEAR WISE NUMBER OF SITES
ANNEXURE-II

S.NO.	YEAR	GAUGE	G&D	GDS	ORG	SRRG	SNOW	NOTE
1.	1961	3	3	-	-	-	-	-
2.	1962	3	3	-	10	-	4	-
3.	1963	3	3	-	10+2=12	-	4+1=5	-
4.	1964	3	3	-	12+2=14	-	5+5=10	-
5.	1965	3+1=4	3	1	14+2=16	1	10+4=14	-
6.	1966	4	3	1	16+2=18	2	14	-
7.	1967	4+1=5	3+1=4	1	18+1=19	2	14	-
8.	1968	5	4	1+1=2	19+1=20	2+5=7	14	-
9.	1969	5+1=6	4+1=5	2+1=3	20	7	14	-
10.	1970	6	5	3	20	7	14	-
11.	1971	6	5	3+1=4	20+1=21	7	14	- 2
12.	1972	6+2=8	5+2=7	4+2=6	21+1=22	7	14+1=15	2
13.	1973	8	7	6	22+1=23	7	15+1=16	2
14.	1974	8+1=9	7+1=8	6	23	7+1=8	16	2
15.	1975	9	8	6	23	8	16	2
16.	1976	9+1=10	8+1=9	6+1=7	23	8	16	2
17.	1977	10	9	7+1=8	23	8	16	2
18.	1978	10	9	8	23	8	16	2
19.	1979	10	9	8	23	8	16	2
20.	1980	10	9	8	23	8	16	2
21.	1981	10	9	8	23	8	16	2
22.	1982	10	9	8	23	8	16	2
23.	1983	10	9	8	23+1=24	8	16	2
24.	1984	10	9	8	24	8	1+ 16=17	2
25.	1985	10	9	8	24	8	17	2
26.	1986	10	9	8	24	8	17	2
27.	1987	10	9	8	24	8	17	2
28.	1988	10	9	8	24	8	17	2
29.	1989	10+1=11	9	8	24	8	17	2
30.	1990	11+1=12	9+1=10	8+1=9	24	8	17	2
31.	1991	12+2=14	10+2=12	9	24	8	17	2
32.	1992	14+2=16	11+3=15	9	24	8	17	2
33.	1993	16	15	9	24+2=26	8	17+2=19	2+2=4
34.	1994	16	15	9	26	8	19	4
35.	1995	16	15	9	26	8	19	4
36.	1996	16	15	9	26	8	19	4
37.	1997	16	15	9	26	8	19	4
TOTAL		16	15	9	26	8	19	4

ANNEXURE-III

DEVELOPMENT OF EXISTING SITES SINCE START OF OBSERVATIONS
RIVER BASIN : CHENAB



ANNEXURE-IV
PARTICIPATION OF NORTHERN CIRCLE (NOW NON.) & APR. DTE.) CWC, FOR HYDROLOGICAL OBSERVATIONS,
SURVEY & INVESTIGATION & FEASIBILITY REPORTS IN J&K

0 - OPERATING U/C - UNDER CONSTRUCTION
 I - INVESTIGATED U/I - UNDER INVESTIGATION

S.NO.	HYDRO-ELECTRIC PROJECTS		MICRO HYDEL PROJECTS		ONGOING/PROPOSED WORKS		PRESENT STATUS
	NAME	LOCATION (DIST.)	NAME	LOCATION (DIST.)	NAME		
1.	SALAL-I & II (O)	UDHAMPUR	DRAS	KARGIL	HYDROMETEOROLOGICAL OBS. IN SPILLOVER SCHEME CHENAB BASIN INCLUDING TRANSMISSION OF FLOOD DATA THROUGH A.I.R./TELEGRAPHIC MESSAGES AS PER REQUIREMENT OF INDUS WATER TREATY. HYDROMETEOROLOGICAL OBS. FOR FLOOD FORECASTING IN JHELUM BASIN. SNOW HYDROLOGY OBS. IN CHENAB SPILLOVER SCHEME BASIN.		
2.	SAMALKOT (I)	UDHAMPUR	THATHOT	LEH			
3.	BAGLIHAR (I)	DODA	KARU	LEH			
4.	BATTLE (I)	DODA	LEH	LEH	MON. & APPRAISAL OF IRRIGA- TION PROJECTS IN J&K		
5.	PAIKAL-DUL (I)	DODA	KARGIL	KARGIL	WATER QUALITY MON. IN NAT- URAL LAKES & RIVERS IN INDUS FIVE YEAR PLAN BASIN.		
6.	BURSAR (I)	DODA	GAIK	LEH	PROPOSED OFFICE COM. RES. COMPLEX FOR CWC AT JAMMU.		-DO-
7.	DUL-HASTI (U/C)	DODA	OTHER ACTIVITIES				
8.	KIRTHAI-I&II (U/I)	DODA	CONSTRUCTION OF LOG BOOM AT AKHNOOR.				
9.	LOWER JHELUM (I)	BARA- MULLA	TULBUL NAVIGATION LOCK OUTLINE PLAN REPORTS FOR IRRIGATION DEVELOPMENT FOR CHENAB, JHELUM & INDUS BASIN.				
10.	LIDAR (I)	ANGANTNAG					
11.	CHANANI (O)	UDHAMPUR					
12.	UPPER SINDH-I	SRINAGAR					
13.	UPPER SINDH-II	-DO-					
14.	STAKNA (I)	LEH					

HYDRO-METEOROLOGICAL OBSERVATIONS ON SITES (OBSERVATIONS OARRIED OUT FOR SPECIFIC DURATION) IN CHENAB BASIN

S. NO.	NAME OF SITE & LOCATION (DIST.)	DURATION OF OBSERVATIONS										ANEXURE-V
		GAUGE		DISCHARGE		SEDIMENT		RAINFALL		SNOWFALL		
		FROM	TO	FROM	TO	FROM	TO	FROM	TO			
1.	TILHAR (DODA)	1.6.61	28.2.91	1.6.61	28.2.91	15.6.62	20.2.91	15.11.67	20.2.91	15.11.67	28.2.91	
2.	WARHAN (DODA)	Apr. 63	Jan, 65	Apr. 63	Jan, 65	-	-	-	-	-	-	
3.	HANZAL (DODA)	N.A	Jan, 63	-	-	-	-	-	-	-	-	
4.	PAKKAL (DODA)	1.12.63	28.2.91	-	-	-	-	-	-	-	-	
5.	KIYARNALLAH (DODA)	14.6.68	28.2.91	14.6.68	28.2.91	-	-	-	-	-	-	
6.	IKHALLA (DODA)	7.12.63	28.2.91	-	-	-	-	-	-	-	-	
7.	KURIYA (DODA)	1.7.61	28.2.91	1.7.61	28.2.91	13.8.68	28.2.91	10.11.62	28.2.91	-	-	
8.	SAUCH (KEYLONG HP)	2.8.66	Dec, 70	-	-	-	-	-	-	-	-	
9.	TRILOKNATH (KEYLONG)	7.8.65	N.A	June, 71	N.A	-	-	-	-	-	-	
10.	ARTHAL (DODA)	1.6.61	28.2.91	1.6.61	28.2.91	15.8.62	28.2.91	06.10.64	28.2.91	06.10.62	28.2.91	
11.	GULIWAR (KIRULI) (DODA)	21.7.64	N.A	-	-	-	-	-	-	-	-	
12.	SUNDARNANI (DODA)	Mar, 70	Aug, 73	-	-	-	-	-	-	-	-	
13.	BAGGAR (DODA)	27.10.61	27.10.67	1.2.62	27.10.67	-	-	-	-	-	-	
14.	BAGLIHAR (DODA)	N.A	30.9.74	-	-	-	-	-	-	-	-	
15.	CHANDERKOT (DODA)	N.A	30.9.74	-	-	-	-	-	-	-	-	
16.	RAMBUN (DODA)	27.7.61	31.8.92	-	-	-	-	-	-	-	-	
17.	SIDHU (DODA)	2.4.66	28.2.90	-	-	-	-	-	-	-	-	
18.	HADOG (UDHA MPUR)	18.4.67	28.2.86	-	-	-	-	-	-	-	-	
19.	KANTHAN (UDHA MPUR)	1.7.67	Dec, 72	20.5.62	Dec, 72	Apr, 65	Dec, 72	-	-	-	-	
20.	TARDAIAH (JA MMU)	Aug, 69	31.10.76	27.10.69	31.10.76	11.8.72	31.10.76	-	-	-	-	
21.	GANTTA (UDHA MPUR)	-	-	-	-	-	-	02.11.63	28.2.91	-	-	
22.	NARKOT (UDHA MPUR)	-	-	-	-	-	-	24.12.63	28.2.91	-	-	
23.	BUDIL (RAJOURI)	-	-	-	-	-	-	17.01.65	31.3.69	06.09.72	31.03.69	
24.	SAIN (UDHA MPUR)	-	-	-	-	-	-	04.06.65	28.2.91	03.02.66	28.02.91	
25.	GULA BGARH (UDHA MPUR)	-	-	-	-	-	-	27.03.64	31.12.89	27.03.64	31.12.89	
26.	KOTI (UDHA MPUR)	-	-	-	-	-	-	25.11.71	28.2.91	25.11.71	28.02.91	
27.	THANA (DODA)	-	-	-	-	-	-	22.08.63	28.2.91	22.08.63	28.02.91	
28.	BUNNACHA (DODA)	-	-	-	-	-	-	15.12.65	31.12.92	17.12.65	31.12.92	
29.	DUSA DUDHA (DODA)	-	-	-	-	-	-	20.07.66	28.2.91	20.07.65	28.02.91	
30.	DEVIGOL (DODA)	-	-	-	-	-	-	01.11.62	28.2.91	29.11.65	28.2.91	
31.	MATSAL (DODA)	-	-	-	-	-	-	01.10.65	28.2.91	01.10.65	28.02.91	
32.	SOHAL (DODA)	-	-	-	-	-	-	20.06.67	31.2.92	20.06.67	31.12.92	
33.	PALMAR (DODA)	-	-	-	-	-	-	10.11.62	28.2.91	10.11.62	28.02.91	
34.	SARKUND (DODA)	-	-	-	-	-	-	19.11.62	28.2.91	01.11.68	28.02.91	
35.	INSHAN (DODA)	-	-	-	-	-	-	06.11.65	28.2.91	01.12.64	28.02.91	
36.	RIKHINIWAS (DODA)	-	-	-	-	-	-	04.09.61	31.05.89	21.10.65	31.05.89	

Water Resources Development In Chenab Basin

ANNEXURE-VI

DAILY OBSERVED GAUGE AND DISCHARGE

SITE:		RIVER:		CODE:		DRAINAGE AREA:		Sq.Kms.		ZERO GAUGE:		mts.	
DATE	MONTH:			YEAR:			MONTH:			YEAR:			
	WATER LEVEL (mts.)			DISCHARGE Cumecs 1200 hrs.			WATER LEVEL (mts.)			DISCHARGE Cumecs 1200 hrs.			
	0800 hrs.	1200hrs.	1600 hrs.				0800 hrs.	1200 hrs.	1600 hrs.				
1													
2													
3													
4													
5													
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31													

EXTRACT OF HYDROLOGICAL DATA

A. Observed Data:				MONTH:		YEAR:		A. Observed Data:				MONTH:		YEAR:					
Total																			
Av.																			
Max.																			
Min.																			
B. Corresponding Data:								B. Corresponding Data:											
Water Level	Time	Date	Discharge	Water Level	Time	Date	Discharge	Water Level	Time	Date	Discharge	Water Level	Time	Date	Discharge				
Max.																			
Min.																			
C. Dependable Flow: (in MCM)								C. Dependable Flow: (in MCM)											
10%	20%	30%	40%	50%	10%	20%	30%	40%	50%	10%	20%	30%	40%	50%	10%	20%	30%	40%	50%
60%	70%	80%	90%	100%	60%	70%	80%	90%	100%	60%	70%	80%	90%	100%	60%	70%	80%	90%	100%
D. Average Flow Per Unit Drainage Area:								D. Average Flow Per Unit Drainage Area:											
E. Sediment Yield: (in Tonnes)								E. Sediment Yield: (in Tonnes)											