सत्यमेव जयते

जल वर्ष पुस्तिका
WATER YEAR BOOK
2011 – 12

माही, साबरमती एवं अन्य पश्चिम प्रवाही नदियाँ

(लूनी, बनास, शेत्रुन्जी, भादर, मच्छु और रूपेन)

MAHI, SABARMATI & OTHER WEST FLOWING RIVERS

(Luni, Banas, Shetrunji, Bhadar, Machhu & Rupen)



GDSQ Site- Mahi at Khanpur

केन्द्रीय जल आयोग
नर्मदा व तापी बेसिन संगठन
जल विज्ञानीय प्रेक्षण परिमण्डल,
गाँधीनगर (गुजरात)

Central Water Commission
Narmada & Tapi Basin Organization
Hydrological Observation Circle,
Gandhinagar (Gujarat)

Preface

The National Water Policy stresses the need for a standardised national information system with a network of data base and data banks, integrating the existing Central and State agencies for providing quality data and improving the processing capabilities. Collection and compilation of data assumes greater importance in the context of optimal resource planning to meet the ever increasing demand for water in its multi-facetted use.

Central Water Commission is an apex organization of the country concerned with planned development and monitoring in water resources sector. CWC has for long been maintaining a Hydrological Observation & Flood forecasting network, which covers almost all the interstate rivers of India.

Hydrological Observation (HO) Circle, Gandhinagar, a field unit in Narmada Tapi Basin Organization of the Central Water Commission, is entrusted with the Hydrological Observation on west flowing rivers draining through the States of Gujarat, Madhya Pradesh, Maharashtra and Rajasthan. The Mahi Division, headquartered at Gandhinagar, under HO Circle, is at present, carrying out hydrological observations at 22 sites on river Mahi, Sabarmati & other west flowing rivers namely Luni, Banas, Shetrunji, Machhu, Rupen and Bhadar and its tributaries, which have been compiled in this Water Year Book.

The publication of Water Year Book in SWDES format has been started since the water year 2005-06 as per guidelines issued by Central Water Commission, New Delhi. This Year Book not only provides the hydrological data but also provides general information about geology, climate, agriculture, soil, cities/towns, major and medium projects in the basin, etc. It also includes trend analysis of annual surface runoff for these basins.

It is hoped that the information and data compiled herein will be useful to all those concerned with any field related with water resources of the country. Comments and suggestions, if any, on the Water Year Book are most welcome.The efforts put in by all the concerned officers and staff of NTBO, Central Water Commission is gratefully acknowledged.

Gandhinagar
28th December-2012

(Dhirendra Kumar Tiwary)
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आमुख

राष्ट्रीय जल नीति में मानकीकृत राष्ट्रीय सूचना प्रणाली डेटा बेस और डेटा बैंकों के एक नेटवर्क के साथ गुणवत्ता के आँकड़े उपलब्ध कराने और प्रसंस्करण क्षमताओं में सुधार के लिए मौजूदा केन्द्रीय और राज्य स्तरीय ऐजेन्सियों के एकीकरण की आवश्यकता पर बल दिया गया है।जल के बहु -उपयोगी स्वरूप एवं उसकी बढ़ती मांग को पूरा करने हेतु संसाधनों के अनुकूलतम नियोजन के संदर्भ में संबंधित आँकड़ो का संकलन अतिमहत्वपूर्ण है।

केन्द्रीय जल आयोग, जल संसाधनों के विकास में संलग्न, भारत सरकार, जल संसाधन मंत्रालय के अन्तर्गत देश की एक शीर्षस्थ तकनीकी संस्था है जो जल विज्ञानीय आँकड़ों के एकत्रीकरण से लेकर परियोजनाओं का मूल्यांकन, अभिकल्पन, प्रबोधन तथा परिचालन करती है।

जल विज्ञानीय प्रेक्षण परिमंडल गाँधीनगर, नर्मदा तापी बेसिन संगठन के अन्तर्गत केन्द्रीय जल आयोग की एक क्षेत्रीय ईकाई है जिसके अन्तर्गत मध्य प्रदेश, महाराष्ट्र,. राजस्थान एवं गुजरात से होकर पश्चिम की ओर बहने वाली नदियों पर अधिसूचित महत्वपूर्ण स्थलों पर जल के सतही प्रवाह के आँकड़े एकत्रित किए जाते हैं । माही मंडल गाँधीनगर द्वारा माही,. साबरमती एवं अन्य पश्चिम प्रवाही नदियों. लूनी बनास शेत्रुन्जी भादर मच्छु. एवं रूपेन पर, वर्तमान में, 22 स्थलों पर सतही प्रवाह का प्रेक्षण किया जा रहा है।इनके आँकड़े इस वार्षिकी में संकलित किए गए हैं।

जल वर्ष 2005-06 से जल वार्षिकी का प्रकाशन. केन्द्रीय जल आयोग द्वारा निर्धारित स्वरूप (SWDES) में किया जा रहा है। इस वार्षिकी में सतही प्रवाह के आँकड़ों के साथ - साथ बेसिन से संबंधित सूचनाएँ जैसे कि जलवायु, भूगर्भ विज्ञान, कृषि, भूमि, आदि भी दिये गए हैं।इन बेसिन के वार्षिक सतही अपवाह आँकडो में प्रवृत्ति का विश्लेषण भी इस वार्षिकी में शामिल किया गया है।इस वार्षिकी में दी गयी सूचना एवं संकलित आँकड़े उन सभी के लिये उपयोगी होंगे जो जल संसाधन से संबंधित किसी भी क्षेत्र में रूचि रखते हैं, ऐसी आशा है।इसे और उपयोगी बनाने हेतु सुझाव आमंत्रित हैं।

वार्षिकी में प्रकाशित आँकड़ों के संकलन, विश्लेषण तथा प्रकाशन हेतु नर्मदा - तापी बेसिन संगठन के अधिकारियों एवं कर्मचारियों ने जिस समर्पण एवं लगन से कार्य संपादित किया है. वह प्रशंसनीय है। मैं उन सभी का आभार व्यक्त करता हूँ।

गाँधीनगर (गुजरात)
28 दिसम्बर 2012

(धीरेन्द्र कुमार तिवारी)
अधीक्षण अभियंता

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Abbreviations and symbols

Av	:	Average
Ann	:	Annual
A.G.R.	:	Automatic Gauge Recorder
C	:	Centigrate
Cum	:	Cubic meter
Cumec	:	Cubic meter per second
c/s	:	Cross section
C.W.C.	:	Central Water Commission
D	:	Days
Dis	:	Discharge
F	:	Float Observation
F.F.	:	Flood Forecasting
G	:	Gauge
GD	:	Gauge and Discharge
GDS	:	Gauge, Discharge and Sediment
GDWQ	:	Gauge, Discharge and Water Quality
GDSWQ	:	Gauge, Discharge, Sediment and Water Quality
GTS	:	Great Trigonometrical Survey
hRs.	:	HouRs
IWYB	:	Integrated Water Year Book
WYB	:	Water Year Book
km	:	Kilo meter
M	:	Million
m	:	Meter
mm	:	milli meter
m^3/s	:	Cubic meter per second
Mm3 / MCM	:	Million Cubic meter
Max.	:	Maximum
Min.	:	Minimum
m.s.l.	:	Mean sea level
MDN	:	Mahi Division, CWC, Gandhinagar
neg.	:	Negligible
NNW	:	National Net Work
R.Days	:	Remaining days

R.L.	:	Reduced Level
R.D.	:	Reduced Distance
R.C.C.	:	Reinforced Cement Concrete
RDN	:	Deputy Director, Hydrology Rajasthan
sq km	:	Square Kilometer
TDN	:	Tapi Division, CWC, Surat
WQ	:	Water Quality
W.L.	:	Water Level
W.Year	:	Water Year
WDN	:	Water Resources Investigation Division, Ahmedabad
WRI Circle	:	Water Resources Investigation Circle
80 Key	:	80 Key Hydrological Station Scheme
163 Key	:	163 Key Hydrological Station Scheme
0, ‘ . “	:	Degree (30^0) Minutes(56’) Seconds (35”)
*	:	Estimated Discharge
#	:	Discarded and estimated discharge

1.0 Introduction

1.1 General

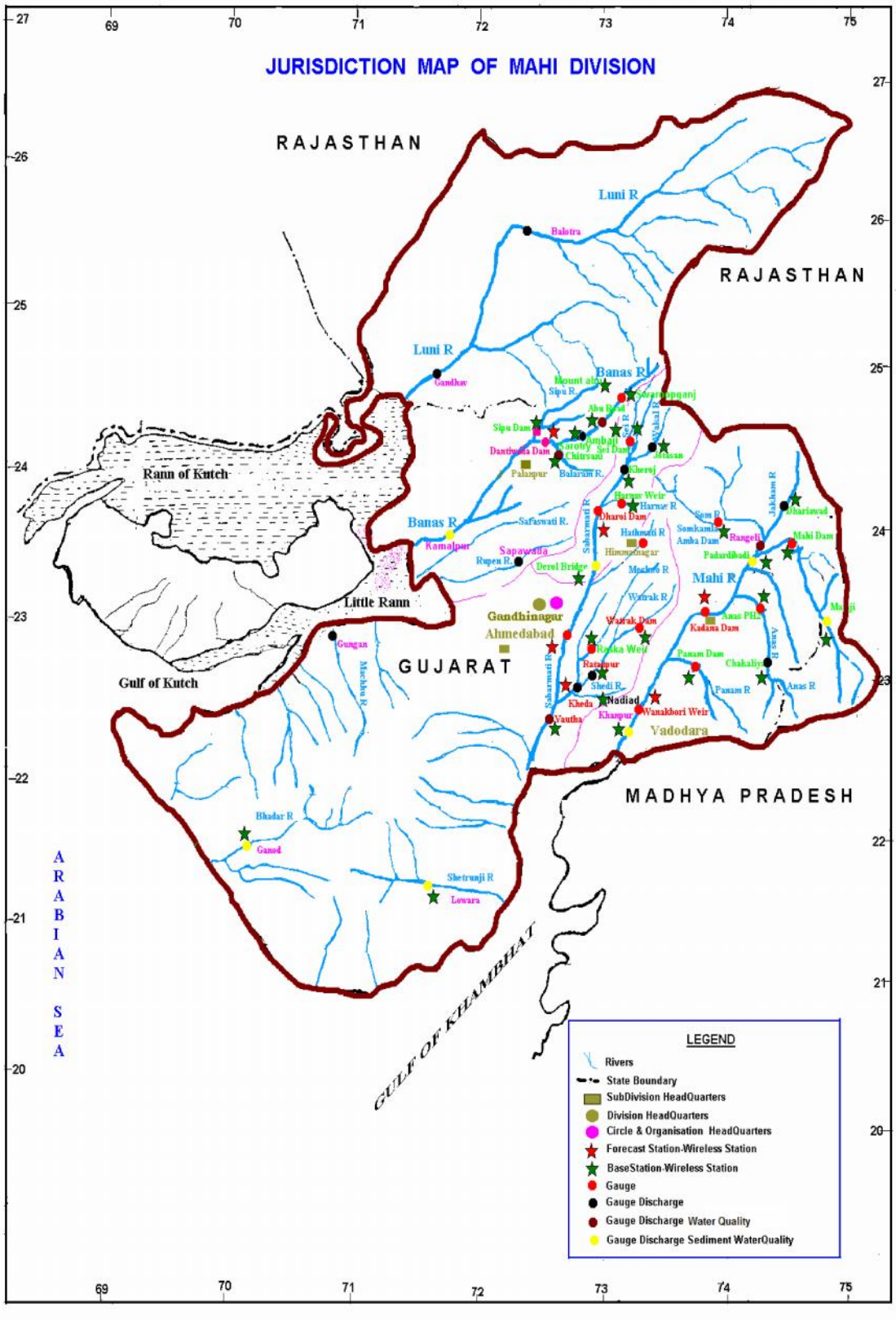
Central Water commission is conducting hydrological observations on major west flowing River Basins under various schemes viz national network, 80-key stations, 163- key stations and flood forecasting. This water year book presents the data of 22 hydrological observation stations for the water year 2011-12 in Mahi, Sabarmati, Luni, Banas, Shetrunji, Bhadar, Machhu and Rupen basins. The data of 22 sites which are included in this book are collected by Mahi division, Central Water Commission, Gandhinagar under Hydrological Observation Circle, Gandhinagar. Jurisdiction map of Mahi division, CWC, Gandhinagar is enclosed at **Plate-1**.

The schemwise distribution of sites is shown in the following table.

Schemewise distribution of sites

National net work					
Sr.no.	Site	River	Basin	Code	Type
1	Mataji	Mahi	Mahi	01 02 13 001	GDSWQ
2	Kamalpur	Banas	Banas	01 02 02 007	GDSWQ
3	Lowara	Shetrunji	Shetrunji	01 02 09 001	GDSWQ
4	Ganod	Bhadar	Bhadar	01 02 07 001	GDSWQ
5	Gungan	Machhu	Machhu	01 02 03 001	GD
6	Gandhav	Luni	Luni	01 02 01 002	GD
80 key hydrological stations					
Sr.no.	Site	River	Basin	Code	Type
1	Rangeli	Som	Mahi	01 02 13 005	GDWQ
2	Khanpur	Mahi	Mahi	01 02 13 012	GDSWQ
3	Paderdibadi	Mahi	Mahi	01 02 13 006	GDSWQ
Flood forecasting					
Sr.no.	Site	River	Basin	Code	Type
1	Dhariwad	Jakham	Mahi	01 02 13 004	GD
2	Kheda	Watrak	Sabarmati	01 02 12 012	GD
3	Ratanpur	Watrak	Sabarmati	01 02 12 010	GD
4	Kheroj	Sabarmati	Sabarmati	01 02 12 003	GD
5	Jotasan	Wakal	Sabarmati	01 02 12 001	GD
6	Derol Bridge	Sabarmati	Sabarmati	01 02 12 006	GDSWQ
7	Chitrasani	Balaram	Banas	01 02 02 004	GDWQ
8	Sarotry	Banas	Banas	01 02 02 003	GD
9	Abu road	Banas	Banas	01 02 02 002	GDWQ
163 key hydrological stations					
Sr.no.	Site	River	Basin	Code	Type
1	Chakaliya	Anas	Mahi	01 02 13 007	GD
2	Balotra	Luni	Luni	01 02 01 001	GD
3	Sapawada	Rupen	Rupen	01 02 04 001	GD
4	Vautha	Sabarmati	Sabarmati	0102 12 013	GDWQ

Plate-1


JURISDICTION MAP OF MAHI DIVISION
RAJASTHAN
RAJASTHAN
MADHYA PRADESH
GUJARAT
Rann of Kutch
Little Rann
Gulf of Kutch
ARABIAN SEA
GULF OF KHAMBHAT
Luni R
Banas R
Sabarmati R
Mahi R
Gandhinagar
Ahmedabad
Vadodara
Balotra
Gandhav
Palanpur
Kamalpur
Sapawadia
Derol Bridge
Harsiddhi
Kheroj
Chhirsani
Dharoi Dam
Hathmati R
Himmatnagar
Wanak Dam
Kadana Dam
Panam Dam
Chakaliya
Ratanpur
Shedi R.
Kheda
Nadiad
Khanpur
Wanakbori Weir
Vautha
Mahi Dam
Padadhodi
Dhariawad
Rangeli
Somkamla
Amba Dam
Harsiddhi Weir
Gungan
Bhadar R
Ganod
Shetrunji R
Lowara
LEGEND
Rivers
State Boundary
SubDivision HeadQuarters
Division HeadQuarters
Circle & Organisation HeadQuarters
Forecast Station-Wireless Station
BaseStation-Wireless Station
Gauge
Gauge Discharge
Gauge Discharge Water Quality
Gauge Discharge Sediment WaterQuality

2.0 Description of Various Basins

2.1 Mahi Basin

2.1.1 Geographical description of the Basin

Mahi River is one of the major west flowing inter-state River of India, draining into the gulf of Khambhat. The basin is bound on the north and the north - west by Aravalli hills, on the east by the ridge separating it from the chambal Basin, on the south by the vindhyas and on the west by the Gulf of Khambhat. Mahi River originates on the northern slope of Vindhyas at latitude 22^0 35'N and longitude 74^0 58'E near the village of Sardarpur in the Dhar district of Madhya Pradesh at an elevation of 500 m above m.s.l. It has a total length of 583 km and it traverses through the States of Madhya Pradesh, Rajasthan and Gujarat. Total drainage area of Mahi is 34,842 sqkm. Basin map of Mahi basin is enclosed as **Plate -2.1.1**

The State wise distribution of the drainage area is shown in the following table.

Sl.No.	Name of state	River length (km)	Drainage area (sqkm)	Percentage of total
1	Madhya Pradesh	167	6695	19.22
2	Rajasthan	174	16453	47.22
3	Gujarat	242	11694	33.56
	Total	583	34842	100.00

2.1 .2 Description of River system

Initially the river flows northwards through Dhar and Jhabua districts of M.P., then turns left and passes through Ratlam district of M.P. Subsequently turning to north - west, it enters the Banswara district of Rajasthan and flows in south - west directions and thereafter enters the Panchmahal district of Gujarat. Then the river continuously flows in the same direction through Kheda district of Gujarat and finally falls into the Gulf of Khambhat in Arabian sea.

This river receives several tributaries on both the banks, out of which the main tributaries are Som, Anas and Panam.

Som

This is a right bank tributary of Mahi. Som River rises near Som on the eastern slopes of the Aravalli hills in the Udaipur district of Rajasthan at an elevation of 600 m above m.s.l. And flows in the eastern direction to join the main River Mahi on the right bank 6.3 km upstream of Paderdibadi site in Dungarpur district of Rajasthan. Its total length is about 155 km. The total drainage area of Som is 8707 sqkm Gomti & Jakham are the major right bank sub tributaries of Som.

Anas

This is a left bank tributary of Mahi. Anas River rises near kalmora on the northern slopes of vindhyas in jhabua district in Madhya Pradesh at an elevation of 450 m above m.s.l. And flows in the north - west direction and joins the main River Mahi on left bank in the Dungarpur district in Rajasthan. It has a total length of about 156 km and the total drainage area of 5604 sqkm.

Panam

This is a left bank tributary of Mahi. Panam River rises near Bhadra on northern slopes of the vindhyas near jhabua district in Madhya Pradesh at an elevation of about 300 m above m.s.l. And flows in the north - west direction and joins the main River on the left bank in the panchmahal district of Gujarat . It has a total length of about 127 km and drainage area of about 2470 sqkm.

A line diagram of river system giving information of Mahi basin and its tributaries and sub tributaries etc. indicating location of major structures is enclosed as **Plate - 2.1.2.**

2.1.3 Cimatic characterstics

The Mahi Basin experiences 3 marked seasons – Summer (March-May), Monsoon (June-Sep) & Winter (Oct-Feb). From the available data & record, the Basin contains two climatic regions, the northern part of the Basin comprises sub tropical wet climate (generally Basin area occupied by Rajasthan). The major part of Basin comprises tropical wet climate, caused mainly due to existence of vindhyas & the Western ghats. Due to relatively high elevation in forest land, the area of the Basin near the origin of the River experiences relatively cooler & moderate rainfall climate which gradually

changes to warm & dry climate as the River flows northwards entering into & flowing through Rajasthan. After the River bends south westwards and enteRs Gujarat the climate gradually changes towards tropical wet climate again.

Temperature (°c) during year 2011-12

Year	Chakaliya		Mataji		Khanpur		Paderdibadi		Dharaiwad		Rangeli	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
2011-12	46	16	44	3	42	7	47	8	44	12	41	9

2.1.4 Rainfall

The average rainfall in the Mahi Basin is 785 mm. The south - west Monsoon sets in by the middle of June and withdraws by the first week of October. About 90 percent of total rainfall is received during the Monsoon months of which 50 percent is received during July and August. Rainfall is mainly influenced by the southwest Monsoon. The effect is most pronounced in Vadodara lying on the windward side of the Western Ghats. Ratlam also receives similar rainfall, lying between the arravalli and hill ranges north of western-ghats. Monsoon contributes nearly 91-94% of annual precipitation in vadodara & ratlam respectively.

Mean annual rainfall in mm Mahi Basin CWC sites

Name of site	Data available (No of years)	Average rainfall (mm)	Average no. of rainy days	Rainfall during water year 2011-12	No of rainy days 2011-12
Chakaliya	21	728	39	953	49
Mataji	23	878	36	1191.2	53
Khanpur	23	946	43	780.6	46
Paderdibadi	27	751	39	889.4	42
Dharaiwad	23	819	55	1170.4	65
Rangeli	12	732	37	1183.2	55
Mahi dam	10	980	44	964.2	55
Som kamla amba dam	10	730	43	1155	43
Kadana dam	11	847	41	730.2	46
Anas ph-2	10	717	41	665.2	42

Panam dam	10	942	51	1098	60
Wanakbori weir	10	1002	45	822	52

2.1.5 Wind

Average wind speed is the lowest in Udaipur & the highest in dahod. In general, wind speed is the lowest in post Monsoon period (oct-nov) & the highest in June. The predominant wind direction is from west in ratlam & dahod from northwest in Udaipur and southwest in vadodara. The wind direction remains uniform from post Monsoon till early winter i.e. Oct – Feb. Change of direction takes place in march/april. In ratlam, vadodara & dahod the dominant wind direction is from north east and east respectively during post Monsoon and in winter changes to westerly and south westerly. In Udaipur, the post Monsoon and winter wind direction is from north & North West which changes to south-westerly & westerly during the remaining part of the year.

2.1.6 Geology

Hydro geologically the River Basin is categorised by two distinct units

1. **Consolidated formation**

This hydro geological unit is mainly dominated by basaltic lava flows associated with inter trappean, infratrappean and Archean rock formation represented by phyllites, gneisses, quartzite & granites. MP, Rajasthan & north eastern parts of Gujarat are mainly underlain by consolidated rocks.

2. Unconsolidated formation

Ground water occures under water table and inconfined condition in the bed of sand, kankar & gravel that constitutes the alluvial aquifers occurred as discontinuous beds of varying thickness in hard rocks- terrain in the north & northeastern part of Basin.

The valley-fills that are having good ground water potential are quite prominent and significant in the hard rock areas in the district of Jhabua, Chittorgarh, Udaipur, Banswara & Panchmahal. The southern part of the Basin is occupied by quaternary, post Miocene and tertiary sediment deposited over a sinking basement between two major structurally controlled lineaments.

2.1.7 Description of the water storage / diversion structures

At present, there are 15 completed major/medium irrigation/multi purpose projects in Mahi Basin.

List of existing projects (State irrigation) in Mahi Basin

Sl. No	Name of project	River	Storage capacity (Mm3)		Purpose
			Gross	Live	
1	Mahi bajaj sagar	Mahi	2180	1712	Multi-purpose
2	Kadana	Mahi	1542	1203	Multi-purpose
3	Panam	Panam	735.8	679.2	Irrigation \ water supply
4	Jakham	Jakham	141.9	131.6	Irrigation
5	Machhan nalla	Machhan	37.91	29.16	Irrigation
6	Wanakbori weir	Mahi	41.884	36.224	Irrigation
7	Jaisamand	Gomti	414.6	296.1	Irrigation flood control
8	Hadaf	Hadaf	32.26	25.02	Irrigation
9	Kabutary	Kabutary	9.58	8.07	Irrigation
10	Bhadar	Bhadar	46.72	40.06	Irrigation
11	Umaria	Hadaf	13.53	11.67	Irrigation
12	Edalwada	Naleshvar	11.33	10.50	Irrigation
13	Nagalia weir	Jakham			Irrigation
14	Karmai weir	Karmai			Irrigation
15	Somkamala amba	Som	126.06	125.83	Irrigation

Salient features of major/important projects viz Mahi Bajaj Sagar, Kadana reservoir, Wanakbori weir & Panam reservoir are as follows.

Mahi Bajaj Sagar project

This project is located across River Mahi near village barekhera about 16 km north - east of banswara town in Rajasthan. It has a catchment area of 6149 sqkm The project comprises of a composite dam of earth fill and masonry having crest length of about 2800 m, having spillway length of 300 m in the River gorge. The maximum height of the earthen dam is 43 m and masonry dam is 65.5 m. The live storage capacity of reservoir is 1712 Mm3. The benefits of this project are irrigation, hydropower generation, fisheries and water supply.

Kadana reservoir project

Kadana dam is located in gorge cut by Mahi River through a low range of hills in dahod of Gujarat state just near the border with Rajasthan. The catchment area up to this project is 25,520 sqkm And catchment area intercepted at banswara in Rajasthan is 6149 sqkm The dam is composite earth fill and masonry gravity structure rising 58 m above the stream bed with the top length of dam about 1551 m with main spillway of 406 m in River gorge portion and 113 m long additional spillway in right bank. The effective storage capacity of kadana reservoir is 1203 Mm3. The benefits of this project include irrigation facilities for 12795 ha and hydro - power generation by installation of 4 nos reveRsible turbines of capacity 60 m.w. Each, with a total capacity of 240 m.w. The total estimated cost of this project is Rs.101.86 crores, out of which Rs.49 crores are for hydro power generation.

Wanakbori weir

The weir is constructed across River Mahi near wanakbori village, balasinnor tehsil of district Kheda in Gujarat . The weir is also known as Mahi stage i project. The catchment area up to this project is 30,665 sqkm.The length at the top of dam is 796 m and maximum height above lowest point oF Foundation is 25 m. It has an ogee type spillway of 735 m length. The effective storage capacity of this composite dam is 36.24 Mm3. The benefit of this project is irrigation for 3, 15,790 ha. The cost of the project is Rs.46.53 crores. The storage capacity of dam is increased to rl 69.240 m by providing fuse gates 33 no which will not result in any increase of HFL.

Panam project

The project is located in village kel dezar of tehsil santrampur in dahod district of Gujarat across River panam, a tributary of River Mahi. The length at the top of masonry dam functioning as ogee spillway is 182 m and maximum height above the lowest point oF Foundation is 56.36 m. It has a catchment area of 2314 sqkm.The live storage capacity of the reservoir is 679.2 Mm3. The purpose of this project is irrigation for 58,273 ha, water supply, power generation and fisheries. The total estimated cost of the project is Rs.5989.5 lakhs.

2.1.8 Streamflow data

Hydrological observation by CWC

In Mahi Basin, CWC is conducting hydrological observations at 6 sites .Detailed salient features and the availability of data of these gauge and discharge observation sites are given in following tables.

Salient features of sites maintained by CWC in Mahi Basin

Sl.no	Name of site	Station code	Scheme	Type
1.	Mahi at Mataji	01 02 13 001	NNW	GDSWQ
2.	Jakham at Dhariwad	01 02 13 004	F F	GD
3.	Som at Rangeli	01 02 13 005	80 key	GDWQ
4.	Mahi at Paderdibadi	01 02 13 006	80 key	GDSWQ
5.	Anas at Chakaliya	01 02 13 007	163 key	GD
6.	Mahi at Khanpur	01 02 13 012	80 key	GDSWQ

Location name	Local River	Lat. D M S	Long. D M S	Stn. Parameters				Type of gauge	Mode of Discharge Measurement
				Met	Hydro	WQ	Silt Lab		
Mataji	Mahi	23 20 57	74 43 31	SRG	GDS	WQ	Silt lab	Staff G	Wading, bridge, boat, float
Mahi dam	Mahi	23 37 43	74 32 50	SRG	G			Staff G	Dam site
Rangeli	Som	23 52 22	74 13 25	SRG	GD	WQ		Staff G	Wading, bridge, float
Som kamala amba dam	Som	23 58 36	74 02 00	SRG	G			Staff G	Dam site
Dhariwad	Jakham	24 04 43	74 28 02	SRG	GD			Staff G	Wading, bridge, float
Paderdibadi	Mahi	23 46 03	74 08 12	SRG	GDS	WQ	Silt lab	Staff G	Wading, boat, OBE, float
Chakaliya	Anas	23 02 58	74 19 14	SRG	GD			Staff G	Wading,bridge, float
Anas Ph-2	Anas	23 21 11	74 14 07	SRG	G			Steps	Converted to gauge site only.made seasonal site w.e.f.2002
Kadana dam	Mahi	23 18 16	73 49 31	SRG	G			Staff G	Dam site and ff stn
Panam dam	Panam	23 03 14	73 43 00	SRG	G			Staff G	Dam site
Wanak bori weir	Mahi	22 56 51	73 25 46	SRG	G			Staff G	FF stn
Khanpur	Mahi	22 31 55	73 08 27	FCS	GDS	WQ	Silt lab	Staff G	Wading, float, boat

2.1.9 Data availability

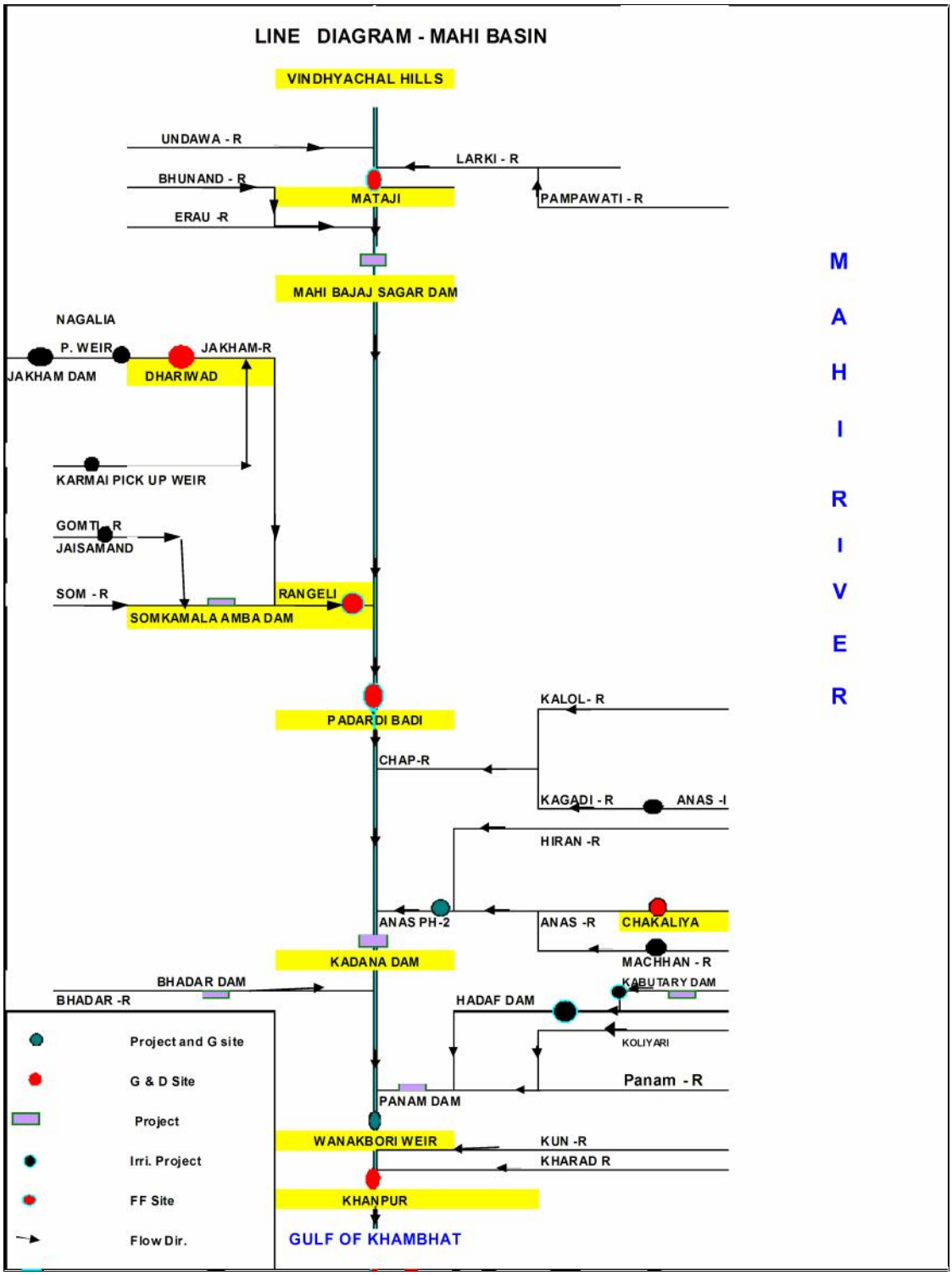
S No.	Site name	Rain Fall	Disch.	Thrice daily water Level	Hourly water level (for Monsoon period only)	Sediment	Water quality
1	Mahi at Mataji GDSWQ	June‘89	July‘82	July ‘82	July ‘82	July‘82	July‘82
2	Jakham at Dhariwad GD	June‘89	June‘84	July ‘84	July‘84	NA	NA
3	Som at Rangeli GDQ	Jan’99	July‘88	July ‘78	July‘78	NA	July ‘88
4	Anas at Chakaliya GD	July‘91	Feb‘91	Feb ‘91	June‘91	NA	NA
5	Mahi at Paderdibadi GDSWQ	Aug‘85	June‘78	Sept‘77	Sept‘77	July ‘80	July‘78
6	Mahi at Khanpur GDSWQ	June‘88	June’88	Dec ‘78	June’79	June ‘87	Jan‘79
7	Som at Som-kamala-amba dam G	Jan’95	---	Jan’95	Jan’95	---	--
8	Anas at Anas ph-2 (seasonal) G	Jun’91	---	Jun’82	Jun’85	--	--
9	Mahi at Kadana dam G	--	--	Jun’78	Jun’78	---	---
10	Panam at Panam dam G	--	--	Jun’80	Jun’80	--	--
11	Mahi at wanak bori weir G	--	--	Jun’79	Jun’79	--	--
12	Mahi at Mahi Bajaj Sagar Dam G	--	--	Jun’82	Jun’82	--	--

Plate-2.1.1

Mahi Basin



Plate-2.1.1


LINE DIAGRAM - MAHI BASIN
VINDHYACHAL HILLS
UNDAWA - R
LARKI - R
BHUNAND - R
MATAJI
PAMPAWATI - R
ERAU -R
MAHI BAJAJ SAGAR DAM
NAGALIA
P. WEIR
JAKHAM-R
JAKHAM DAM
DHARIWAD
KARMAI PICK UP WEIR
GOMTI R
JAISAMAND
SOM - R
RANGELI
SOMKAMALA AMBA DAM
PADARDI BADI
KALOL- R
CHAP-R
KAGADI - R
ANAS -I
HIRAN -R
ANAS PH-2
ANAS -R
CHAKALIYA
MACHHAN - R
KADANA DAM
BHADAR DAM
BHADAR -R
KABUTARY DAM
HADAF DAM
KOLIYARI
Panam - R
PANAM DAM
WANAKBORI WEIR
KUN -R
KHARAD R
KHANPUR
GULF OF KHAMBHAT
Project and G site
G & D Site
Project
Irri. Project
FF Site
Flow Dir.
M A H I R I V E R

2.2 Sabarmati Basin

2.2.1 Geographical description of the Basin

Sabarmati River is one of the major west flowing inter-state rivers in india, draining into the gulf of Khambhat. The Basin is bounded by Aravalli hills in the north and north-east, by ridge separating it from basins of minor streams and draining into Rann of Kachchh and Gulf of Khambhat in west and by Gulf of Khambhat in the south. It is triangular in shape with the main River as the base and the source of the Watrak as the apex point. It originates in the Aravalli hills at latitude 24^0 40'N and longitude 73^0 20'E in the Rajasthan state at an elevation of 762 m above m.s.l. The Sabarmati River has a length of 371 km and the drainage area is of 21674 sq km. Basin map of Sabarmati basin is enclosed as **Plate -2.2.1**. The State wise distribution is shown below.

Sl.no.	Name of State	River length (km)	Drainage area (sq.km)	Percentage of total
1	Rajasthan	48	4124	19
2	Gujarat	323	17550	81
	Total	371	21674	100

2.2.2 Description of River system

The Sabarmati River with its origin in Rajasthan flows generally in south – west direction. It enters the Gujarat state and passes through the plains and continues to flow in the same direction and joins the Gulf of Khambhat in the Arabian sea at the 51 km of its run, the river is joined by the Wakal on the left bank near village Ghanpankari. Flowing generally in the south – west direction at 67^{th} km of its run, it receives the Sei on the right bank near Mahauri and then the Harnav on the left bank at about 103 km. From respective sources beyond this confluence, Sabarmati flows through the Dharoil gorge. Emerging from the gorge it passes through the plains and

is joined on its left bank at about 170 km from its source by the Hathmati, which is its major tributary. Continuing to flow in south – west direction, the River passes through Ahmedabad and about 65 km down stream, another major tributary, Watrak joins its on the left bank, flowing for a further distance of 68 km, the River outfalls in the gulf of Khambhat in Arabian sea.

Description of tributaries

Sei

This is a right bank tributary of Sabarmati River. It rises in the Aravalli hills in Rajasthan and flows in south – west direction for a total distance of 95 km before it joins on its right bank. It drains an area of 946 sq km.

Wakal

This is a left bank tributary of Sabarmati River. It rises in the Aravalli hills in Rajasthan and flows in south – west direction for a total length of 88 km. It joins Sabarmati on its left bank. It drains an area of 1625 sq km. The menas is its main tributary.

Harnav

This is a left bank tributary of Sabarmati River. It rises in the northern portion of the Kulalia hills of Rajasthan ranges and flows in south – west direction for a total distance of 75 km. Harnav joins the left bank of Sabarmati. It drains an area of 972 sq km.

Hathmati

This is a left bank tributary of Sabarmati River this is a left bank tributary of Sabarmati River it rises in southwest foot hills of Rajasthan range in Gujarat state and flows in south west direction for a distance of 122 km to meet the Sabarmati on its left bank.this tributary drains an area of 1526 sq km.

Watrak

This is a left bank tributary of Sabarmati River it rises in panchara hills in Dungarpur district of Rajasthan and flows in southwest direction for a distance of 248 km and

joins Sabarmati on the left bank.Watrak and its tributaries drain an area of 8638 sq km.

A line diagram of river system, giving information of Sabarmati Basin, its tributaries and sub tributaries etc. indicating the location of major structures is enclosed as **Plate -2.2.2.**

2.2.3 Climatic characterstics

The Sabarmati Basin experiences 3 marked seasons – summer (March-May), Monsoon (June-Sep) & winter (Oct-Feb). From the available data & record, the Basin contains two climatic regions, the northern part of the Basin comprises sub tropical wet climate (generally Basin area occupied by Gujarat). The major part of Basin comprises tropical wet climate causes mainly due to existence of Aravalli & the Western ghats. The climate varies from arid in the Saurastra area to semi –arid in north Gujarat to humid in coastal areas

Temperature (°c) during year 2011-12

Year	Jotasan		Kheroj		Derol Bridge		Ratanpur		Kheda	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
2011-12	42	2	44	4	44	5	45	7	39	16

2.2.4 Rainfall

Rainfall varies from a meager few mm in Saurastra to over 1000 mm in southern part.the average annual rainfall in the Sabarmati Basin is about 787.5 mm the south - west Monsoon sets in by middle of June and withdraws by the first week of October. The rainfall is mainly influenced by the southwest Monsoon.

Mean annual rainfall in mm Sabarmati Basin CWC sites

Name of site	Data available (No of years)	Average rainfall (mm)	Average no. of rainy days	Rainfall during water year 2011-12	No of rainy days 2011-12
Jotasan	16	697	40	1013.6	45

Kheroj	23	709	43	957.4	48
Derol Bridge	23	749	40	833.2	46
Watrak dam	25	832	40	715.1	49
Raskaweir	26	625	34	372.3	35
Ratanpur	20	810	39	504.8	34
Kheda	26	735	38	526.6	37
Sei dam	11	773	42	954.6	49
Dharoil dam	11	804	44	917.6	50
Himatnagar	11	868	36	893.6	32
Voutha	4	830	34	796.3	38
Subhash bridge	3	721	37	699.4	36

2.2.5 Wind

Average wind speed is the lowest in Udaipur & higher in Ahmedabad district. In general, wind speeds are taken to be moderate over most of the months.

2.2.6 Geology

Hydro geologically the River Basin is categorised by two distinct units

1. Consolidated formation

This hydro geological unit is mainly dominated by basaltic lava flows associated with inter trappean, infratrappean and archean rock formation represented by phyllites gneisses, quartzite & granites. Consolidated rocks mainly underlie north-eastern part of Gujarat

2. Unconsolidated formation

Ground water occures under water table and in confined condition in the bed of sand, kankar & gravel that constitutes the alluvial aquifers occurred as discontinuous beds of varying thickness in hard rocks- terrain in the north & north eastern part of Basin. The valley-fills that are having good ground water potential are quite prominent and significant in the hard rock areas in Udaipur.

In the northern part of the Basin, including areas in Rajasthan and those in sabarkantha district the aquifers available are the highly jointed and fractured or extensively weathered rock zones. Wells tapping some thick rock-formations of this type yield as much as 1, 00,000 litres per hour though – 40,000 litres per hour would be more common. Such aquifer of moderate potential is available within 100-150 m below GL and even as closed as at 30-40 m depth if one was especially fortunate.

The parts of the Basin in Kheda and Surendranagar district have only limited ground water potentials comparable to that in northern parts of the Basin and good confined aquifeRs are not available. The phreatic aquifeRs in the alluvial strata are only suited for shallow wells and low yields tube wells.

2.2.7 Description of the water storage / diversion structures

At present there are 13 completed major / medium irrigation schemes which are listed in the following table.

Existing projects in Sabarmati Basin

Sl. No.	Name of project	River	Storage capacity (Mm3)		Purpose
			Gross	Live	
1	Sei dam	Sei	31.34	24.16	DiveRsion
2	Dharoil dam	Sabarmati	907.88	731.99	Irri.water
3	Harnav i	Harnav	----	----	Supply
4	Harnav ii	Harnav	21.67	19.97	Irrigation
5	Guhai	Guhai	62.34	57.04	Irrigation
6	Hathmati	Hathmati	161.0	153.0	Irrigation
7	Meshwo	Meshwo	82.00	77.00	Irri.& flood control

8	Mazam	Mazam	43.86	36.58	Control
9	Watrak	Watrak	176.9	154.3	Irrigation
10	Waidy	Suron	13.60	12.30	Irrigation
11	Raska weir	Meshwo	----	----	Irrigation
12	Moti fatewadi	Sabarmati	----	----	Irrigation
13	Vasana barrage	Sabarmati	----	----	Irrigation

Salient features of important major irrigation schemes namely Dharoil project and Watrak project are as follows.

Dharoi project

The project is located on Sabarmati River at Dharoil village of kheralu thehsil in Mehsana district of Gujarat. This comprises of a composite dam, having earthen dam of 843 m length with central spillway of 219 m. The maximum height from deepest foundation level for masonry dam is 52.00 m and for earth dam is 31 m. The catchment area up to project is 5475 sq km. The live storage capacity of the dam is 731.99 Mm3. The total estimated cost of the project is Rs.96 crores. The direct benefits of the project are water supply for Ahmedabad city, and providing irrigation facilities to an area of 42800 ha. The project also supports existing irrigation under fatewadi canal system. The indirect benefit of the project is flood control. There is provision for 1.4 m.w. Hydro - power generations also.

Watrak project

This project is located in village Pahadia of Malpur teh. In district Sabarkantha of Gujarat. The project envisages construction of a composite dam across Watrak River having ogee type spillway of length 89 m. The length at top of dam is 313 m and maximum height above the lowest point of Foundation is 43.31 m. The catchment area of this project is 1114 sq km. The live storage capacity of the reservoir is 154.3

Mm3. The purpose of this project is irrigation for 25914 ha. The estimated cost of the project is Rs.47.58 crores.

2.2.8 Streamflow data

Hydrological observation by CWC.

In Sabarmati Basin, the CWC is conducting gauge and discharge observations at 6 sites. The details of these sites alongwith salient features in Sabarmati Basin are given in the following tables.

Sl.no	Name of site	Station code	Scheme	Type
1.	Wakal at Jotasan	01 02 12 001	F F	GD
2.	Sabarmati at Kheroj	01 02 12 003	F F	GD
3.	Sabarmati at Derol Bridge	01 02 12 006	F F	GDSWQ
4.	Watrak at Ratanpur	01 02 12 010	F F	GD
5.	Watrak at Kheda	01 02 12 012	F F	GD
6.	Sabarmati at Vautha	01 02 12 013	163 key	GDWQ

Salient features of sites maintained by CWC in Sabarmati Basin

Sr No	Name	Local River / tributory	Lat. N	Long. E	Stn Parameters			Silt Lab	Type of gauge	Mode of Discharge Observation
			D M S	D M S	Met	Hydro	WQ			
1	Jotasan	Wakal	24 21 20	73 10 05	SRG	GD			Staff G	Wading,boat, float
2	Sei dam	Sei	24 45 39	73 19 05	SRG	G			Staff G	Dam sie

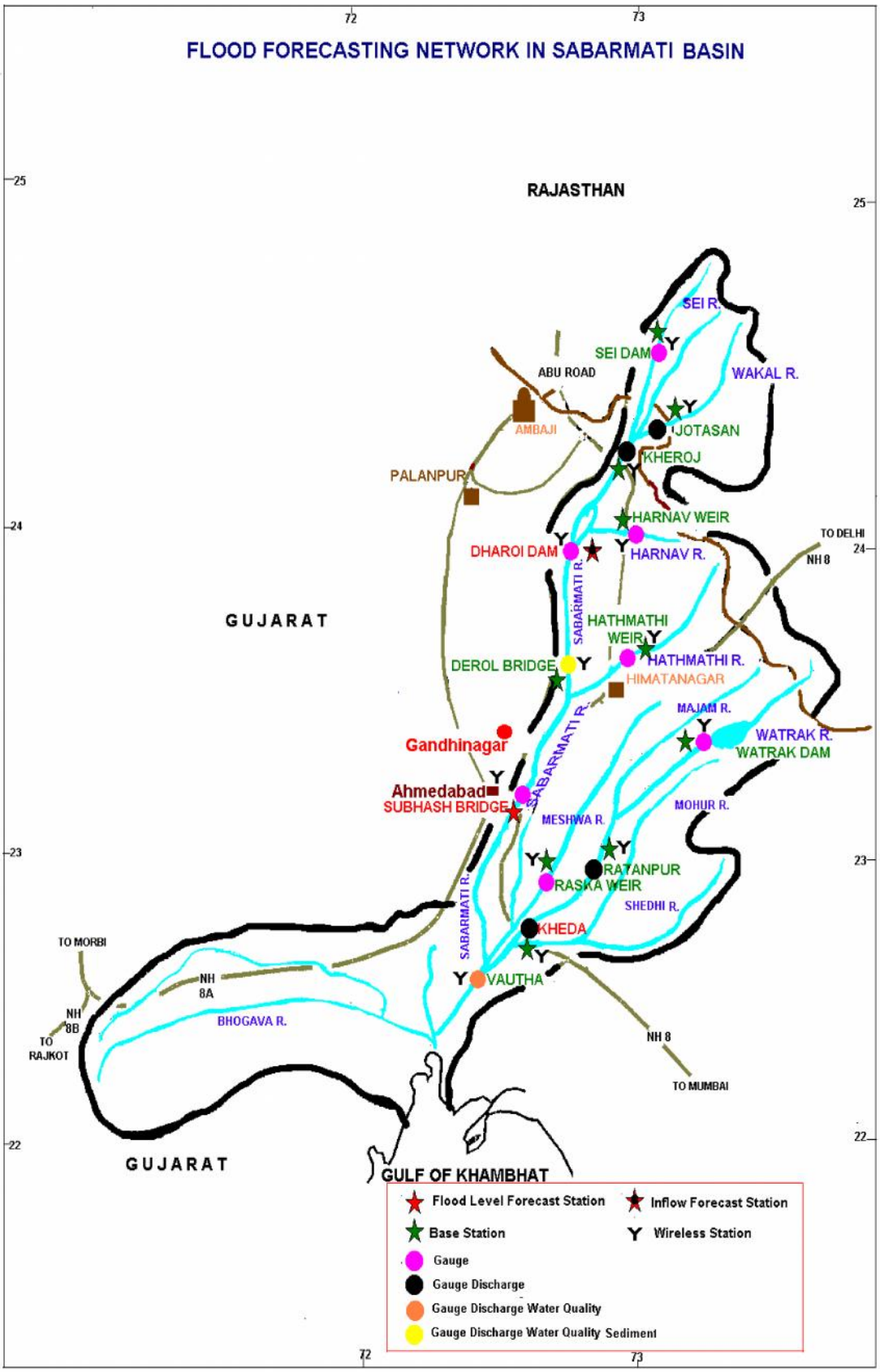
3	Kheroj	Sabarmati	24 13 45	73 00 26	SRG	GD			Staff G	Wading, boat, float
4	Harnav weir	Harnav	24 01 49	73 10 23	SRG	G			Staff G	Weir site
5	Dharoil dam	Sabarmati	24 00 13	72 51 24	SRG	G			Staff G	Ff stn dam site
6	Hathmati weir	Hathmati	23 36 20	72 58 00	SRG	G			Staff G	Weir site
7	Derol Bridge	Sabarmati	23 34 24	72 48 25	SRG ARG	GDS	WQ	Silt lab	Staff G	Wading, bridge, float
8	Subhash bridge	Sabarmati	23 03 35	72 35 14	SRG	G			Staff G	Ff stn
9	Raska weir	Meshwa	22 54 19	72 44 30	SRG	G			Staff G	Weir site
10	Watrak dam	Watrak	23 18 53	73 25 00	SRG	G			Staff G	Dam site
11	Ratanpur	Watrak	22 58 31	72 53 02	SRG	GD			Staff G	Wading, bridge float
12	Kheda	Watrak	22 44 45	72 40 49	SRG	GD			Staff G	Wading, bridge float
13	Vautha	Sabarmati	22 38 59	72 32 08	Na	GD	WQ		Staff G	Wading, boat, float

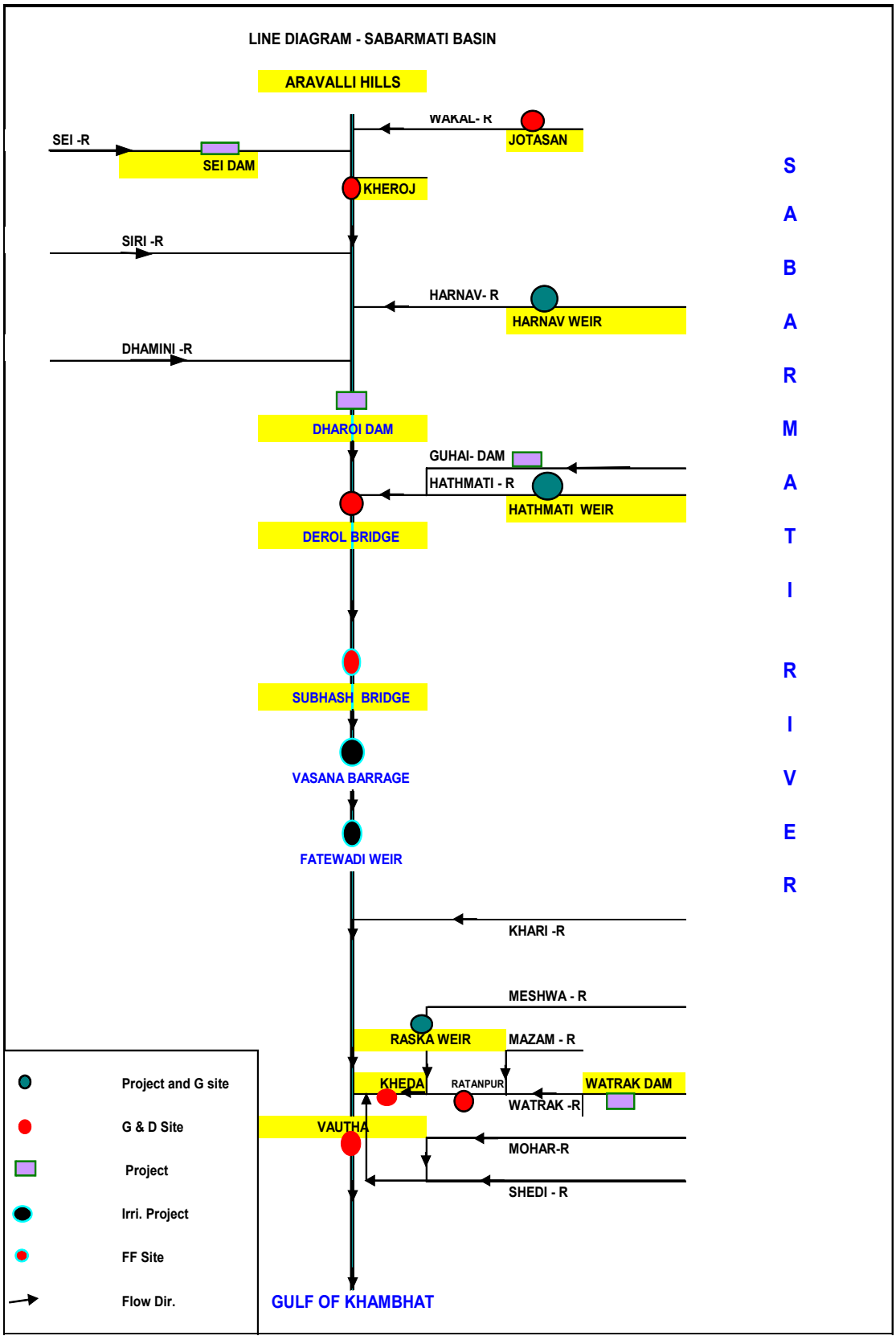
2.2.9 Data availability

Sl. No	Site name	Rain fall	Disch.	Thrice daily water level	Hourly water level (Monsoon period only)	Sediment	Water quality
1	Sabarmati at Jotasan GD	June‘94	June‘95	June‘95	June ‘95	N A	N A
2	Sabarmati at Kheroj GD	June‘88	June‘81	June‘81	June ‘81	N A	N A
3	Sabarmati at derol GDSQ	June‘88	June‘91	Aug‘80	Aug.80	Sept 92	July 92
4	Watrak at Ratanpur GD	Aug‘85	July ‘89	Mar‘85	June ‘85	N A	N A
5	Watrak at Kheda GD	Jun ‘88	July ‘89	Aprl‘85	June ‘85	N A	N A
6	Sabarmati at Vautha GDQ	N A	June2000	June2000	June2000	N A	June2000
7	Sei dam G	Jun’90	--	Mar’79	Mar’79	---	---
8	Harnav weir G	Jun’79	---	Jul’79	Jul’79	--	--
9	Dharoil dam G	Jun’89	--	Dec’78	Dec’78	--	--
10	Hathmati weir G	Feb’85	--	Jun’80	Jun’80	--	--
11	Subhash bridge G	--	--	Jul’79	Jul’79	--	--
12	Raska weir G	Nov’84	--	Nov’84	Nov’84	--	--
13	Watrak dam G	Jul’85	--	Jul’85	Jul’85	--	--

Plate- 2.2.1

Sabarmati Basin




LINE DIAGRAM - SABARMATI BASIN
ARAVALLI HILLS
WAKAL- R
JOTASAN
SEI -R
SEI DAM
KHEROJ
SIRI -R
HARNAV- R
HARNAV WEIR
DHAMINI -R
DHAROI DAM
GUHAI- DAM
HATHMATI - R
HATHMATI WEIR
DEROL BRIDGE
SUBHASH BRIDGE
VASANA BARRAGE
FATEWADI WEIR
KHARI -R
MESHWA - R
RASKA WEIR
MAZAM - R
KHEDA
RATANPUR
WATRAK DAM
WATRAK -R
VAUTHA
MOHAR-R
SHEDI - R
GULF OF KHAMBHAT
SABARMATI RIVER
Project and G site
G & D Site
Project
Irri. Project
FF Site
Flow Dir.

2.3 Luni Basin

2.3.1 Geographical description of the Basin

Luni is the only River Basin of any significance in western Rajasthan, which forms the bulk of arid zone. Luni originates from western slopes of the Aravalli ranges at an elevation of 772 m above m.s.l. near Ajmer flowing in south west direction and traversing a course of 511 km in Rajasthan, it finally flows into the Rann of Kachchh. Most of its tributories drain the steep north-west of Aravalli hills and join it on left side. Its total catchment area falls in Rajasthan. Luni Basin is situated in between 24^0 11' to 26^0 43' north latitude and 70^0 37' to 74^0 39' east longitude approximately. The peculiarity of this River is that it tends to increase its width rather than deepening the bed because the banks are of soils, which are easily erodable whereas beds are of sand. The floods develop and disappear so rapidly that they have no time to scour the bed. The Aravalli ranges form its east boundary whereas main course of River in Barmer district itself forms north boundary and mostly Banas and initial reach of Chambal River form its southern boundary. Basin map of Luni Basin is enclosed as **Plate -2.3.1**

2.3.2 Description of River system

Luni receives all the main tributaries on its left bank except one i.e. Jojari (Mithri) on the right bank. Luni receives ten tributories namely Lilari, Guhiya, Bandi (Hemawas), Sukri (Hemawas), Sukri, Mithri, Jawai, Khari Bandi, Sukri Bandi and Sugi. Drainage on the left bank of Luni is, therefore, more extensive than on right bank. The Luni drains an area of 32879 sq km in Rajasthan State only.

The catchment area of the Basin up to chittalwana is 32661 sq km. The remaining catchment area of the Luni Basin below chittalwana and up to rann of kachchh is only 218 sq km which is delta where the water spreads out and does not contribute any runoff. The total available runoff From entire Luni Basin is 788 Mm^3, out of which guhiya, Jojari (Mithri), Bandi (Hemawas) and Jawai tributaries contribute runoff of 116 Mm^3, 64 Mm^3, 120 Mm^3 and 125 Mm^3 respectively. The catchment area, length and elevation of source of important tributaries are shown below.

S.no	Name of River	Bank	Elevation of source above m.s.l. (m)	Length (km)	Catchment area (sqkm)
1	Luni	Main	737	511	32879
2	Jojari (mithri)	Right	312	83	1060
3	Lolari	Left	731	60	1611
4	Guhiya & Sukri (hemavas)	Left	237	125	4126
5	Bandi (Hemavas)	Left	935	135	3016
6	Sukari	Left	995	140	3280
7	Mithri	Left	459	71	2637
8	Jawai	Left	1099	145	2701
9	Khari bandi	Left	701	84	2671
10	Sukri bandi	Left	588	85	1161
11	Sugi	Left	688	80	1370

A line diagram of River system giving information of Luni Basin & its tributaries and sub tributaries etc is enclosed as **Plate -2.3.2.**

2.3.3 Climatic characterstics

Temperature (°c) during year 2011-12

Year	Balotra		Gandhav	
	Max	Min	Max	Min
2011-12	47	4	48	3

2.3.4 Rainfall

The 50 cm isohyet approximately follow Aravallies range and is dividing line between arid and semi arid in the west and sub humid in the east and south east. The rainfall is erratic and its distribution is uneven in the catchment.

Mean annual rainfall in mm Luni Basin CWC sites

Name of site	Data available (No of yeaRs)	Average rainfall (mm)	Average no. of rainy days	Rainfall during water year 2011-12	No of rainy days 2011-12
Balotra	12	271	17	380.2	23
Gandhav	10	454	24	713.7	32

2.3.5 Geology

Aravallies form the wateRshed boundary that divides the state virtually into two broad physio-climatic zones i.e. Arid and semi arid. The arid zone that lies to the west of Aravallies (whole Luni Basin) is covered by vast stretches of sand intercepted by numerous hillocks of low elevation. The North West part of Aravallies shows discontinuity and is full of wide gaps enabling penetration of western sand dunes to east. The drainage system mostly continues to the eastern half of the state; most of the easterly flowing streams drain into Chambal River. On west of Aravallies, only Luni has outlet to the Rann of kachchh.

2.3.6 Description of the water storage / diveRsion structures

No major irrigation structure exists in the Luni Basin. However, there is a net deficit of the available runoff due to all existing/under construction /proposed schemes in Luni Basin. Below table shows the salient features of Some of the important irrigation schemes.

Description	**Jawai dam**	**Jaswant sagar dam**	**Hemawas**	**Sardar samand**	**Banki bund**
T ehsil	Bali	Bilara	Pali	Sojat	Ahore
District	Sirohi	Jodhpur	Pali	Pali	Jalore
Latitude	24^0 06’40”	26^0 44’45”	25^0 44’00”	25^0 26’54”	24^0 42’00”

Longitude	73^0 09'00"	72^0 44'45"	73^0 20'00"	73^0 20'58"	72^0 53'00"
C.a.(sq km)	787	3367	1124	2072	1716
C.c.a. (ha)	41300	6381	8300	10337	5235
Gross storage Mm3	198	52.8	62.5	88	48.6
Live storage capacity Mm3	184	52.6	62.5	88	34.5
Type of dam	Masonry	Earthen	Earthen	Earthen	Earthen

2.3.7 Streamflow data

Hydrological observations by CWC

In Luni Basin, the central waster commission is conducting hydrological observations i.e. Gauge and discharge observations at 2 sites. The details of the sites are given below

Sl.No.	Name of site	Station code	Scheme	Type
1.	Luni at Gandhav	01 02 01 002	NNW	GD
2.	Luni at Balotra	01 02 01 001	163 key	GD

The data of above two sites have been presented in this book. During the water year 1984-85 and 1985-86, the site Luni at Gandhav was under the administrative control of defunct Jodhpur gauging division.

Salient features of sites maintained by CWC in Luni Basin

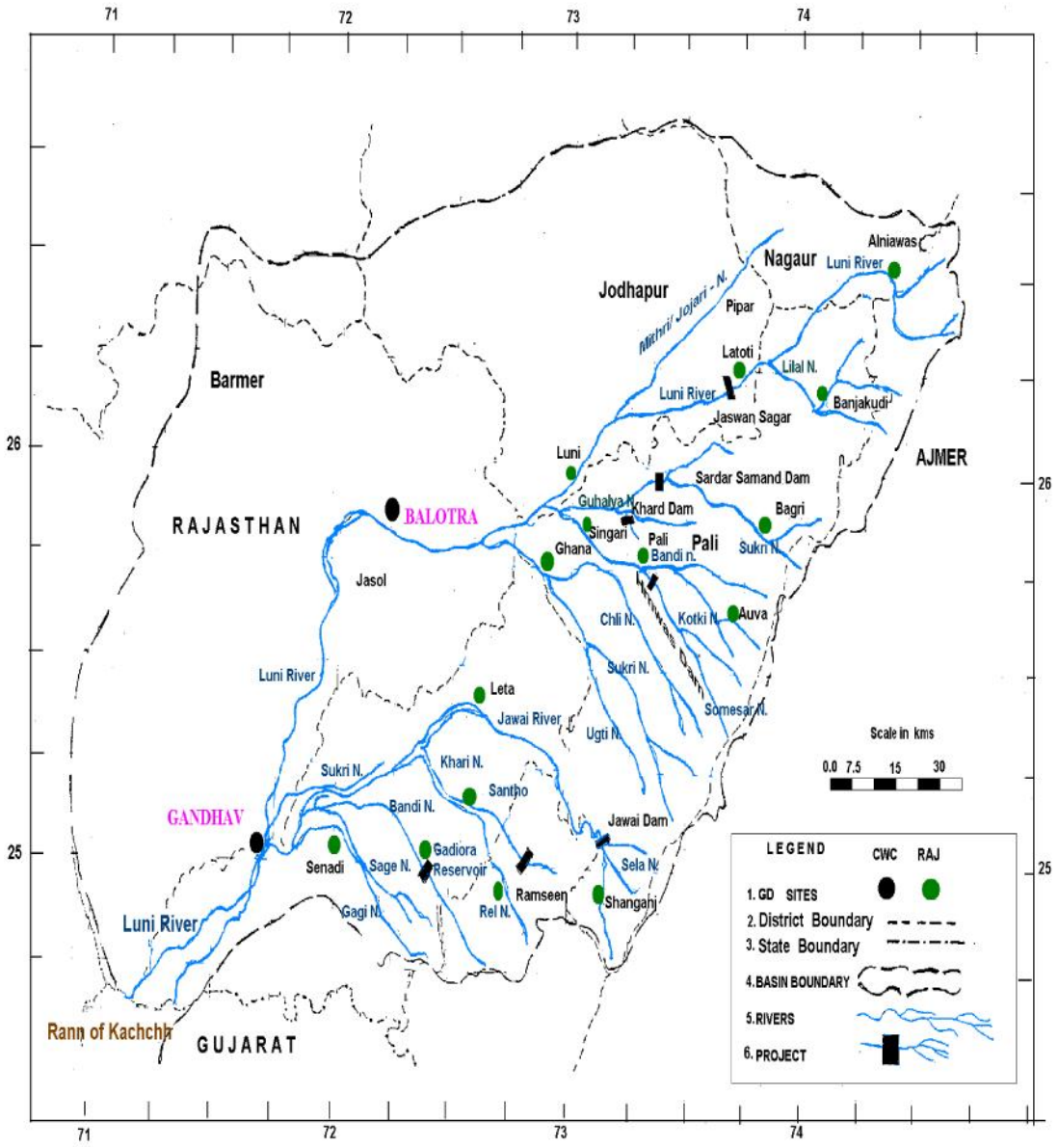
Sr No	Name	Local River	Lat. D M S	Long. D M S	Stn Parameters Met	Stn Parameters Gauge	Type of gauge	Discharge Measurement
1	Gandhav	Luni	24 59 22	71 40 47	SRG	GD	Staff G	Wading, bridge, float
2	Balotra	Luni	25 49 18	72 13 23	SRG	GD	Staff G	Wading, float

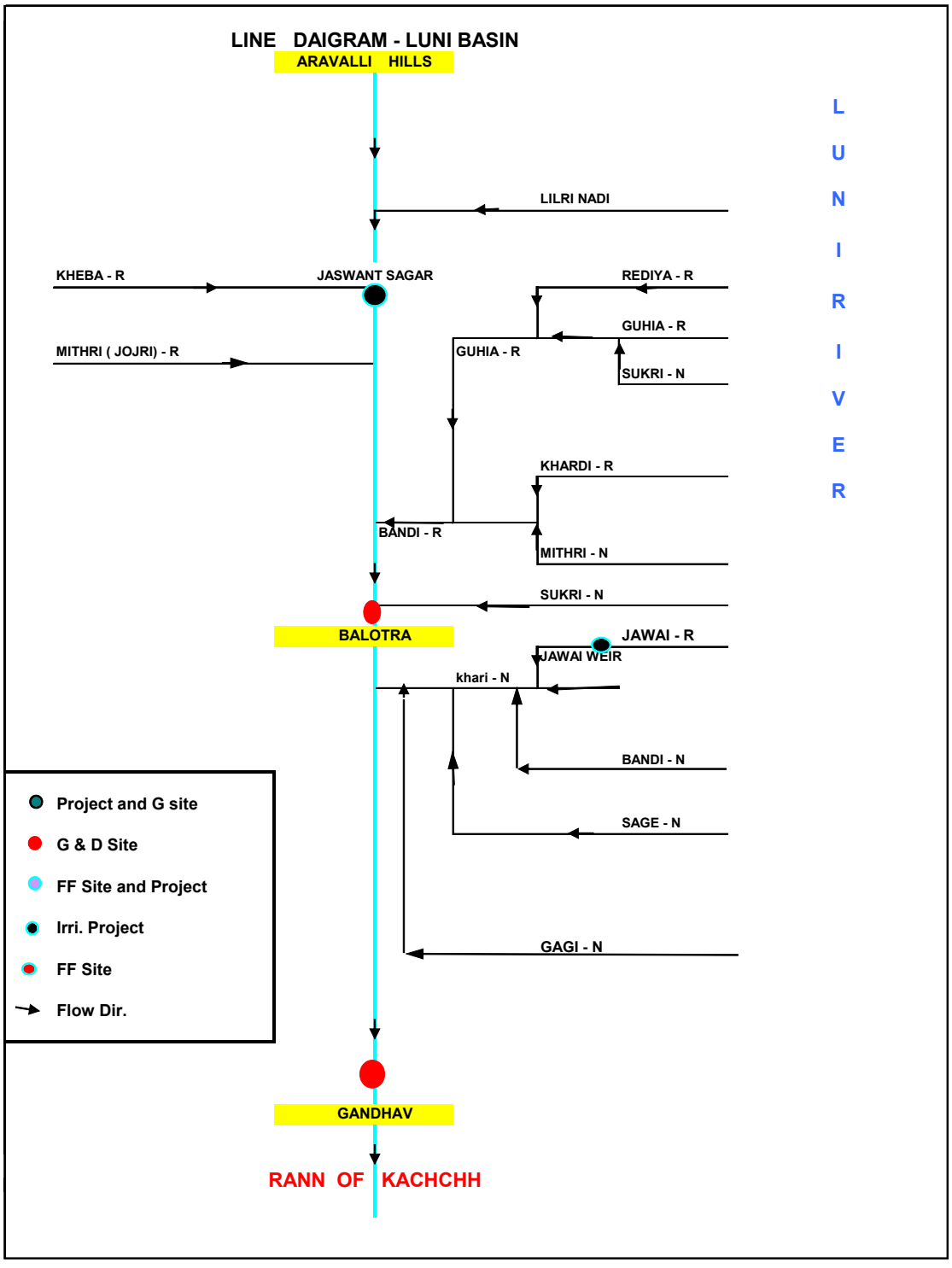
2.3.8 Data availability

Sl No	Site name	Rain fall	Discharge	Thrice daily water level	Hourly water level (for Monsoon period only)
1	Luni at Gandhav GD	Jan'99	June '74	June '74	June '74
2	Luni at Balotra GD	July'90	July '90	July '90	July '90

Plate-2.3.1

Luni Basin




LINE DAIGRAM - LUNI BASIN
ARAVALLI HILLS
LILRI NADI
KHEBA - R
JASWANT SAGAR
REDIYA - R
GUHIA - R
MITHRI (JOJRI) - R
GUHIA - R
SUKRI - N
KHARDI - R
BANDI - R
MITHRI - N
SUKRI - N
BALOTRA
JAWAI - R
JAWAI WEIR
khari - N
BANDI - N
SAGE - N
GAGI - N
GANDHAV
RANN OF KACHCHH
L U N I R I V E R
Project and G site
G & D Site
FF Site and Project
Irri. Project
FF Site
Flow Dir.

2.4 Banas Basin

2.4.1 Geographical description of the Basin

Banas River originates from Aravalli hills and descends in a south-western direction through Rajasthan state and travels through Banaskantha and Mehsana district of Gujarat before it drains into little Rann of Kutchh. The Banas Basin is the northern Basin and is situated between 23^0 30' 24^0 55' north latitudes and 71^0 15' to 73^0 15' east longitudes approximately. Saraswati and Luni Basins form the southern and northern boundaries of this Basin. The Aravalli hills form its eastern extremity.the Banas drains an area of 8674 sq km, out of which nearly 37.69% lies in Rajasthan state and remaining 62.31% falls in Gujarat state. Basin map of Banas Basin is enclosed as **Plate -2.4.1**

The state and district wise distribution of its drainage area is shown the following table

Sl.no.	Name of state	Name of district	Length of River km	Drainage area sqkm	% of total ca
1	Rajasthan	Sirohi	78	3269	37.69
2	Gujarat	Banaskantha	119	4638	53.47
3	Gujarat	Mehasana	69	767	8.84
Total			**266**	**8674**	**100.00**

2.4.2 Description of River system

The Banas rises near Pindwara of Sirohi district of Rajasthan at an elevation of 372.51m above m.s.l. Little Rann of Kachchh is the outfall of Banas River. Sipu is the only right bank tributary of Banas, which drains into the main channel. There are 6 tributaries on the left bank of Banas River namely the batria, the sukli, the sewaran, the suket, the balaram and the Khari which drain into the main channel. Hence the draining system on the left bank of the Banas River is more extensive as compared to the right bank area. The Sipu and the Khari are the two important right and left bank tributories, which together drain nearly 37% of the total catchment area of Banas.

Sipu

Sipu is the principal trtibutary of the Banas rising from Sirohi and Mount Abu hills in Sirohi district of Rajasthan state. Abu hills fall between the Banas and Sipu sub Basin. About 30% of Mount Abu hills direct runoff drains into the Sipu River while about 70% of Mount Abu hills direct runoff flows into the Banas River. The confluence of Sipu and Banas River is 12 km downstream of Dantiwada dam.

Khari

Khari River rises from palanpur (b.k.district) and drains into the Banas River through Mehsana district at 80 km downstream of dantiwada dam.

Sukli

The Sukli tributary rises from Aravalli hills near pindwara of Sirohi district (Rajasthan) and drains into the Banas River downstream of Swaroopganj dam and 9 km upstream of Aburoad in Rajasthan.

Batria

The batria rises near ambaji hills of Aravalli range and drains into the Banas, 3km upstream of abu road. It passes through Sirohi district of Rajasthan.

Sewaran, Suket and Balaram

The Sewaran, Suket and Balaram tributaries rises near Ambaji hills of Aravalli ranges. Sewaran and suket before they both drain into Banas River 7.5 km downstream of Abu Road pass from Banaskantha and Sirohi districts. Balaram River totally drains Banaskantha district. Its confluence with Banas is 14 km upstream of Bantiwada dam. A line diagram of River system giving information of Banas, its tributaries and sub tributaries etc indicating the stations showing diversions etc enclosed as **Plate -2.4.2.**

The catchment area, length and elevation of source of the above said tributaries are indicated in the following table.

Sl.no.	Name of River	Bank	Elevation of source above m.s.l. (m)	Length (km)	Catchment area (sq km)
1	Banas	Main	372.51	266	8674
2	Sipu	Right	1150	75	1420
3	Sukli	Left	372.51	38	438

4	Batria	Left	780	24	218
5	Sewaram	Left	850	28	202
6	Suket	Left	606	15	79
7	Balaram	Left	807	40	345
8	Khari	Left	215.285	88	1391

2.4.3 Climatic characterstics

Temperature (°c) during year 2011-12

Year	Kamalpur		Chitrasani		Sarotry		Aburoad	
	Max	Min	Max	Min	Max	Min	Max	Min
2011-12	47	1	42	4	42	8	45	5

2.4.4 Rainfall

Mean annual rainfall- Banas Basin- CWC sites

Name of site	Data available (No of years)	Average rainfall (mm)	Average no. of rainy days	Rainfall during water year 2011-12	No of rainy days 2011-12	Name of site
1	Abu road	32	670	42	1056	50
2	Sarotry	23	785	42	1115.6	53
3	Chitrasani	32	684	39	1079.9	50
4	Bhakudar	27	621	32	698.4	43
5	Kamalpur	31	513	26	641.9	33
6	Dantiwada	13	597	37	882.4	44
7	Ambaji	13	728	39	1397.2	49
8	Mt.abu	13	1306	50	2137.2	55

2.4.5 Description of the water storage / diversion structures

A line diagram of River system giving information of Banas, its tributaries and sub tributaries etc indicating the stations showing diveRsions, etc is enclosed as Fig 3.4.

List of existing projects in Banas Basin

Sl.no.	Name of project	River	Storage capacity (Mm3)		Purpose
			Gross	Live	
1	Swarupgunj dam	Banas	39.05	-----	Irrigation
2	Dantiwada dam	Banas	464	444	Irrigation
3	Sipu dam	Sipu	177.8	156	Irrigation

2.4.6 Streamflow data

Hydrological observation by CWC

In Banas Basin the central water commission is conducting hydrological observation i.e. Gauge and discharge observation at 4 sites. The details of these four sites are given below.

Sl.no.	**Name of site**	**Station code**	**Scheme**	**Type**
1.	Banas at abu road	01 02 02 002	F F	GDWQ
2.	Banas at Sarotry	01 02 02 003	F F	GD
3.	Balaram at Chitrasani	01 02 02 004	F F	GDWQ
4.	Banas at Kamalpur	01 02 02 007	N.n.w	GDsWQ

Salient features of sites maintained by CWC

Sr No	Location Name	Local River	Lat. D m s	Long. D m s	Stn. Parameters			Silt lab	Type of gauge	Mode of Discharge Measurement
					Met	Gauge	WQ			
1	Swarup-ganj	Banas	24 41 28	72 55 52	SRG	G			Staff G	Weir site
2	Abu road	Banas	24 29 38	72 47 30	SRG	GD	WQ		Staff G	Wading,boat
3	Sarotry	Banas	24 22 04	72 32 48	Arg/SRG	GD			Staff G	Wading,bridge

4	Chitrasani	Balaram	24 17 20	72 29 54	SRG/arg	GD	WQ		Staff G	Wading,bridge
5	Dantiwada dam	Banas	24 20 14	72 20 17	SRG	G			Staff G	Ff stn dam site
6	Bhakudar	Sipu	24 23 56	72 18 02	SRG	G			Staff G	Dam site
7	Kamalpur	Banas	23 47 59	71 45 00	SRG	GDS	WQ	Silt lab	Staff G	Wading,float

2.4.7 Data availability

Sl No	Site name	Rain fall	Disch.	Thrice daily water level	Hourly water level (for Monsoon period only)	Sediment	Water quality
1	Banas at Aburoad GDWQ	Jun-80	July-89	May-78	Jun- 88	NA	Jul- 88
2	Banas at Sarotry GD	Jun-80	Jun-89	Jun-80	Jun-80	NA	NA
3	Balaram at Chitrasani GDWQ	Jun-80	July-90	May-78	Jun-78	NA	Jul-88
4	Banas at Kamalpur GDSWQ	Jun-81	Jul-71	July-71	Aug-71	Aug-83	Jun-73
5	Swarupganj G	--	--	Jul-89	Jul-89	--	--
6	Dantiwada dam G	Jun-85	---	Jul-78	Jul-78	--	--
7	Bhakudar dam G	Jul-85	--	Jun-79	Jun-79	---	--

Plate-2.4.1

Banas Basin

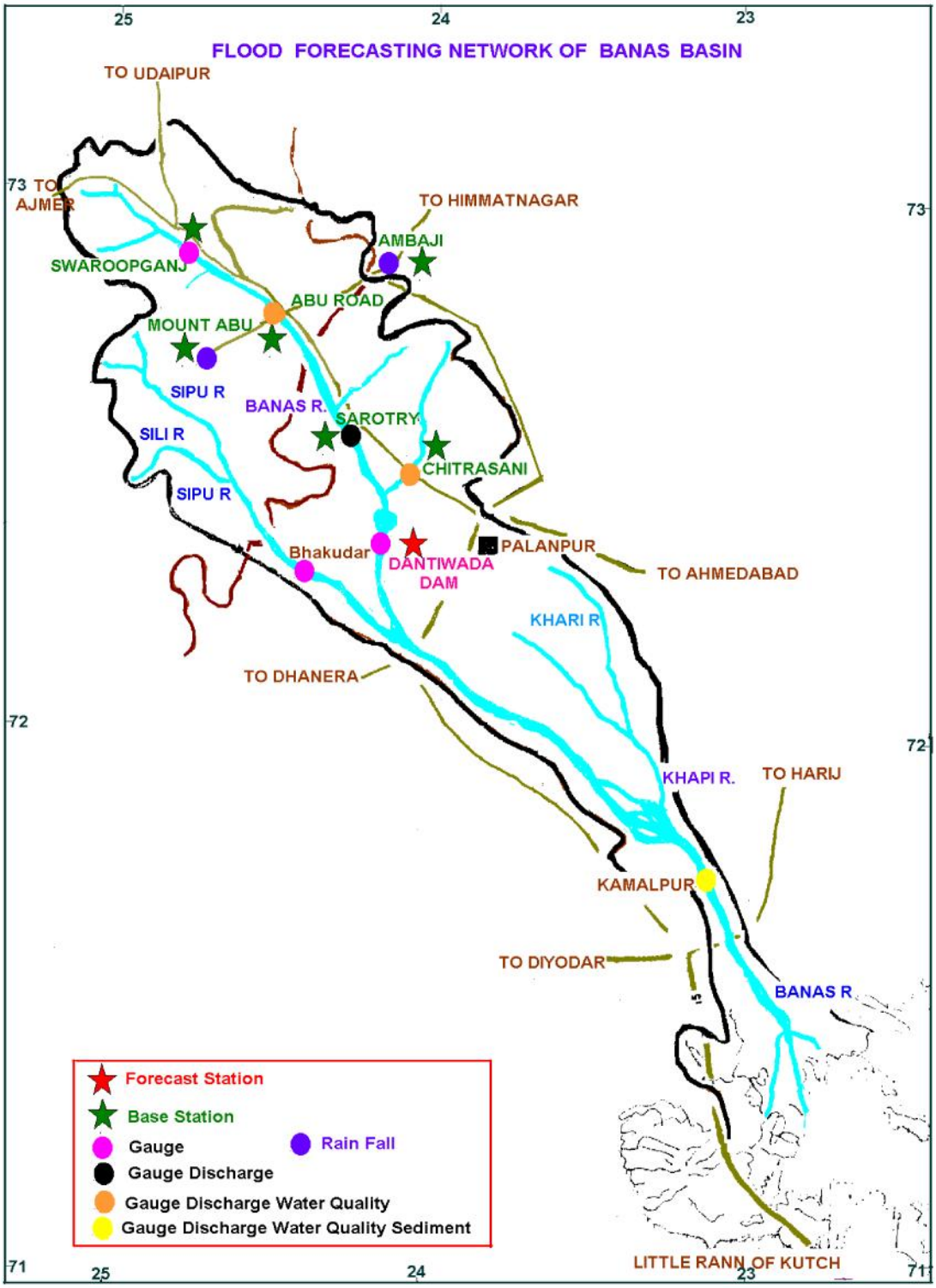
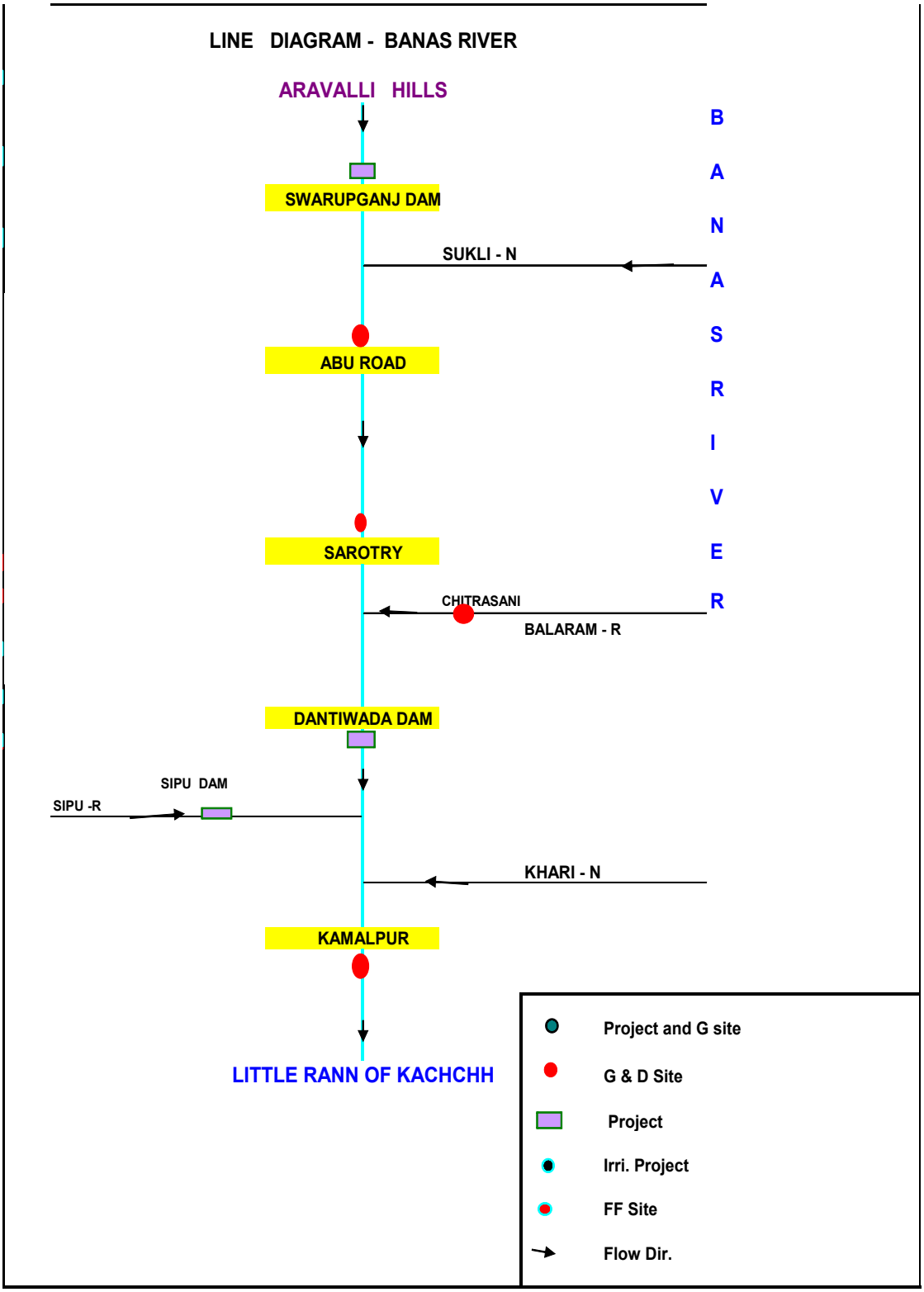


Plate-2.4.2


LINE DIAGRAM - BANAS RIVER
ARAVALLI HILLS
B
A
N
A
S
R
I
V
E
R
SWARUPGANJ DAM
SUKLI - N
ABU ROAD
SAROTRY
CHITRASANI
BALARAM - R
DANTIWADA DAM
SIPU DAM
SIPU -R
KHARI - N
KAMALPUR
LITTLE RANN OF KACHCHH
Project and G site
G & D Site
Project
Irri. Project
FF Site
Flow Dir.

2.5 Shetrunji Basin

2.5.1 Geographical description of the Basin

The Shetrunji is one of the major Rivers of Saurastra. The Shetrunji basin is the eastern most basin of Saurastra and is situated in between 21^0 00' to 21^0 47' north latitude and 70^0 50' to 72^0 10' east longitude. The river Shetrunji originates at Chachai Hills in Gir forest of Junagarh district at 380 m above m.s.l. and flows towards east direction till its fall in the Gulf of Khambhat near Santhrampur port. The river Shetrunji makes fertile the area of Amerli and Bhavnagar districts and some part of Junagarh district of Saurashtra. The Shetrunji drains an area of 5514 sq km out of which more than 50% in Amerli district. Basin map of Shetrunji Basin is enclosed is enclosed as **Plate -2.5.1**

The district wise distribution of drainage area is shown below.

Name of district	Drainage area sq km	% of total area
1. Amreli	2946.68	53.44
2. Bhavnagar	2492.88	45.21
3. Junagarh	74.44	1.350
Total	**5514.00**	**100.00**

2.5.2 Description of River system

The total length of this east flowing river from its origin to the outfall into the Gulf of Khambhat is 182 km. This river receives tidal influence for a length of 5 km from the mouth. The Shetrunji receives several tributaries on both banks. There are 9 tributaries having lengths more than 15 km. Out of which Safara, Shel, Khari and Talaji are the 4 tributaries on the right bank of Shetrunji and the remaining 5 tributaries viz Stali, Thebu, Gagadia, Rajwal and Kharo are on left bank. The drainage system on left bank of Shetrunji is more extensive as compared to the right bank area.

The Stali, Thebi and Gagadia are important tributaries feeding from left bank of Shetrunji and drain nearly 34% of total catchment area of the River Shetrunji. The Gagadia and Theli (Thebu) are the principal tributaries of Shetrunji rising from the

high ground near visavadar talukas of Junagarh district. The catchment area, length and elevation of source, of the important tributaries are tabulated in the following table

Sl.no	Name of River	Bank	Elevation of source above m.s.l. (m)	Length (km)	Catchment area(sq km)
1	Shetrunji	Main	380	182	5514
2	Satali	Left	400	35	651
3	Theli	Left	201	18	484
4	Safara	Right	250	34	226
5	Shel	Right	273	42	303
6	Gagaria	Left	180	52	754
7	Kharai	Right	211	39	665
8	Kharo	Left	125	34	261
9	Rajwal	Left	100	34	321
10	Talaji	Right	273	23	134

A line diagram of river system giving information of Shetrunji Basin, its tributaries and sub tributaries etc indicating the stations showing diveRsions etc is enclosed as **Plate -2.5.2.**

2.5.3 Climatic characterstics

The average rainfall in the Shetrunji Basin is 604.52 mm. The south -west Monsoon sets in by middle of June and withdraws by the first week of October. About 90% of total rainfall is received during July and August. Owing to the topographical characteristics climate is variable.

Temperature (°c) during year 2011-12

Lowara		
Year	**Max**	**Min**
2011-12	40	3

Mean annual rainfall in mm Shetrunji Basin CWC sites

Name of site	Data available (No of yeaRs)	Average rainfall (mm)	Average no. of rainy days	Rainfall during water year 2011-12	No of rainy days 2011-12
Lowara	23	463	33	671	40

2.5.4 Description of the water storage / diversion structures

Major / medium irrigation projects in River Basin Shetrunji

At present, there are 16 completed irrigation schemes (1 major and 15 minor).

A) Major irrigation scheme:

1) Shetrunji irrigation scheme:

B) Mnor irrigation scheme

1 Munjiasar	2 Thebi
3 Vedi	4 Khodiar
5 Popatdi	6 Shel Dedumal-1
7 Bavdi	8 Kodvadri
9 Hanol	10 Rajwal
11 Kharo	12 Hamirpura
13 Pingli	14 Samidhiara

15 Datred (P.W)

Shetrunji irrigation scheme

The Shetrunji irrigation scheme comprises construction of masonry dam in the River portion and earthen dam on both the banks. The catchment area at dam site is 430 sq km. It has gross capacity of 350 MCM with live storage of 309 Mm3. It commands gross area of 2, 09,400 acres of land out of which cultivated command area is 1,21,400 acres and irrigable area is 88,000 acres.

2.5.5 Streamflow data

Hydrological observation by CWC

In Shetrunji Basin, the central water commission is conducting hydrological observations at only one site namely Lowara for which data has been finalised and the same is presented in this book. The details of the site are given below.

Sl.no.	**Name of site**	**Station code**	**Scheme**	**Type**
1.	Shetrunji at luwara	01 02 09 001	NNW	GDSWQ

Salient features of sites maintained by CWC in Shetrunji Basin

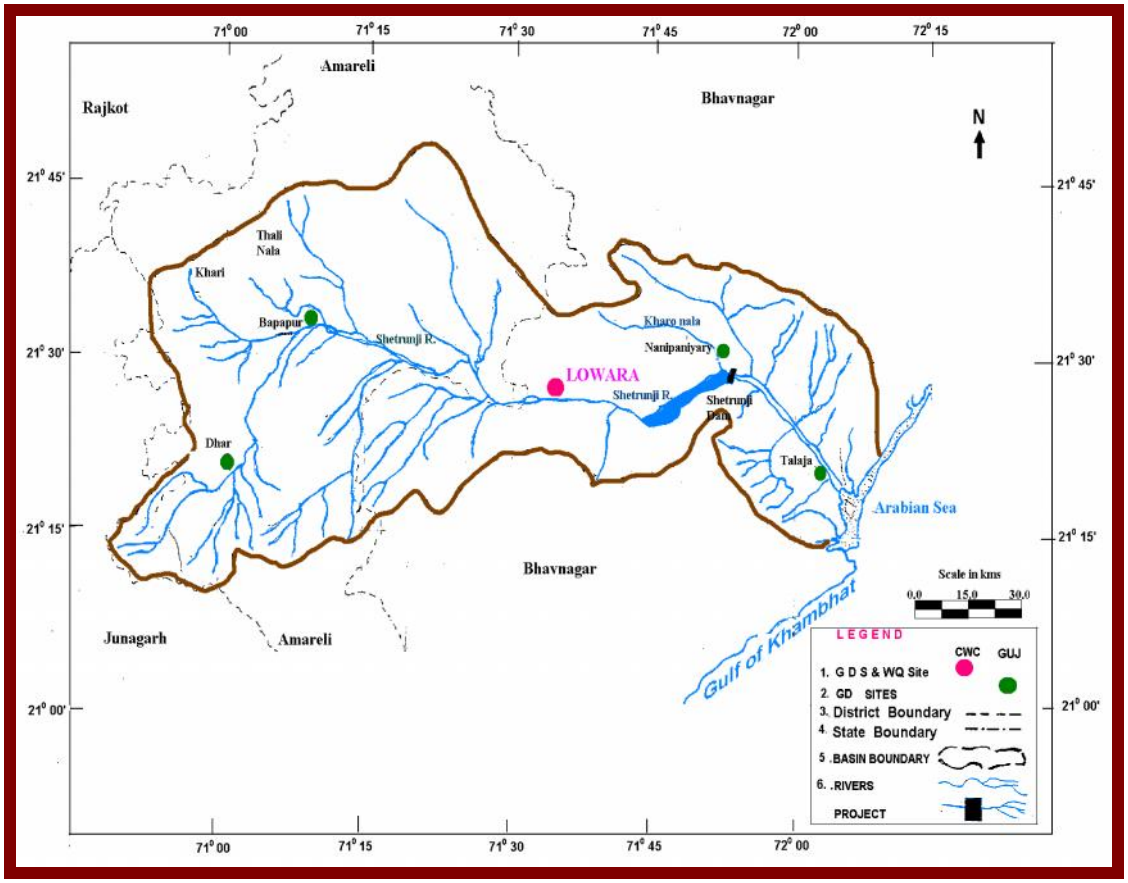
Sr No	Name	Local River	Lat.	Long.	Stn Parameters			Silt lab	Type of gauge	Discharge measure-ment
			D M S	D M S	Met	Gauge	WQ			
1	Lowara	Shetrunji	21 26 36	71 33 42	SRG	GDS	WQ	Silt lab	Staff G	Wading, boat with cable, float

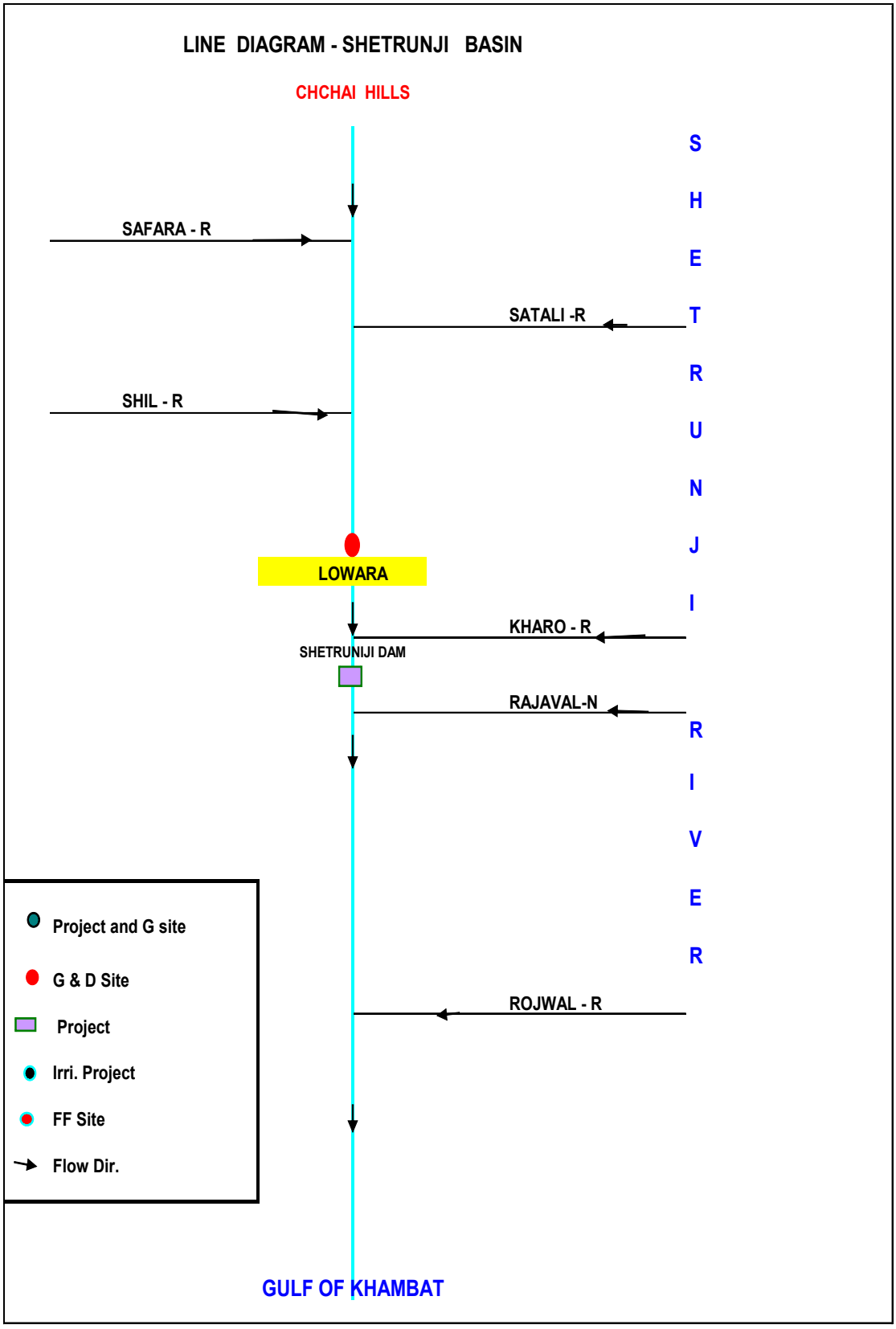
2.5.6 Data availability

Sl No	Site name	Rain fall	Discharge	Thrice daily water level	Hourly water level (for Monsoon period only)	Sedi-ment	Water quality
1	Shetrunji at Lowara GDSQ	June-89	Nov -70	Nov -70	June -71	July -73	July-77

Plate-2.5.1

Shetrunji Basin




LINE DIAGRAM - SHETRUNJI BASIN
CHCHAI HILLS
SHETRUNJI RIVER
SAFARA - R
SATALI -R
SHIL - R
LOWARA
KHARO - R
SHETRUNIJI DAM
RAJAVAL-N
ROJWAL - R
GULF OF KHAMBAT
Project and G site
G & D Site
Project
Irri. Project
FF Site
Flow Dir.

2.6 Bhadar Basin

2.6.1 Geographical description of the Basin

Bhadar is one of the major rivers of Saurashtra. It drains about 1/7 th of the area of Saurashtra. The Bhadar Basin is the south western basin and situated between 21^0 25' to 22^0 10' north latitude and 69^0 45' to 71^0 20' east longitude. The river Bhadar originates at an elevation of 261 m above m.s.l. in Vaddi about 26 km north – west of jasdan in Rajkot district and flows towards south upto Jasdan village and then turns towards south – west up to village jetpur and finally changes its direction towards west till its confluence with Arabian sea at Navibandar (Porbandar). Thus, from Jetpur to Porbandar the river Bhadar makes fertile areas of Rajkot, Jamnagar, Amreli andJjunagarh districts of Saurashtra. The Bhadar drains an area of 7094 sq km out of which 706 sq km in hilly and the rest in plain regions of Saurastra. Basin map of Bhadar Basin is enclosed is enclosed as **Plate -2.6.1**

.

The district wise distribution of drainage area is shown in the following table

Name of district	Drainage area sq km	% of total
1. Rajkot	4902.67	69.11
2. Jamnagar	1047.78	14.77
3. Amreli	715.78	10.09
4. Junagarh	427.77	6.03
Total	7094	100

2.6.2 Description of River system

The total length of this south west flowing river from its origin to its outfall into the sea is 198 km. For the first 150 km the river flows in Rajkot district and the rest of 48 km in Junagarh district. The river receives tidal influence for a length of about 26 km from mouth in Junagarh district. The river Bhadar receives several tributaries on both the banks. There are 9 major tributaries having a length more than 25 km out of which 6 tributaries viz Gondali, Chapparwadi, Phopal, Utawali, Moj and Venu are feeding from right and the remaining 3 tributaries viz Vasavadi, Surwa and Galolia from left. The drainage system on the right bank of river Bhadar is more extensive as compared to the left bank.

Gondali, chapperwadi, phopal and venu, these 4 important right bank tributaries together account for nearly 35% of total catchment area of Bhadar. Venu, which is the principal tributary of Bhadar also rises in Jamnagar district in hilly range and drains Jamnagar and Rajkot districts. Phopal, another tributary rises at high level range about 5 km north of the town Lodhika. The catchment area, length and elevation of sources of important tributaries are indicated below

Sl.no.	Name of River	Bank	Elevation of source above m.s.l. (m)	Length (km)	Catchment area (sq km)
1	Bhadar	Main	261	198	7094
2	Vasavadi	Left	194	32.18	583
3	Gondali	Right	231	46.66	513.85
4	Surwa	Left	180	30.6	273.6
5	Galolio	Left	160	27	198.25
6	Chappervadi	Right	180	43.45	455.4
7	Phopal	Right	175	48.27	590.5
8	Utawali	Right	146	24	103.6
9	Moj	Right	245	48.27	105.15
10	Venu	Right	180	61.15	953.12

A line diagram of River system giving information of Bhadar Basin, its tributories and sub tributories etc indicating the stations showing diveRsions, etc. is enclosed as **Plate -2.6.2.**

2.6.3 Climatic characterstics:

The average rainfall in Bhadar Basin is 625 mm. The south west Monsoon sets in by the middle of June and withdraws by the first week of October. About 90% of total rainfall is received during July and August. Owing to the topographical characteristics climate is variable

Temperature (°c) during year 2011-12

Ganod		
Year	Max	Min
2011-12	43	10

Mean annual rainfall (mm) for Bhadar Basin (CWC sites)

Name of site	Data available (No of yeaRs)	Average rainfall (mm)	Average no. of rainy days	Rainfall during water year 2011-12	No of rainy days 2011-12
Ganod	31	688	36	468.6	23

2.6.4 Description of the water storage / diversion structures

Medium irrigation projects in Bhadar River Basin

At present there are 12 completed structures either reservoirs or weirs in Bhadar catchment which are as follows:

1. Jasdan tank (alansagar)
2. Gondali irrigation scheme (near kotesangani)
3. Gondali irrigation scheme (veri tank)
4. Sekroli irrigation scheme
5. Moj dam
6. Venu dam
7. Venu dam ii
8. Irrigation scheme
9. Mewasa bund
10. Rajawadla tank
11. Hamir barrage
12. Bhadar dam

The Bhadar irrigation scheme is on the Bhadar River in Rajkot .The gross storage capacity is 238 MCM and tributary storage capacity is 221 MCM. The cost of project is Rs 4.5475 crores.

2.6.5 Streamflow data

Hydrological observations by CWC

In Bhadar Basin, the central water commission is conducting hydrological observations i.e. Gauge and discharge observation at site Ganod for which data has been finalised and presented in this book. The details of this site are given below.

Sl.no.	Name of site	Station code	Scheme	Type
1.	Bhadar at Ganod	01 02 07 001	NNW	GDSWQ

Salient features of sites maintained by CWC in Bhadar Basin

Sr No	Name	Local River	Lat. D M S	Long. D M S	Stn Met	Stn. Gauge	Stn WQ	Silt lab	Type of gauge	Discharge Measurement
1	Ganod	Bhadar	21 39 53	70 10 52	SRG	GDS	WQ	Silt lab	Staff G	Wading, boat with cable, float

2.6.6 Data availability

Sl. No	Site name	Rain fall	Discharge	Thrice daily water level	Hourly water level (for Monsoon period only)	Sedi-ment	Water quality
1	Bhadar at Ganod GDS WQ	June-81	Nov -70	Nov-70	June -71	July -73	July -77

Plate-2.6.2

Bhadar Basin

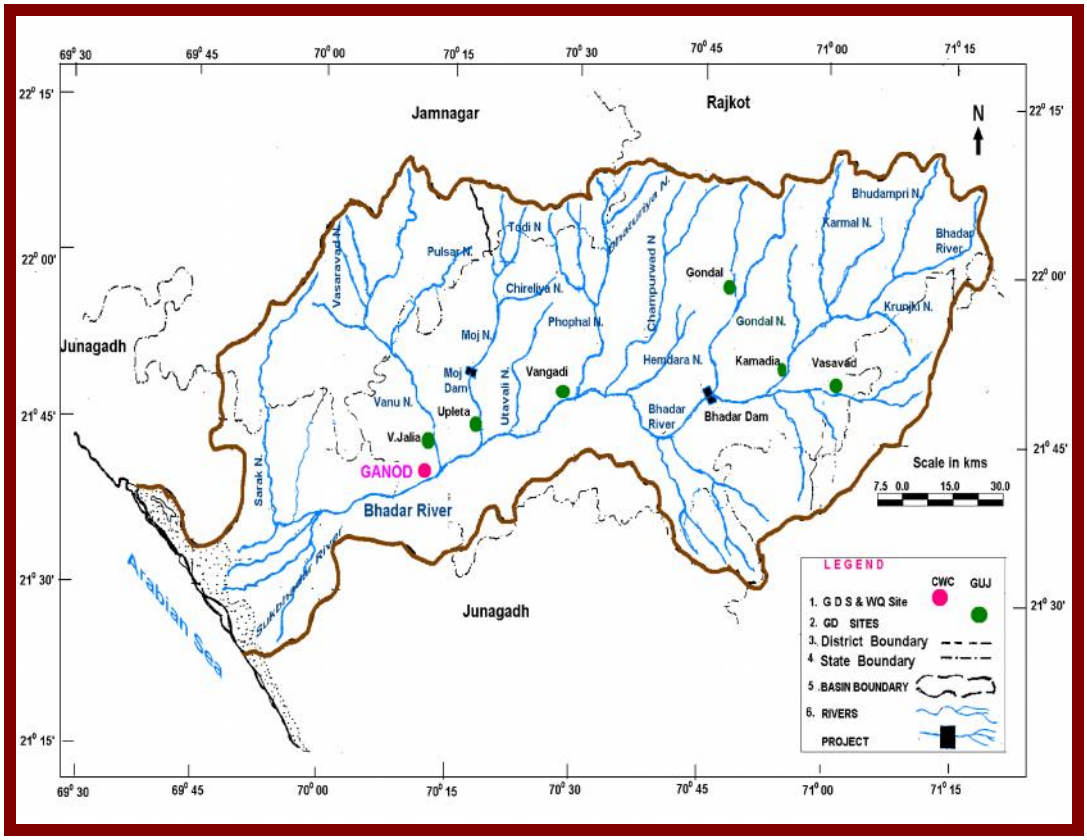
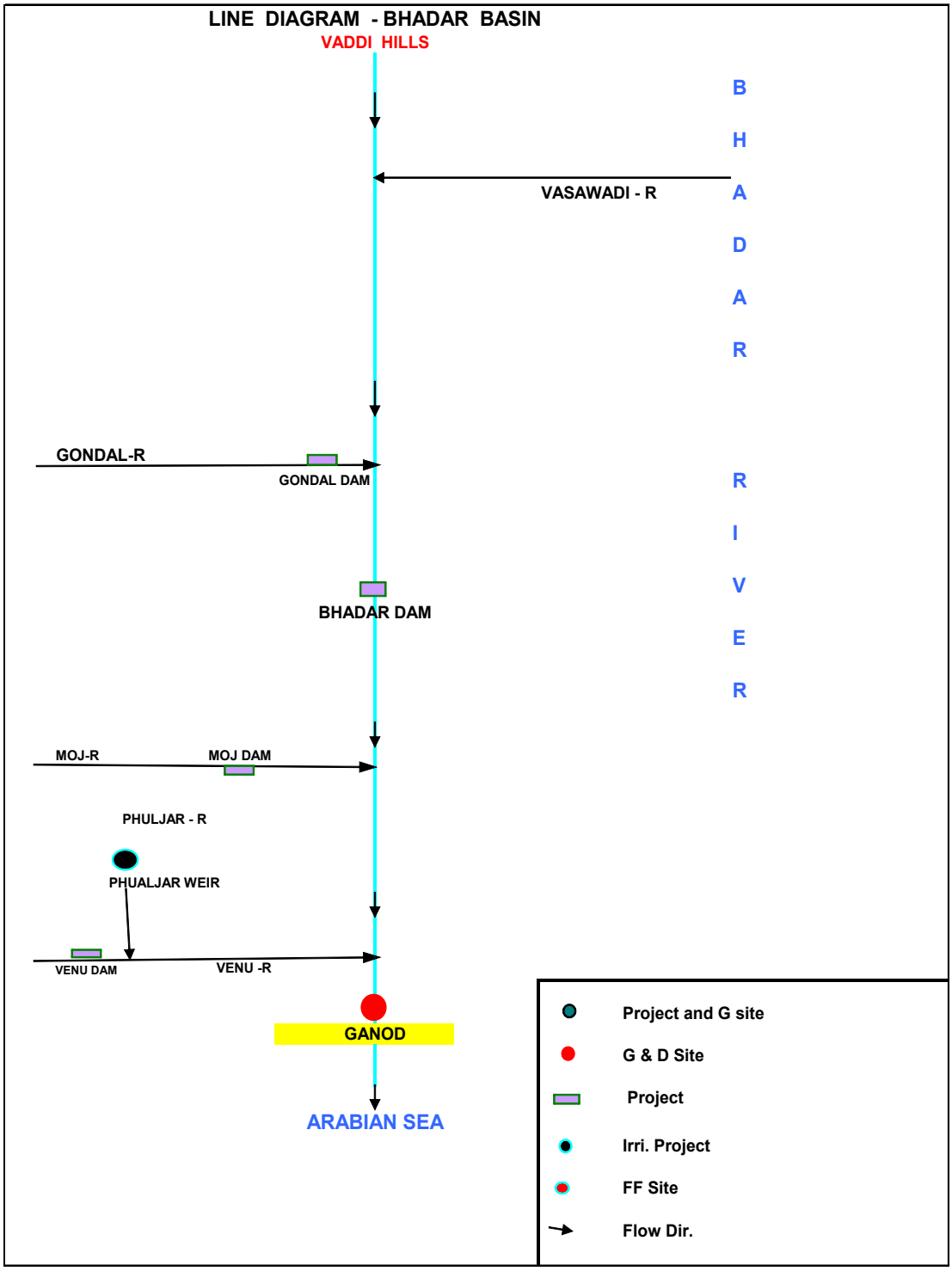


Plate-2.6.2


LINE DIAGRAM - BHADAR BASIN
VADDI HILLS
B
H
A
D
A
R
VASAWADI - R
GONDAL-R
GONDAL DAM
R
I
V
E
R
BHADAR DAM
MOJ-R
MOJ DAM
PHULJAR - R
PHUALJAR WEIR
VENU DAM
VENU -R
GANOD
ARABIAN SEA
Project and G site
G & D Site
Project
Irri. Project
FF Site
Flow Dir.

2.7 Machhu Basin

2.7.1 Geographical description of the Basin

Machhu river rises in the hills of Jasdan near village Khokhara in Chotila taluk of Surendranagar districts at an elevation of 220 m above m.s.l. This is one of the north flowing rivers of Saurashtra in Gujarat state. The Machhu basin is situated between 22^0 10 to 23^0 10' north latitude and 70^0 40' to 71^0 15' east longitude. The river Machhu originates from the hill ranges of Jasdan Sardar and Mandva in Rajkot district and Chotila in Surendranagar district and flows in north westerly direction along the district boundry of Surendranagar and Rajkot upto village Beti and then flows mostly towards north in Rajkot district and finally disappears near Malia in the little Rann of Kachchh. Machhu alongwith its tributaries flows 52 % in the hilly area and 48 % in plain region. The River makes fertile areas of Malia, Morbi, Wankaner, Jasdan and Rajkot taluks of Rajkot districts and part of Chotila taluk in Surendranagar district. Machhu drains an area of 2515 sq km out of which more than 75 % lies in Rajkot district. Basin map is enclosed as **Plate -2.7.1**

The district wise distribution is shown as below

Name of district	**Drainage area sq km**	**% of total**
1. Rajkot	1924	76.51
2. Surendranagar	591	23.49
Total	2515	100.00

2.7.2 Description of River system

The total length of this north flowing river from its origin to its outfall into the little rann of Katchch is 141.75 km. Machhu receives several tributaries on both the banks. There are 6 major tributaries having length more than 25 km out of which 4 tributaries namely Jamburi, Benia, Machhori and Maha feed from the right and the remaining 2 tributories namely beti and asoi from the left. The drainage system on the right bank of Machhu is more extensive as compared to the left bank.

The Beti, Asoi, Machhori and Maha, the 4 important tributaries together account for nearly 42.52% of the total catchment area of Machhu. Maha, the principal tributari, rises from rampura in chotila taluk of Surendranagar district and drains in north western direction and fertiles Surendranagar and Rajkot districts and joins main stream Machhu about 1.6. km downstream of Panchaisa village.

Machhori the another important tributari also rises from Chotila taluka and drains towards north direction and meets the main stream about 8.5 km downstream of wankaner in Rajkot district. Asoi tributari rises from the hilly region of village vanjhara of wankaner taluka and drains towards north direction and meets the main stream just upstream of village derali.

The catchment area, length and elevation of sources of important tributaries are given below.

Sl.no.	Name of River	Bank	Elevation of source above m.s.l. (m)	Length (km)	Catchment area (sq km)
1	Machhu	Main	220	141.75	2515.00
2	Beti	Left	280	28.00	235.69
3	Jampuri	Right	300	27.36	119.14
4	Bania	Right	300	27.36	113.96
5	Machhori	Right	260	26.00	140.62
6	Asoi	Left	140	25.75	197.84
7	Maha	Right	200	45.06	507.64

A line diagram of river system giving information of Machhu Basin, its tributaries and sub tributaries etc. indicating the stations showing diversions, flows at terminal sites is enclosed as **Plate -2.7.2.**

2.7.3 Climatic characterstics

The average rainfall in the Machhu Basin is 533.5mm. The south west Monsoon sets in by the middle of June and withdraws by the first week of October. Owing to the topographical characteristics, the climate is variable.

Temperature (°c) during year 2011-12

Gungan		
Year	Max	Min
2011-12	42	8

Mean annual rainfall in mm Machhu Basin CWC site

Name of site	Data available (No of years)	Average rainfall (mm)	Average no. of rainy days	Rainfall during water year 2011-12	No of rainy days 2011-12
Gungan	24	586	27	623	34

2.7.4 Description of the water storage / diversion structures

Medium irrigation projrcts in River Basin Machhu

At present there are five medium irrigation schemes completed in the catchment of Machhu.

1 Adhia irrigation scheme
2 Kuvadva irrigation scheme
3 Ghunda irrigation scheme
4 Machhora irrigation scheme
5 Vadsar and Amarsar irrigation scheme.

There are two important irrigation schemes viz Machhu i & Machhu ii. Machhu irrigation scheme no. 1 is on River Machhu in wankaner taluka of distt. Rajkot. The gross storage capacity of this dam at frl is 72.74 Mm^3, having 70.8 Mm^3 as effective storage capacity. The cost of this project is Rs.1.5404 crore.

Machhu irrigation scheme no.2 is on Machhu in Morbi taluka of distt. Rajkot.the gross storage capacity of this dam is 100.55 Mm^3, having 90.8 Mm^3 as effective storage capacity. The estimated cost of this project was 31.61 crore.

2.7.5 Streamflow data

Hydrological observations by CWC

In Machhu Basin, the central water commission is conducting hydrological observations i.e. Gauge and discharge observation at site Gungan .

The details of this site are given below:-

Sl.No.	**Name of site**	**Station code**	**Scheme**	**Type**
1.	Machhu at Gungan	01 02 03 001	N.n.w	GD

Salient features of sites maintained by CWC in Machhu Basin

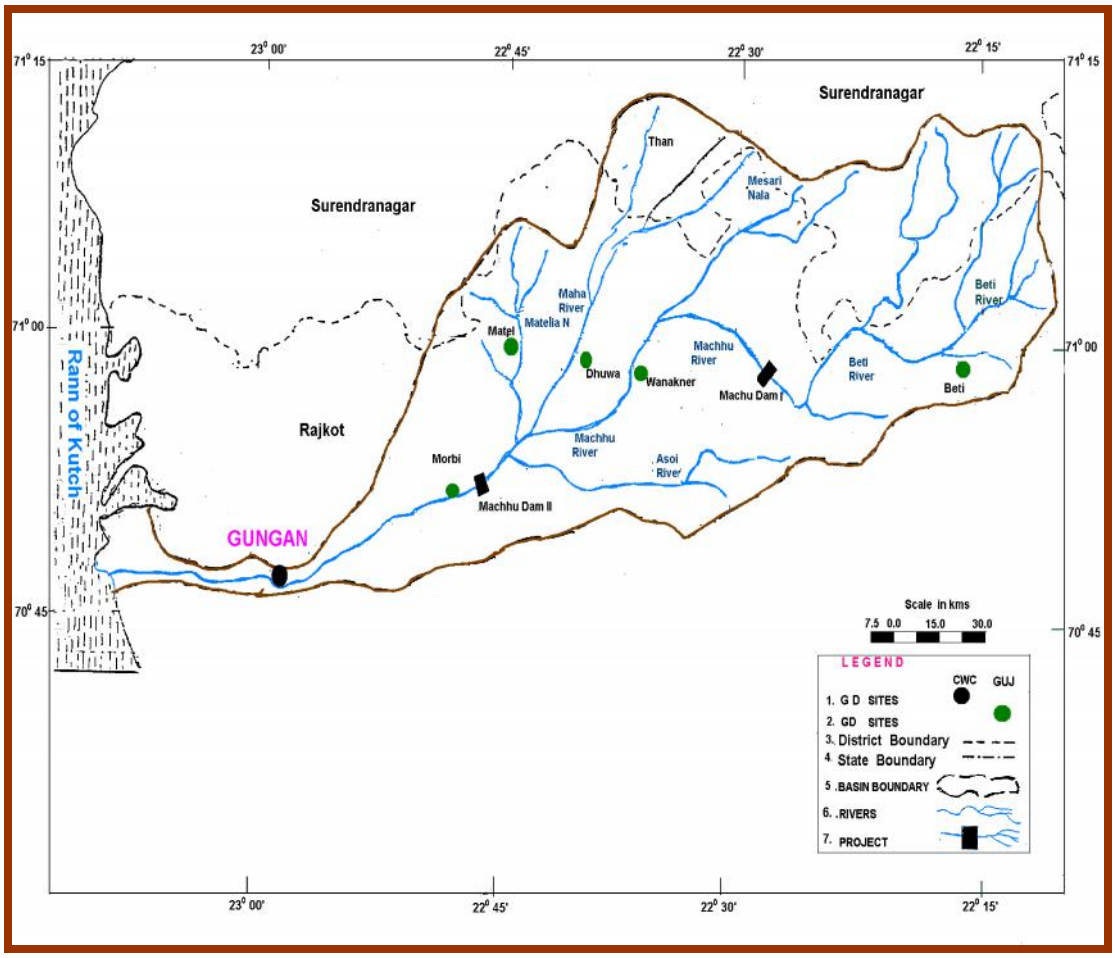
Sl No	Name	Local River	Lat. N D M S	Long. E D M S	Stn Met	Stn. Gauge	Stn WQ	Silt lab	Type of gauge	Discharge Measurement
1	Gungan	Machhu	22 57 42	70 45 52	SRG	GD	---	--	Staff G	Wading, boat with cable,float

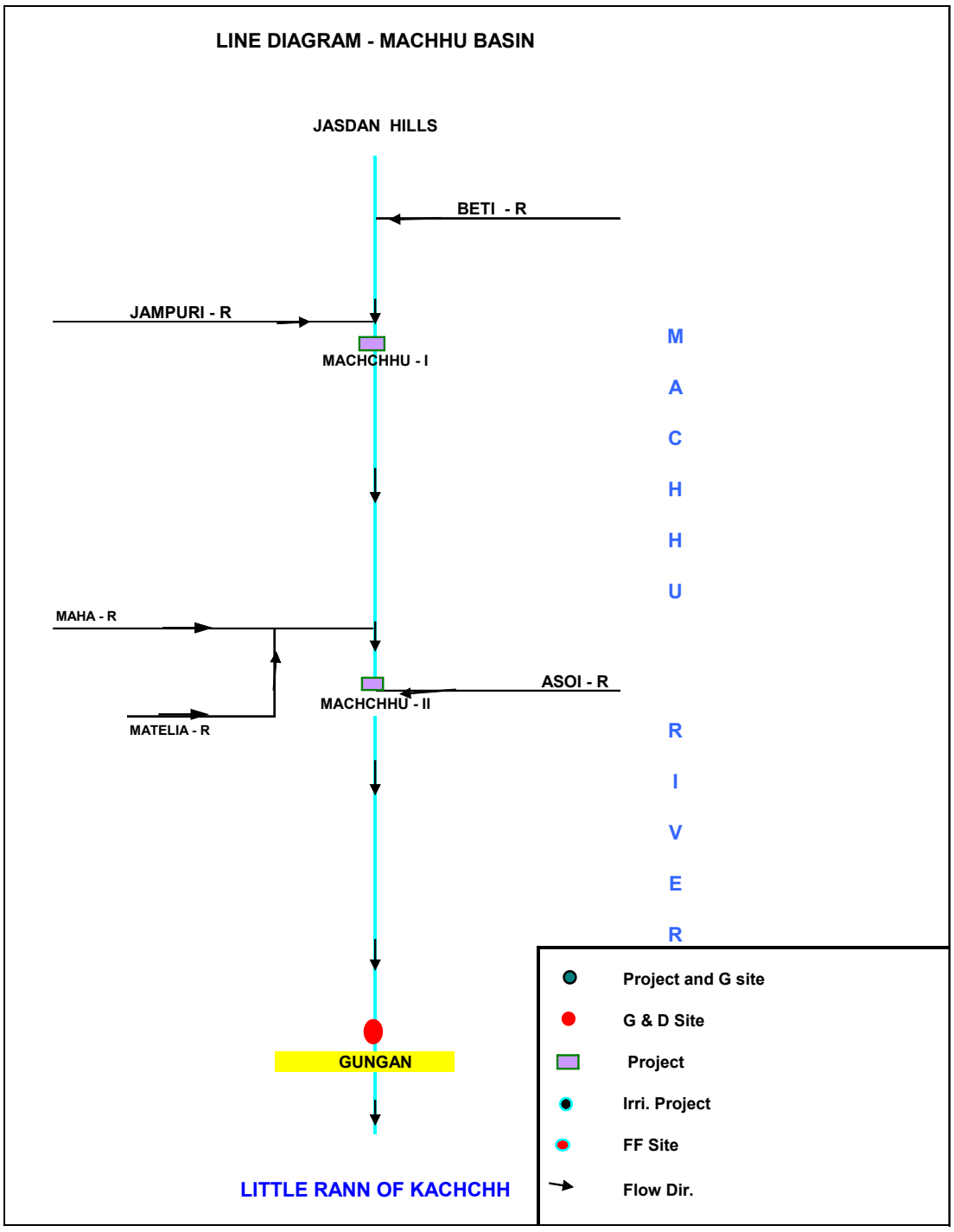
2.7.6 Data availability

Sl No	Site name	Rain fall	Discharge	Thrice daily water level	Hourly water level (for Monsoon period only)
1	Machhu at Gungan GD	June -88	Dec -70	Sep -70	Sep -70

Plate-2.7.1

Machhu Basin




LINE DIAGRAM - MACHHU BASIN
JASDAN HILLS
BETI - R
JAMPURI - R
MACHCHHU - I
M
A
C
H
H
U
MAHA - R
ASOI - R
MACHCHHU - II
MATELIA - R
R
I
V
E
R
GUNGAN
LITTLE RANN OF KACHCHH
Project and G site
G & D Site
Project
Irri. Project
FF Site
Flow Dir.

2.8 Rupen Basin

2.8.1 Geographical description of the Basin

Rupen River originates from taranga hill ranges near Kheralu taluka of Mehsana district in Gujarat at an elevation of 180 m above m.s.l. And decends in south western direction and travels through Mehsana district before it drains into little Rann of Kachchh. The Rupen Basin is a northern Basin of Gujarat and is situated between 23^0 25' to 24^0 00' north latitude and 71^0 30' to 72^0 46' east longitude approx. Basin map of Machhu Basin is enclosed is enclosed as **Plate -2.8.1**

2.8.2 Description of River system

Pushpavathi and Khari the two right bank tributaries of Rupen River, drains into the main channel. There is only one left bank tributary namely Khari. Hence the drainage system on the right bank of Rupen River is more extensive as compared to left bank area.

Pushpavathi and Khari are the two important tributaries which together drain nearly 24.6 % of the total catchment area of Rupen River. Pushpavathi is the principal tributary of Rupen rising from the hilly ranges upstream of balad village of kheralu taluk, in Mehsana district of Gujarat at an elevation of 183 m above m.s.l. Pushpavathi meets the main River Rupen at upstream of village Sapawada.The catchment area, length and elevation of sources of the above three tributaries are as shown below.

Sl.no.	Name of River	Bank	Elevation of source above m.s.l. (m)	Length (km)	Catchment area (sq km)
1	Rupen	Main	180	156	2500
2	Khari	Left	131	59	180
3	Pushpavati	Right	183	68	446
4	Khari	Right	53	46	170

A line diagram of River system giving information of Rupen Basin, its tributories and sub tributories etc indicating the stations showing diveRsions is enclosed as **Plate - 2.8.2.**

2.8.3 Climatic characterstics

The south west Monsoon sets in the last week of June and withdraws by the end of September. Owing to the topographical characteristics the climate is variable.

Temperature (°c) during year 2011-12

Sapawada		
Year	Max	Min
2011-12	42	11

Mean annual rainfall in mm Rupen Basin CWC site

Name of site	Data available (No of years)	Average rainfall (mm)	Average no. of rainy days	Rainfall during water year 2011-12	No of rainy days 2011-12
Sapawada	21	611	24	768.8	34

2.8.4 Streamflow data

Hydrological observations by CWC

In Rupen Basin, the CWC is conducting hydrological observations at Sapawada.

The details of this site are given below.

Sl.no.	Name of site	Statin code	Scheme	Type
1.	Rupen at Sapawada	01 02 04 001	163 key	GD

Salient features of sites maintained by CWC in Rupen Basin

Sr No	Location Name	River	Lat. N D M S	Long. E D M S	Stn Met	Stn. Gauge	Stn WQ	Silt lab	Type of gauge	Mode of Discharge Measure-ment
1	Sapawada	Rupen	23 32 54	72 00 52	SRG	GD	--	----	Staff G	Wading, float

2.8.5 Data availability

Availability of gauge and discharge data of c.w.c sites in Rupen Basin.

Sl No	Site name	Rain fall	Discharge	Thrice daily water level	Hourly water level (for Monsoon period only)	Sediment	Water quality
1	Rupen at Sapawada	June '91	Aug '89	Aug '89	Aug '89	Not available	Not available

Plate-2.8.1

Rupen Basin

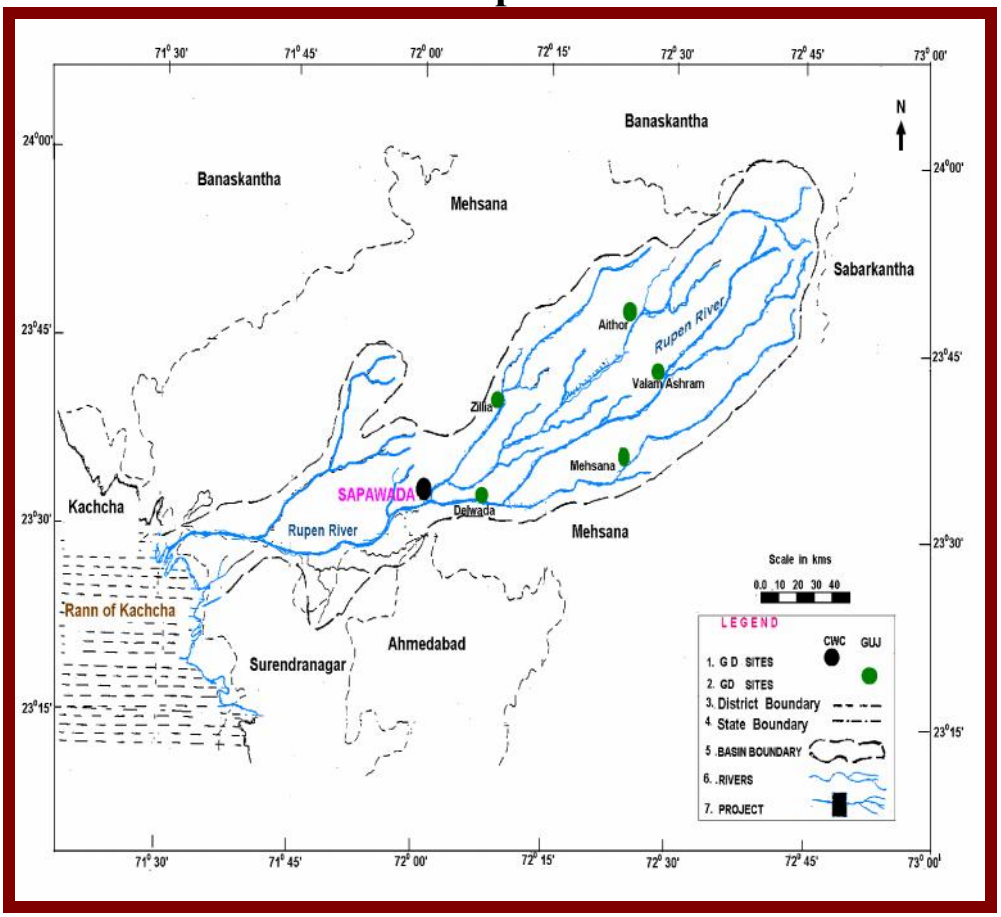
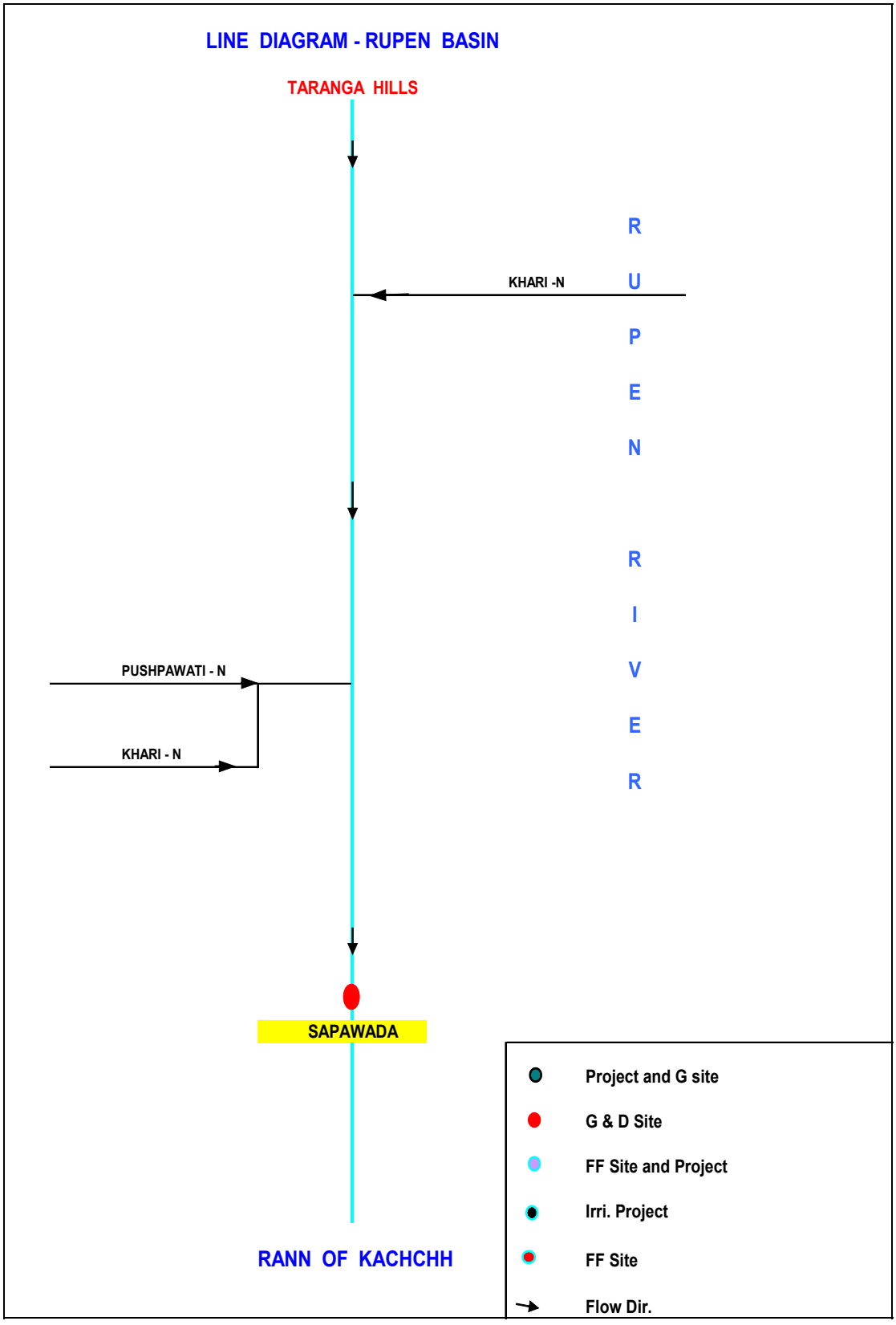


Plate-2.8.2


LINE DIAGRAM - RUPEN BASIN
TARANGA HILLS
KHARI -N
R
U
P
E
N
R
I
V
E
R
PUSHPAWATI - N
KHARI - N
SAPAWADA
RANN OF KACHCHH
Project and G site
G & D Site
FF Site and Project
Irri. Project
FF Site
Flow Dir.

Hydrological observations by State government

Source of information

Apart from the sites maintained by central water commission the state government of Gujarat, Madhya Pradesh, Rajasthan and Maharashtra are also conducting gauge and discharge observations in among 14 Basins. The Basin wise list of sites and the authority maintaining the sites are listed in the following para.

Basin wise list of sites

Sl.no	Name of Basin	Name of site	Site maintained by
1	Mahi Basin	1 Mahi At Vasad 2 Bhadar At Khanpur 3 Bhadar At Undva 4 machhan At Davadia 5 machhan At Limdi 6 hadaf (Wankol) 7 kabutari At Morva 8 panam At Vadosar 9 goma At Sant Road 10 Mahi At Kalol	Sup. Engineer, wri circle i, ld engg. College compus, nr. Gujarat univeRsity, Ahmedabad &
		11 Mahi At Anklav 12 Mahi At Borsad 13 goma At Gamla 14 kun At Sureli 15 koliyari At Khandia	Executive engineer Wri divn., Bhadra fort, laldarwaja, Ahmedabad Gujarat
		16 wankadi At Rampur 17 jakham At Wankadi 18 jakham At Dhariwad 19 jakham At Nagalia	Superintending engineer, Jakham irrigation circle, Udaipur, Rajasthan
		20 Mahi Pickup Weir 21 Mahi At Karmai 22 Mahi Pickup Weir 23 Mahi At Mahi Dam	Chief engineer, Mahi bajaj sagar project , banswada, Rajasthan

		24 Anas 25 Anas 26 Pantalla 27 Bhunand 28 Pampawati 29 Undwa Nallah	At Chandangarh At Ratangarh At Bhairongarh At Anas I At Anas Ii At Parwalia At Sangam At Larki At Ranisingh	Chief engineer, survey & irrigation (major projects) irrigation dept. E-3 / 28 - a, arora colony, near bus stop ii, bhopal Madhya Pradesh
	Note: Following River gauge stations are closed from 1st June 2006 *1 Bhadar at Vegadi 2 Aaji-iii at Tarana 3 Jolapuri at Jolapur*			

Name of Basin		**Name of site**	**Site maintained by**
2	Sabarmati Basin	1.Sabarmati At Gandhinagar(Borij) 2.Sabarmati At Subhash Bridge 3.Sabarmati At Derol Bridge 4.Sabarmati At Kheroj 5.Sabarmati At Balwa 6.Abarmati At Dharoil 7.Sabarmati At Kalol 8.Sabarmati At Kanewal 9.Sabarmati At Mhij 10.Sabarmati At Mansa 11.Sabarmati At Nallake 12.Sabarmati At Rasikpur 13.Sabarmati At Red Lazximipura 14.Siri At Ganpipali 15.Dhamini At Momanwas 16.Harnav At Khedbrahma 17.Harnav A Abhapur 18.Guhai At Kadiadra	Supt,engineer, wri circle-i, l.d.engg.college campus near Gujarat univveRsity, Ahmedabad & executive engineer, wri division, Bhadra fort, laldarwaz, Ahmedabad (Gujarat) “

		19.Guhai At Rampur 20.Guhai At Khandiol 21.Vekri At Mathasur 22.Hathmati At Bhiloda 23.Hathmati At Balochpur 24.Hathmati At Himatnagar 25.Hathmati At Mankadi 26.Hathmati At Pal 27.Khari At Prntij 28.Khari At Raipur 29.Meshwo At Kabola 30.Meshwo At Mithajinamuwada 31.Majam At Ambaliyara 32.Majam At Modasa 33.Watrak At Dhabha 34.Watrak At Memdabad 35.Watrak At Bayad 36.Watrak At Meghraj 37.Watrak At Bempoda 38.Khari At Magodi 39.Warasi At Betawada 40.Mahor At Katlal 41.Mahor At Mahadevpura-Mahadevia 42.Shedi At Bilodra 43.Shedi At Dakor	

3	Luni Basin	1 Luni At Luni 2 Luni At Latoti 3 Luni At Alniawas 4 Sagi At Sewadi 5 Bandi At Gadi 6 Bandi At Santhu	Executive engineer planning & co - ordination division i, adaRsh nagar, raja park, jaipur, Rajasthan ,,

		7 Rel At Ramsen 8 Sukri At Leta 9 Jawai At Shivganj 10 Sukri At Ghana 11 Khardi At Pali 12 Mithri At Auwa 13 Rediya At Singari 14 Sukri At Bagri 15mithri- At Pipar Jojri At Banjakudi 16 Lilri	,, ,, ,, ,, ,, ,,
4	Banas Basin	1 Banas At Roho 2 Banas At Deesa 3 Banas At Umari 4 Banas At Balundra 5 Banas At Dantiwada Dam 6 Banas At Gadh 7 Banas At Wav 8 Banas At Zerda 9 Sipu At Panthawada 10 Sipu At Bhakudar 11 Balaram At Chitrasani	Sup. Engineer, wri circle i, ld engg. College compus, near Gujarat univeRsity, Ahmedabad & Executive engineer Wri divn., Bhadra fort, laldarwaja, Ahmedabad Gujarat
5	Shetrunji Basin	1 Shetrunji At talaja 2 Shetrunji At dhari 3 Shetrunji At gariyadhar 4 Shetrunji At gopnath 5 Shetrunji At jesar 6 Shetrunji At lathi 7 rajwal At makhadka 8 kharo At nanipaniyari 9 satli At babapur	Sup. Engineer, wri circle i, ld engg. College compus, near Gujarat univeRsity, Ahmedabad & Executive engineer Wri divn., Bhadra fort, laldarwaja, Ahmedabad Gujarat
6	Bhadar Basin	1 Bhadar At Vangadi 2 Bhadar At Kamadhia 3 Bhadar At Chhaparvadi-Ii 4 Bhadar At Dhandhuka 5 Bhadar At Jasdan 6 Bhadar At Kukavav 7 Minsar At Rana-Kandorana 8 Venu Ii At Warjan Jaliya 9 Moj At Upleta 10 Gondali At Gondal 11 Vasawadi At Vasavad	Sup. Engineer, wri circle i, ld engg. College compus, near Gujarat univeRsity, Ahmedabad & Executive engineer Wri divn., Bhadra fort, laldarwaja, Ahmedabad Gujarat

7	Machhu Basin	1 Machhu At Morbi 2 Machhu At Wankaner 3 Machhu At Beti 4 Machhu At Chotila 5 Asoi At Sindhavadar 6 Maha At Dhuwa 7 Matelia At Matel	Sup. Engineer, wri circle i, ld engg. College compus, near Gujarat univeRsity, Ahmedabad & Executive engineer Wri divn., Bhadra fort, laldarwaja, Ahmedabad Gujarat
8	Rupen Basin	1 Rupen At Delwada 2 Rupen At Valam Ashram 3 Rupen At Dhinoj 4 Rupen At Ranuj 5 Rupen At Viramgam 6 At Aithor Pushpavati At Zillia 7 Khari At Mehsana 8 Khari	Sup. Engineer, wri circle i, ld engg. College compus, near Gujarat univeRsity, Ahmedabad & Executive engineer Wri divn., Bhadra fort, laldarwaja, Ahmedabad Gujarat

3.0 Methodology: Streamflow measurement

3.1 Gauge measurement

Water level or stage of the River is measured as its elevation above the g t s datum. Water level measurement was conducted by reading non-recording gauges. A series of vertical staff gauges as per the specifications laid down in is 4080-1977 have been fixed at three sections at each site i.e. Upstream, station gauge and downstream. The gauge posts are of r.c.c/wooden/ metallic with cut and edge wateRs and are fixed securely in position by installing them in m-150 concrete blocks of suitable size. Enamelled gauge plate with marking in metric unit is fixed on the gauge posts with least count 0.005 m.out of the three gauge lines the central line is used as station gauge line and readings of the other two lines are used for calculating the surface slope. The gauges were read hourly during Monsoon season and three hourly i.e. 0800, 1300 and 1800 hRs., during non Monsoon season at station gauge line.

3.2 Discharge observation

Discharge observation is conducted once a day at 0800 hRs, at all the sites by area velocity method except on Sunday and holidays in non Monsoon period. However additional observations were conducted during floods to cover different stages, irrespective of holidays.The River width is generally divided into 15 to 25 segments based on the degree of accuracy as outlined in is: 1192-1981. The width of the River

is measured by steel/metallic tape or wire rope stretched across the River with segment markings indicated thereon, when the River width is quite small and the flow depths permit wading. For larger width and deeper flow conditions and in unmanageable flood conditions segment points vertically are located by measuring the navigation craft with reference to pivot point and segment blocks constructed at sites.the depth measurement is carried out by using sounding rod for depths up to 3 metres and by using long bamboos for depths between 3 metres and 6 metres. For depths exceeding 6 metres sounding reel measurements at segment points are resorted to, and in Some cases, the depths are measured by echo sounder or are computed from the most recent x-sections of the River.the velocity is measured as per is 3918 - 1976 by using a cup type current meter conforming to is 3910 - 1976. The current meter is lowered to the requisite depth i.e. 0.6 of total depth down the vertical at every segment point by suspension equipment as specified in is 6064 - 1981 and where the depth is less than 0.3 metres, the velocity is observed just below the water surface.in medium and high stages with significant flow velocities, boats fitted with power engines are used. Measurements of velocity are sometimes carried out from the bridges when the River flow condition does not permit the boat to be kept stable for velocity observation. When none of the above procedures are possible, the velocity is measured by float observations.

The data observed as above at the site is entered in the prescribed standard format to compute the total River discharge and it is further scrutinised at various levels before finalisation.

The daily observed/estimated discharge data is presented in this book.

Equipment used for observation:

Sl. No	Name of equipment	By wading	By boat	Bridge	By float
1	Current meter	√	√	√	X
2	Pigmy current meter	√	X	X	X
3	Stop watch	√	√	√	√
4	Wading rod	√	X	X	X
5	Nylon rope & tag	√	X	X	X

6	Measuring tape	√	X	X	X
7	Protractor	√	√	√	X
8	Ranging rod	√	√	X	√
9	Sounding rod	√	√	X	X
10	Automatic battery counter	√	√	√	X
11	Thermometer	√	√	√	√
12	Prismatic compass	X	X	X	√
13	Balloon	X	X	X	√
14	Sounding cable with fish weight	X	√	X	X
15	Echo sounder	X	√	√	X
16	Bridge out fit	X	X	√	X
17	Boat out fit	X	√	X	X

3.3 Explanatory notes

Explanatory notes given here have been designed to assist in the data interpretation of hydrological parameters contained in the data presented. The notes are therefore, applicable in so far as the data presented in this book.

1. Water Year covers the period from June 1st of one calendar year to may 31st of next calendar year and includes one complete hydrological cycle.

2. Discharge is given in cubic metres per second.

3. Discharges given are daily observed / estimated discharges.

4. The zero of gauge is a datum level / RL Fixed for a given site, which is kept 1 or 2 m lower than the lowest water level recorded in a perennial stream. In a non - perennial stream, it is kept 1 or 2 m lower than the lowest bed level of the stream.

5. Maximum and minimum discharges are taken from the daily observed flows / estimated.

6. Runoff in "mm" is the notional depth of water in millimetres over the catchment area equivalent to annual runoff calculated at the discharge measurement station.

$$\text{Runoff (mm)} = \frac{\text{Annual runoff (Mm3)}}{\text{Catchment area (km}^2\text{)}} \times 1000$$

7. Peak and lowest flows correspond to the highest and lowest water levels recorded during the period of record.

8. Measuring authority refers to the field division responsible for the operation of the gauge station. The name of the division is abbreviated by taking first alphabet of the River name followed by alphabets "DN" for division. For example Mahi division is denoted by mDN and tapi division is denoted as TDN. These abbreviations are given cross-reference in the list of abbreviations and symbols.

9. Gauging station code number is a unique nine-digit reference number, which facilitates retrieval of flow data in data bank. The first two digits denote the measuring authority. The third and fourth digits are the Basin/zone identifier and fifth and sixth digits are the independent River Basin identifier. The last three digits of the code number indicate gauging site no. which is given from origin to mouth.

11. The month and the year from which data are available in the data bank are indicated against the record available.

3.4 Method of presentation

The data presented in this book is processed discharge data obtained from application of SWDES/HYMOS software.

The stationwise hydrological data is presented comprising history sheet, daily flow table and pictorial summary.The sequence of hydrological station arranged from its outfall to origion giving inter-priority to an intermediate tribuetory station.

4.0 Hydrological data

The hydrological data presented hereby mainly consist of the following

History sheet

Its manly consist of some salientfeatures of particular site as Site name, state, distruct, River Basin, tributary, catchment area, latitude / logitude, opening / closing date for various types of data& maximum –minimum discharge values.

Data sheet

It consists of stage- discharge data (both observed & estimated from stage discharge curve for the season), for the current year with mean water level during the discharge observation and peak observed and computed discharge with corresponding water level with date during the year, Lowest discharge with corresponding water level with date during the year,Peak discharge with corresponding water level with date since inception,Lowest discharge with corresponding water level with date since inception.

Stage discharge curve

It gives a relationship between the stage of the river and the corresponding discharge.

Annual run-off

It gives the value of Annual run off in MCM for all the years from the opening of the site.

Water level v/s time graph

Hourly observed water level for one to three important highest peak flood events of current Water Year covering the period well before the start and upto well beyond the completion of these flood events.

Charts / maps

Basin map showing sites / projects

The site-wise pre – Monsoon and post – Monsoon crossections

The site-wise pie chart

Site-wise bar charts

The site-wise hydrographs (flood events)

Stage Discharge data of Mahi Basin
HISTORY SHEET

			Water Year	:	**2011-2012**
Site	:	**Mahi at Khanpur**	**Code**	:	**01 02 13 012**
State	:	Gujarat	District		Anand
Basin	:	Mahi	Independent Rive	:	Mahi
Tributary	:	Mahi	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Mahi
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	Mahi Sub Divn., Kadana
Drainage Area	:	32510 Sq. Km.	Bank	:	Right
Latitude	:	22°31'55" N	Longitude	:	73°08'27" E

Zero of Gauge (m)	:	8.22 (m.s.l)
		Opening Date
Gauge	:	21/12/1978
Discharge	:	21/12/1978
Sediment	:	01/05/1988
Water Quality	:	01/01/1979

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1979-1980	6168	14.570	12/08/1979	3.800	8.600	17/04/1980
1980-1981	2417	14.005	01/09/1980	5.400	8.450	06/04/1981
1981-1982	9880	23.600	17/08/1981	4.300	8.625	06/04/1982
1982-1983	2121	13.605	19/08/1982	5.000	8.800	29/03/1983
1983-1984	4416	15.348	16/08/1983	0.300	8.660	08/05/1984
1984-1985	12880	21.810	20/08/1984	9.200	8.850	28/05/1985
1985-1986	1524	11.645	08/10/1985	7.700	8.845	30/05/1986
1986-1987	3652	15.570	16/08/1986	6.200	8.685	05/04/1987
1987-1988	5241	18.435	27/08/1987	2.670	8.567	14/07/1987
1988-1989	7515	19.295	06/08/1988	8.300	8.760	13/04/1989
1989-1990	2680	13.720	20/08/1989	7.989	8.935	30/05/1990
1990-1991	20127	26.320	24/08/1990	7.754	8.704	04/07/1990
1991-1992	10293	20.870	01/08/1991	8.571	8.690	23/05/1992
1992-1993	199.6	9.473	08/09/1992	8.747	8.740	12/03/1993
1993-1994	8391	19.295	18/07/1993	5.800	8.770	06/07/1993
1994-1995	16590	22.795	07/09/1994	12.00	8.600	23/06/1994
1995-1996	1022	10.920	31/07/1995	6.500	8.940	24/03/1996
1996-1997	7796	17.460	09/09/1996	11.00	9.080	30/03/1997
1997-1998	11956	21.370	02/08/1997	7.740	8.935	25/05/1998
1998-1999	5751	16.865	18/09/1998	10.00	9.010	06/09/1998
1999-2000	291.7	10.020	21/07/1999	4.785	8.680	29/04/2000
2000-2001	884.5	11.495	14/07/2000	2.844	8.850	03/01/2001
2001-2002	378.6	10.440	08/08/2001	4.845	8.830	21/07/2001
2002-2003	992.5	11.130	04/09/2002	1.490	8.870	15/03/2003
2003-2004	1677	12.210	27/09/2003	1.800	8.850	15/06/2003
2004-2005	9717	19.020	15/08/2004	10.00	9.070	25/07/2004
2005-2006	1675	12.750	03/08/2005	15.80	8.770	24/04/2006
2006-2007	31062	26.820	12/08/2006	17.150	8.770	03/07/2006
2007-2008	11480	21.235	10/07/2007	15.05	8.720	21/05/2008
2008-2009	441.7	10.690	13/08/2008	10.01	8.700	23/04/2009
2009-2010	465.4	10.850	31/08/2009	5.203	8.690	18/05/2010
2010-2011	1156	11.795	05/08/2010	3.273	8.750	31/05/2011
2011-2012	4362.8	15.240	13/09/2011	2.371	8.470	29/05/2012

Stage-Discharge Data for the period 2011 - 2012

Station Name : Mahi at Khanpur (01 02 13 012) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn., Kadana**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	8.750	3.265	8.845	6.047	9.080	16.32	12.015	1451	9.795	168.6	8.750	22.30
2	8.760	3.508	8.955	8.232	9.085	12.36	10.905	615.6	9.700	115.7 *	8.740	19.73
3	8.760	3.524	8.970	13.28 *	9.070	11.40	14.865	3893	9.405	79.74	8.740	18.71
4	8.760	3.504	8.950	7.989	9.015	7.919	12.740	1661 *	9.155	51.90	8.760	19.90
5	8.760	2.610 *	8.930	8.041	8.985	7.435	11.980	1392	9.030	50.00	8.760	19.88
6	8.810	4.578	8.920	7.913	8.960	6.341	12.495	1469 #	8.930	10.60 *	8.770	20.63 *
7	8.820	4.607	8.900	7.073	8.940	11.24 *	12.145	1215 #	8.865	30.37	8.800	23.87 *
8	8.810	4.580	8.930	7.970	8.920	5.866	11.500	1082	8.815	23.42	8.780	21.03
9	8.810	4.511	9.755	133.8	8.995	8.167	11.190	839.6	9.200	34.53 *	8.780	21.02
10	8.810	4.524	9.820	142.4 *	9.190	36.49	11.160	815.1	9.340	59.82	8.780	21.68 *
11	8.780	4.054	9.510	90.89	10.835	426.5	11.260	681.5 *	9.240	71.44	8.770	20.03
12	8.780	3.270 *	9.420	75.13	10.960	477.2	14.840	3976	9.215	59.94	8.770	19.60
13	8.780	4.049	9.195	24.31	10.330	301.3	15.240	4363	9.155	45.60	8.770	20.63 *
14	8.800	4.291	9.115	17.23	10.090	212.6 *	12.850	1899	9.100	63.78	8.770	19.49
15	8.810	4.489	9.025	13.11	10.890	504.2 *	11.735	1139	9.080	57.21	8.740	19.57
16	8.820	4.623	9.080	15.66	10.330	292.7	10.855	461.3	9.050	62.69 *	8.720	19.29
17	8.830	5.171	9.040	18.68 *	11.570	673.2	11.360	928.6	9.030	58.75 #	8.720	19.18
18	8.840	5.346	8.995	10.05	11.295	569.4	11.180	640.9 *	8.960	41.60	8.720	19.20
19	8.840	5.700 *	9.340	49.60	11.150	581.2	10.810	442.8	8.880	36.77	8.720	18.99
20	8.830	5.198	9.205	25.92	11.315	591.9	10.870	485.8	8.830	32.13	8.720	15.86 *
21	8.810	4.593	9.035	10.89	11.680	915.4 *	10.820	429.9	8.800	29.77	8.720	18.98
22	8.800	4.321	9.020	11.26	11.290	697.0 *	10.820	427.6	8.795	26.51	8.710	18.41
23	8.785	4.010	9.020	11.16	11.180	581.4	10.780	407.7	8.780	21.68 *	8.710	16.06
24	8.780	3.746	9.020	17.04 *	11.710	807.8	10.550	390.4	8.740	21.67	8.710	16.24
25	8.780	3.730	9.000	10.06	10.990	640.0	10.350	293.7 *	8.740	21.60	8.690	15.17
26	8.780	3.270 *	8.980	9.301	10.990	497.6	10.070	299.6	8.740	17.68 *	8.690	15.04
27	8.800	4.247	8.960	7.824	12.390	1337	9.880	202.0	8.740	21.46	8.690	13.35 *
28	8.820	4.713	8.970	8.087	12.980	1861 *	9.840	192.3	8.740	21.44	8.690	15.05
29	8.820	5.160	8.990	7.893	13.215	1639	10.010	295.3	8.740	21.72	8.700	16.29
30	8.820	5.156	8.990	8.010	14.280	2529	9.770	155.0	8.740	17.68 *	8.800	23.61
31			9.040	18.68 *	15.175	4268			8.730	22.17		
Ten-Daily Mean												
I Ten-Daily	8.785	3.921	9.097	34.27	9.024	12.35	12.100	1443	9.224	62.47	8.766	20.87
II Ten-Daily	8.811	4.619	9.193	34.06	10.877	463.0	12.100	1502	9.054	52.99	8.742	19.18
III Ten-Daily	8.799	4.295	9.002	10.93	12.353	1434	10.289	309.3	8.753	22.12	8.711	16.82
Monthly												
Min.	8.750	2.610	8.845	6.047	8.920	5.866	9.770	155.0	8.730	10.60	8.690	13.35
Max.	8.840	5.700	9.820	142.4	15.175	4268	15.240	4363	9.795	168.6	8.800	23.87
Mean	8.799	4.278	9.094	25.92	10.803	662.1	11.496	1085	9.002	45.1	8.740	18.96

Annual Runoff in MCM = 5014 Annual Runoff in mm = 154

Peak Observed Discharge = 4363 cumecs on 13/09/2011 Corres. Water Level :15.24 m

Lowest Observed Discharge = 2.371 cumecs on 29/05/2012 Corres. Water Level :8.47 m

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Mahi at Khanpur (01 02 13 012) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn., Kadana**

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	8.710	15.91	8.720	15.86 *	8.710	15.48	8.680	10.62	8.590	6.760 *	8.520	3.698
2	8.710	16.23	8.710	15.72	8.740	17.92	8.680	10.15	8.590	6.760 #	8.520	3.796
3	8.880	34.67	8.710	15.66	8.720	16.73	8.700	9.903	8.580	4.048	8.620	8.116
4	8.810	25.01 *	8.740	18.49	8.720	16.68	8.700	14.16 *	8.570	5.760 #	8.620	7.458
5	8.780	21.67	8.720	16.77	8.720	15.86 *	8.680	9.919	8.570	5.760 *	8.540	4.179
6	8.760	19.62 *	8.730	17.70	8.730	17.32	8.660	9.021	8.570	5.760 *	8.540	4.420 *
7	8.720	19.84	8.740	18.34	8.770	20.14	8.660	9.126	8.570	5.760 #	8.520	3.816
8	8.720	19.58	8.740	17.68 *	8.720	13.74	8.660	11.09 *	8.570	5.760 *	8.490	3.221
9	8.730	19.65	8.710	15.68	8.720	14.05	8.660	8.936	8.540	3.861	8.490	3.267
10	8.730	19.69	8.770	20.12	8.760	16.27	8.660	9.089	8.540	3.827	8.490	3.140
11	8.730	16.75 *	8.770	19.93	8.760	16.35	8.660	11.09 *	8.540	3.831	8.490	3.150
12	8.720	19.52	8.750	18.04	8.740	17.68 *	8.660	9.039	8.540	3.852	8.490	3.171
13	8.770	20.16	8.880	35.54	8.720	14.20	8.650	9.435	8.540	3.847	8.490	2.650 *
14	8.770	20.33	8.770	20.00	8.720	14.52	8.640	9.203	8.540	4.420 *	8.490	3.183
15	8.770	20.04	8.820	26.18 *	8.710	13.61	8.620	7.161	8.540	4.420 *	8.480	2.510
16	8.750	17.89	8.780	21.03	8.710	14.02	8.620	7.187	8.550	4.025	8.480	2.527
17	8.730	17.01	8.720	16.29	8.850	25.27	8.620	7.225	8.540	4.052	8.470	2.466
18	8.730	16.75 *	8.740	18.03	8.770	16.97	8.620	8.460 *	8.535	4.356	8.470	2.428
19	8.710	15.95	8.740	18.09	8.730	16.75 *	8.620	7.183	8.530	4.071	8.470	2.409
20	8.710	15.99	8.740	18.08	8.720	15.86 *	8.620	7.015	8.530	3.943	8.490	2.650 *
21	8.710	16.05	8.740	16.38	8.720	14.37	8.600	7.303	8.530	4.021	8.490	2.846
22	8.710	16.00	8.720	15.86 *	8.710	13.46	8.610	6.796	8.530	4.030 *	8.490	2.659
23	8.750	18.21	8.720	16.48	8.710	13.50	8.610	6.779	8.530	4.018	8.490	2.670
24	8.720	16.62	8.720	16.34	8.710	13.54	8.610	6.784	8.530	3.996	8.480	2.505
25	8.720	15.86 *	8.720	16.30	8.680	10.66	8.610	7.870 *	8.540	4.129	8.480	2.551
26	8.740	18.31	8.720	15.86 *	8.680	12.57 *	8.610	6.729	8.540	4.177	8.480	2.557
27	8.730	17.66	8.720	16.30	8.680	10.39	8.590	4.771	8.540	4.168	8.470	2.090 *
28	8.740	18.57	8.710	15.82	8.670	10.53	8.590	4.849	8.540	4.123	8.470	2.494
29	8.740	18.44	8.710	14.99 *	8.670	10.41	8.590	4.444	8.540	4.420 *	8.470	2.371
30	8.720	16.72	8.710	15.78			8.590	6.760 #	8.530	3.988	8.470	2.383
31	8.720	16.70	8.710	15.68			8.590	4.082			8.470	2.377
Ten-Daily Mean												
I Ten-Daily	8.755	21.19	8.729	17.20	8.731	16.42	8.674	10.20	8.569	5.406	8.535	4.511
II Ten-Daily	8.739	18.04	8.771	21.12	8.743	16.52	8.633	8.300	8.538	4.082	8.482	2.714
III Ten-Daily	8.727	17.19	8.718	15.98	8.692	12.16	8.600	6.106	8.535	4.107	8.478	2.500
Monthly												
Min.	8.710	15.86	8.710	14.99	8.670	10.39	8.590	4.082	8.530	3.827	8.470	2.090
Max.	8.880	34.67	8.880	35.54	8.850	25.27	8.700	14.16	8.590	6.760	8.620	8.116
Mean	8.740	18.76	8.739	18.03	8.723	15.13	8.635	8.135	8.547	4.532	8.498	3.218

Peak Computed Discharge = 1861 cumecs on 28/08/2011 **Corres. Water Level :12.98 m**

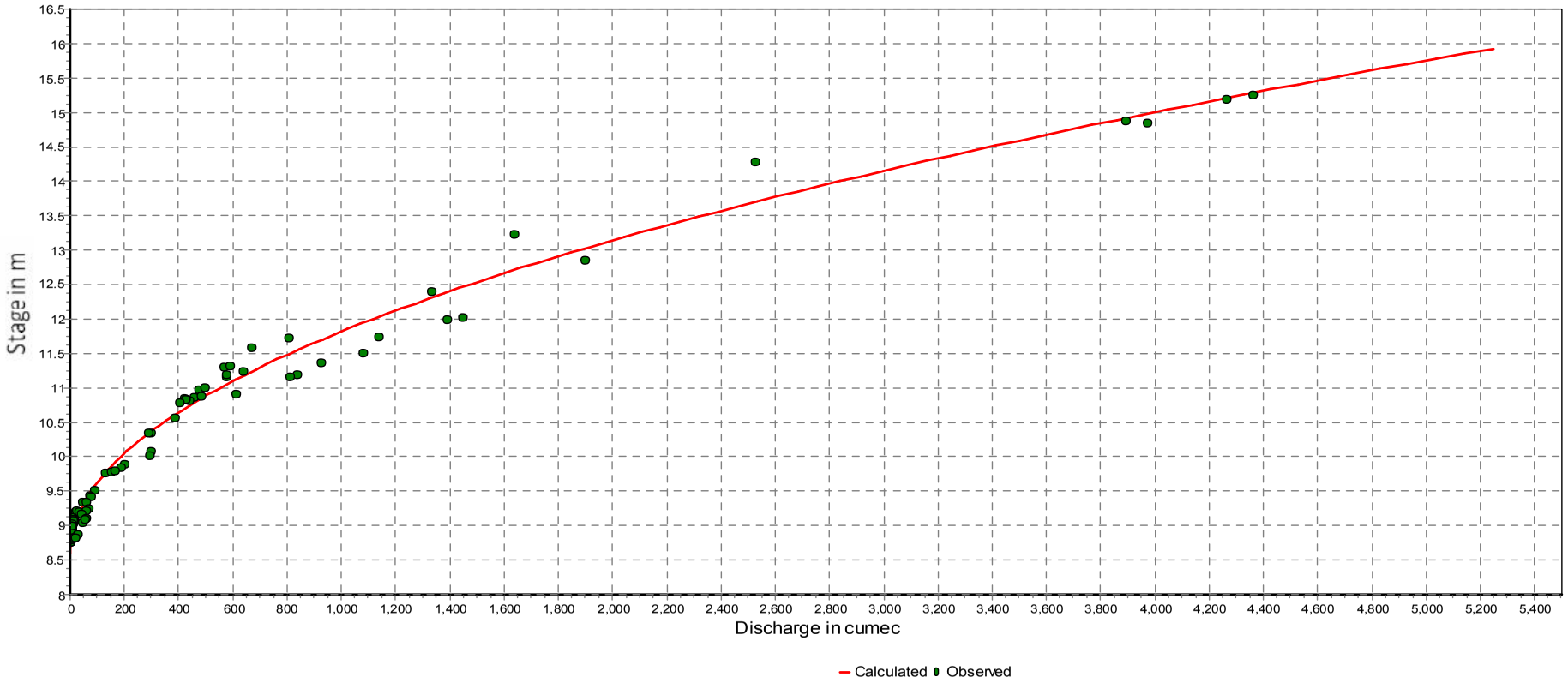
Lowest Computed Discharge = 2.090 cumecs on 27/05/2012 **Corres. Water Level :8.47 m**

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff

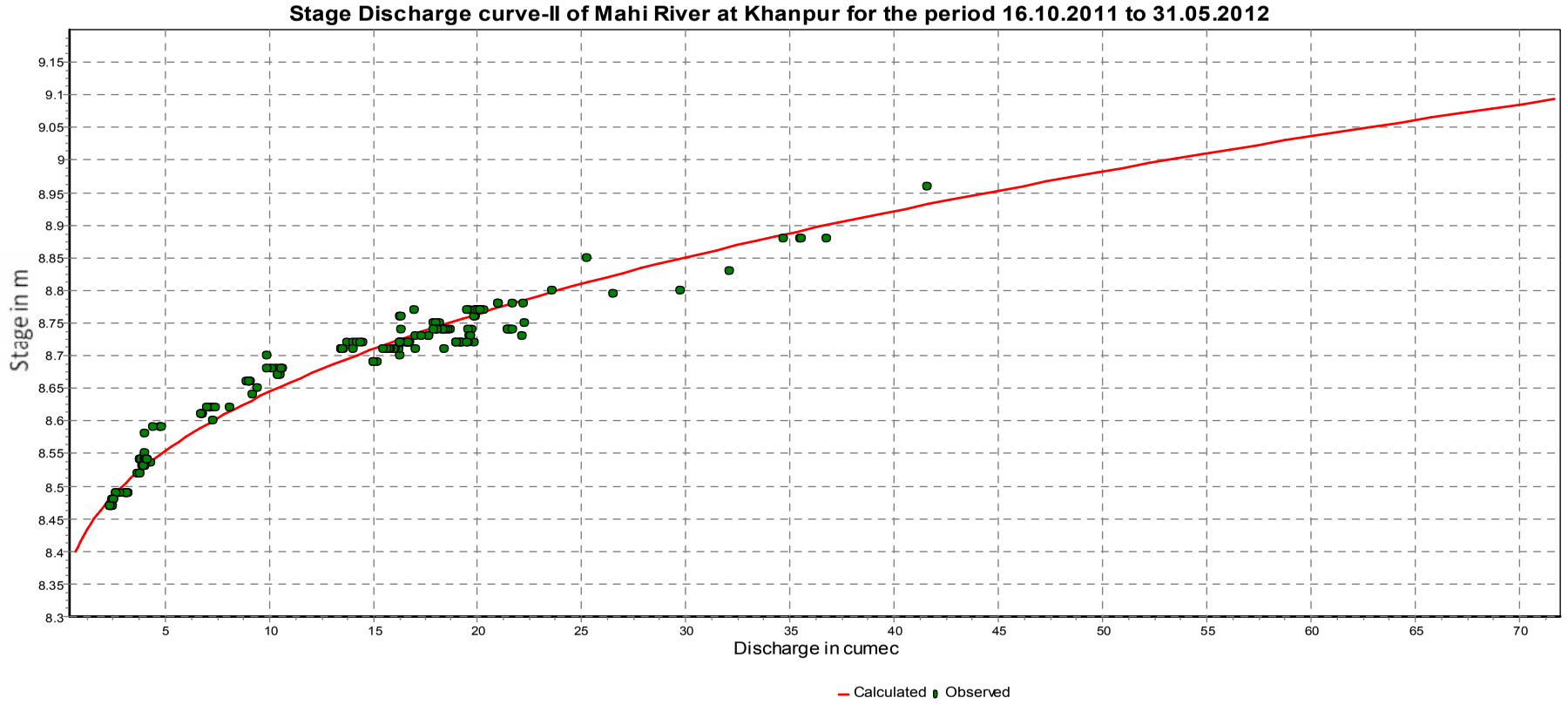
Stage discharge curve I of river Mahi for the site Khanpur for the period 01.06.2011 to 15.10.2012



Procedure : Standard

Equation type: Power

Q = c (h+a)^b, a = -8.59, b = 2.02, c = 93.732



Procedure : Standard

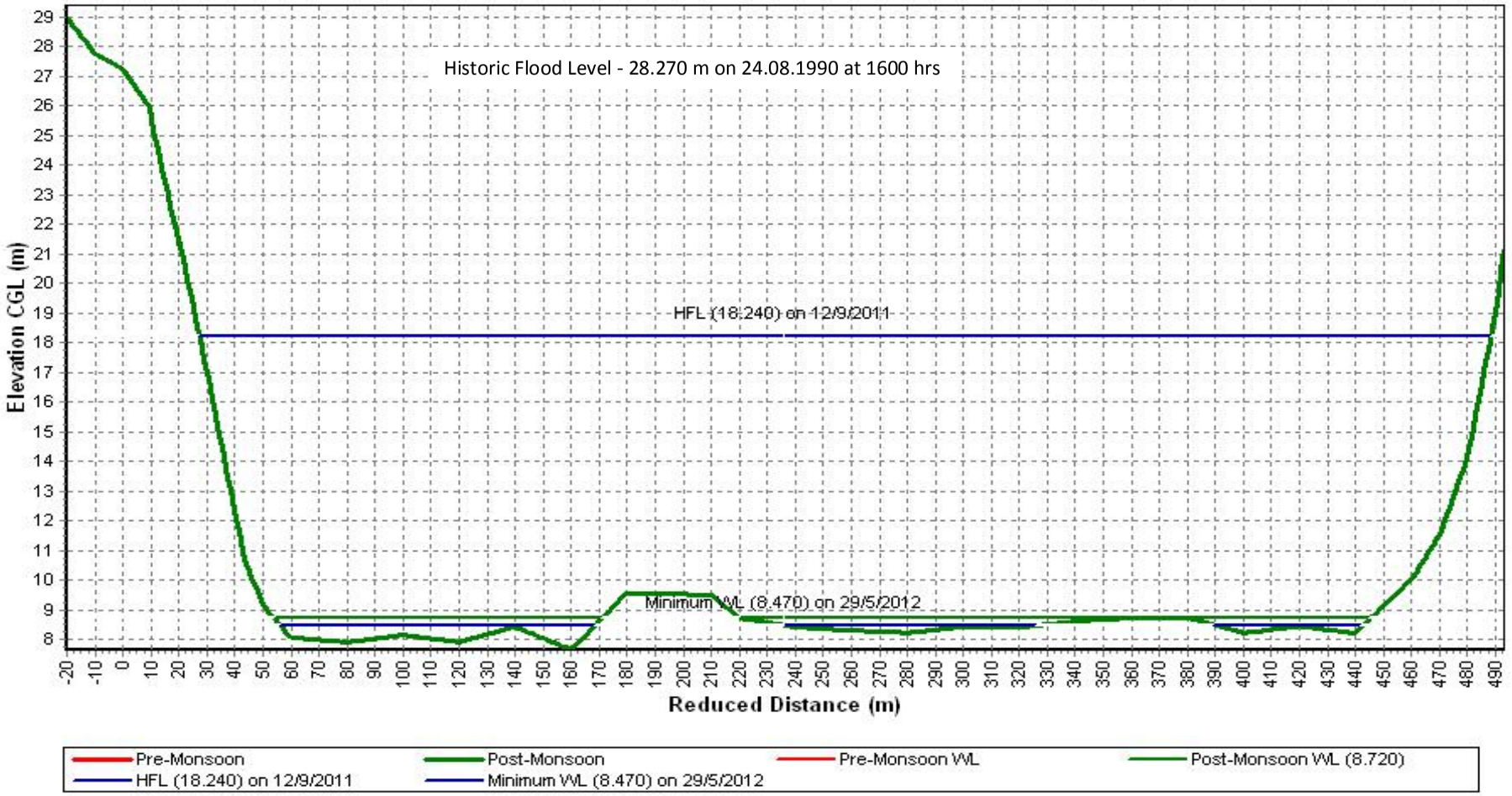
Equation type: Power

Q = c (h+a)^b, a = -8.27, b = 2.499, c = 116.647

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Mahi at Khanpur (01 02 13 012) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn., Kadana**

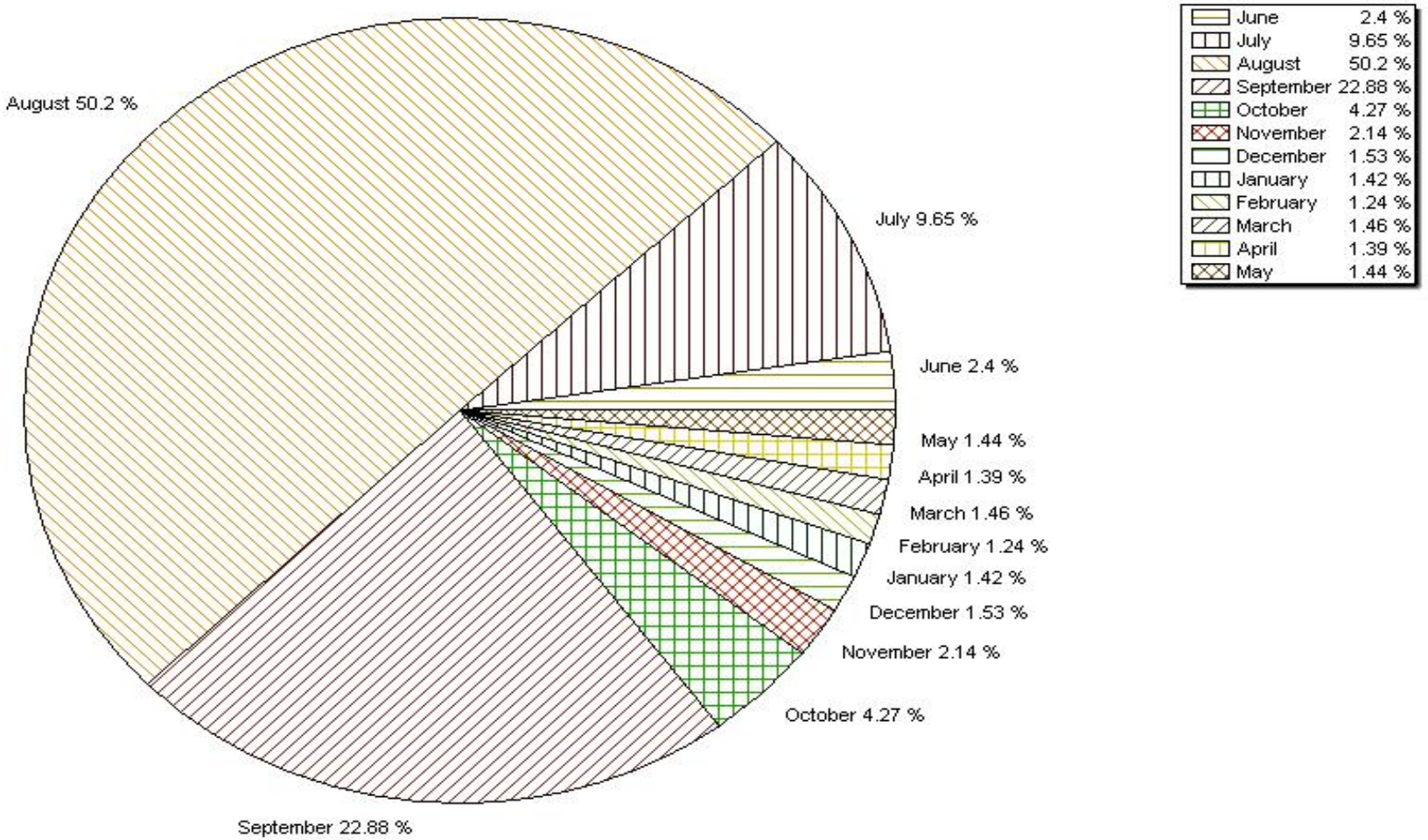


Historic Flood Level - 28.270 m on 24.08.1990 at 1600 hrs

Monthly Average Runoff based on period : 1979-2011

Station Name : Mahi at Khanpur (01 02 13 012)
Local River : Mahi

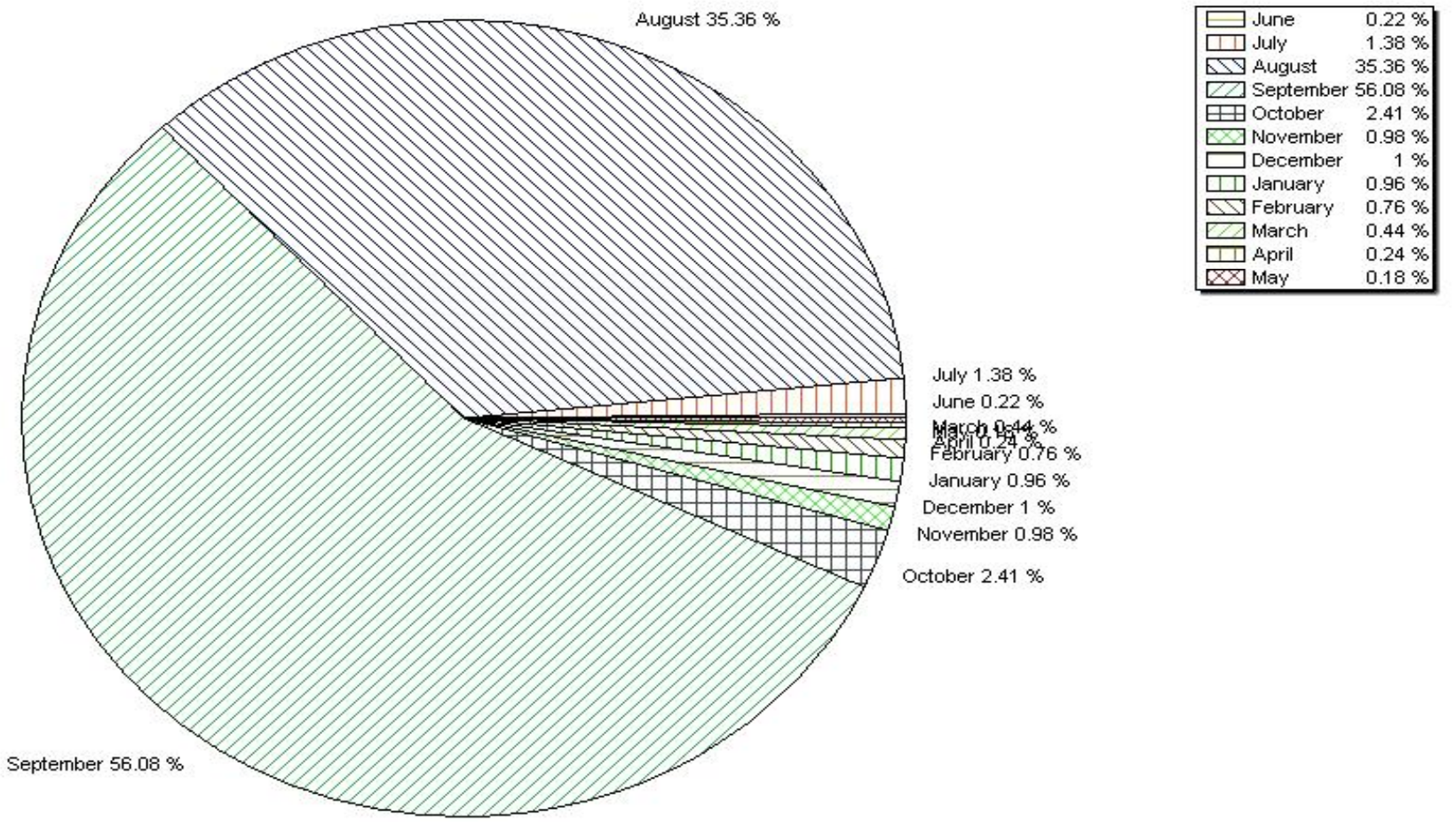
Division : Mahi Division, Gandhinagar
Sub-Division : Mahi Sub Divn., Kadana



Monthly Runoff for the Year : 2011-2012

Station Name : Mahi at Khanpur (01 02 13 012)
Local River : Mahi

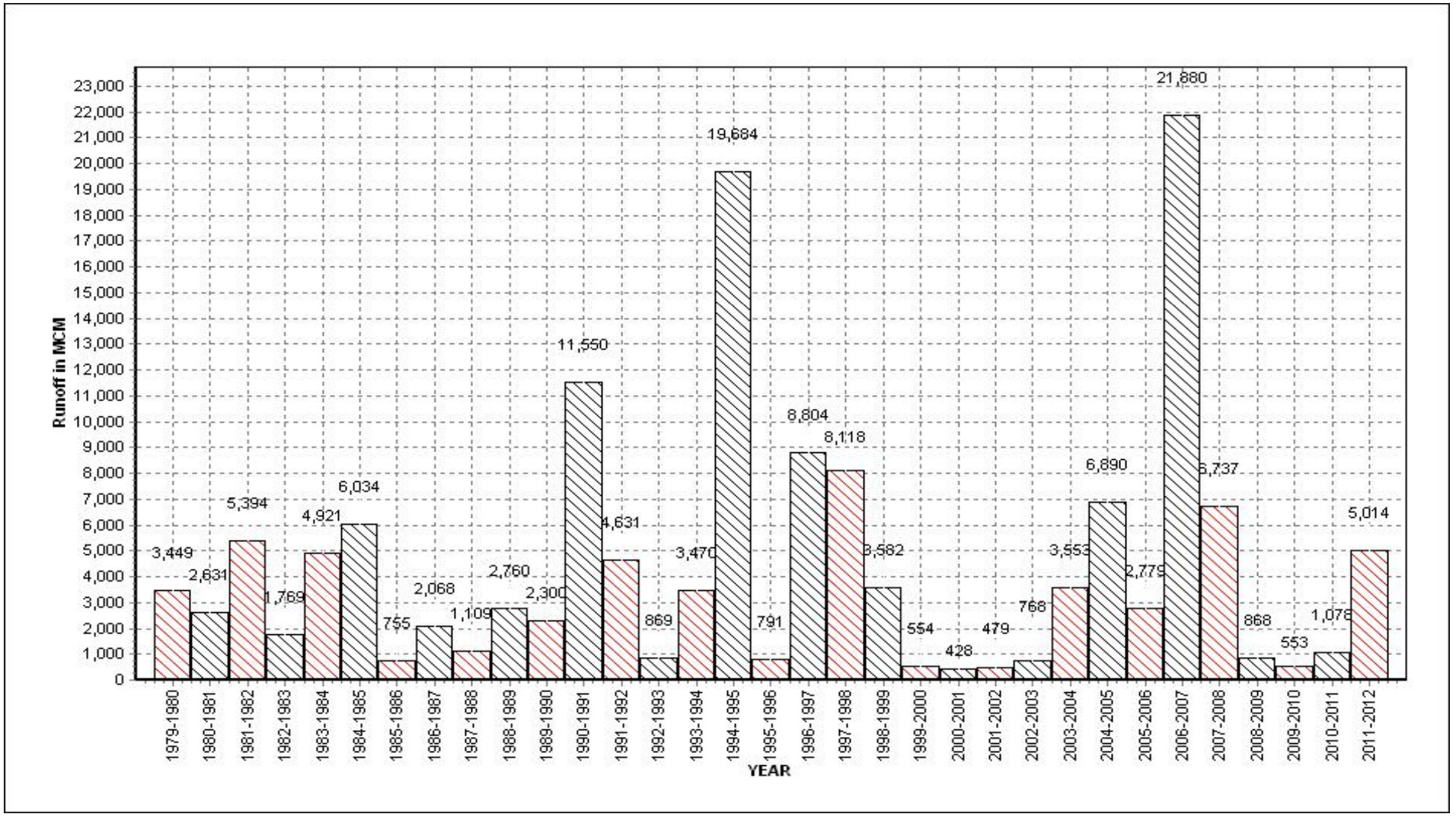
Division : Mahi Division, Gandhinagar
Sub-Division : Mahi Sub Divn., Kadana



Annual Runoff Values for the period: 1979 - 2012

Station Name : Mahi at Khanpur (01 02 13 012)
Local River : Mahi

Division : Mahi Division, Gandhinagar
Sub-Division : Mahi Sub Divn., Kadana

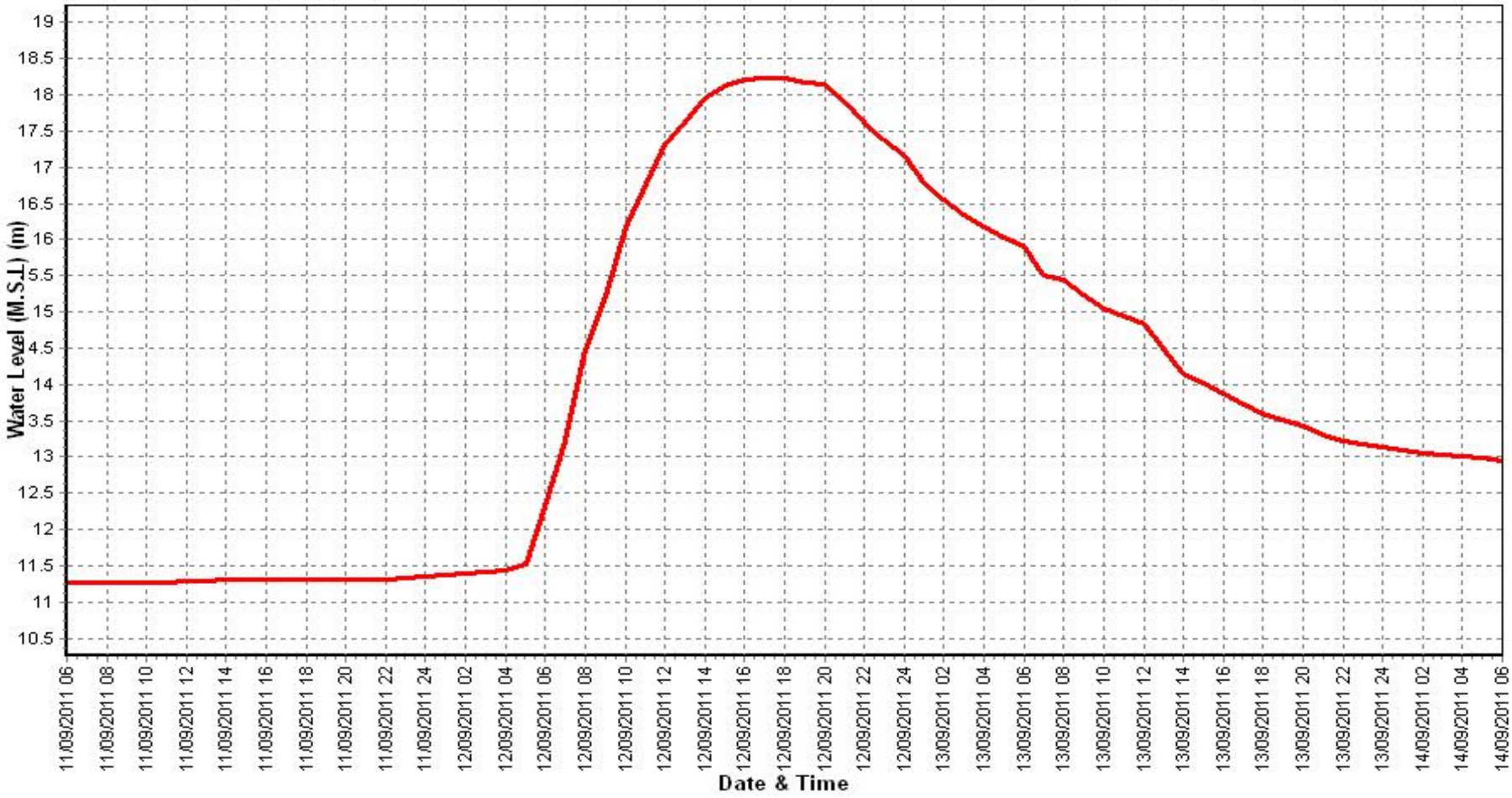


Note: Missing values have not been considered while arriving at Annual Runoff

Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Mahi at Khanpur (01 02 13 012) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn., Kadana**

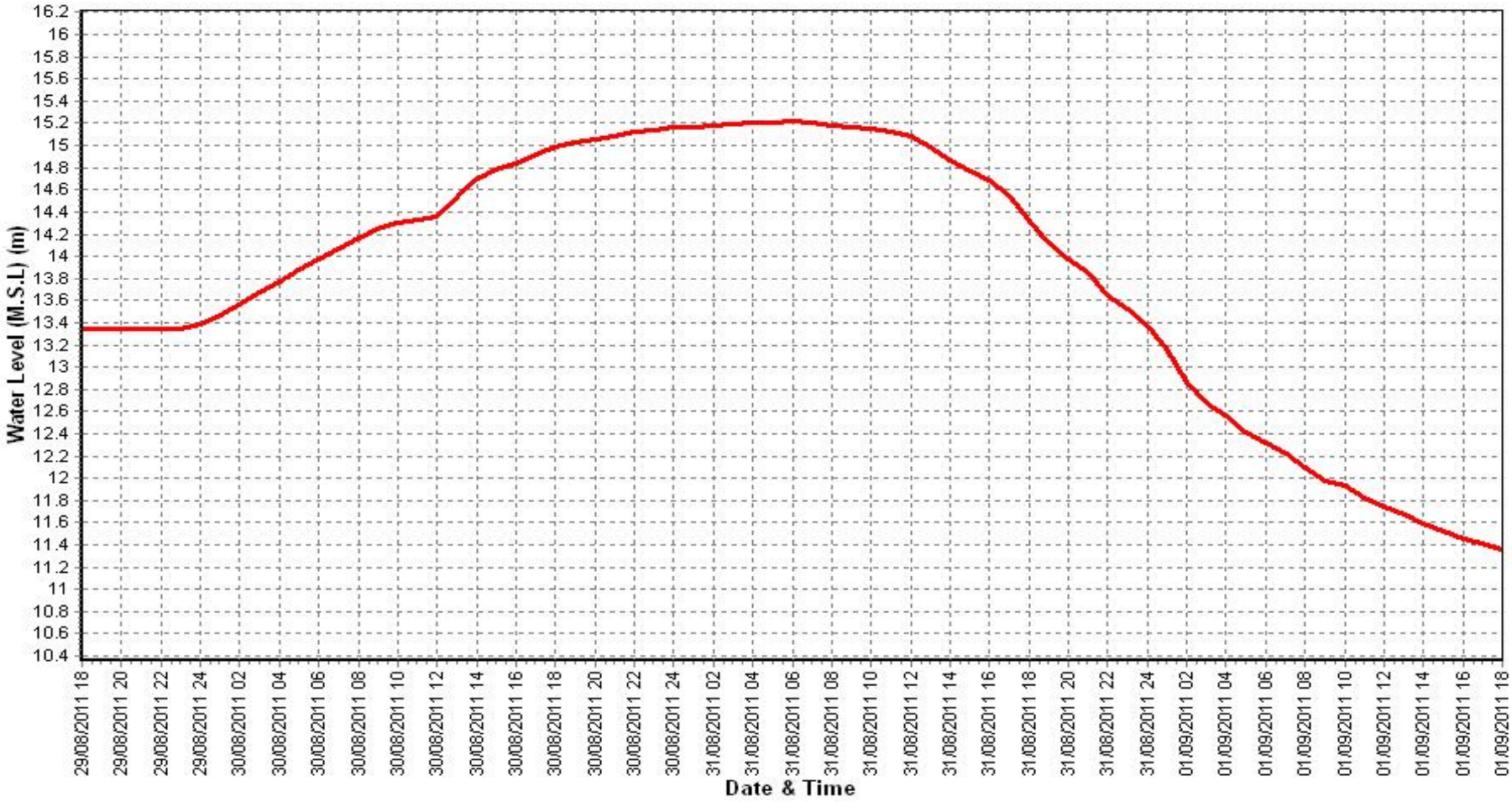


Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Mahi at Khanpur (01 02 13 012) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn., Kadana**

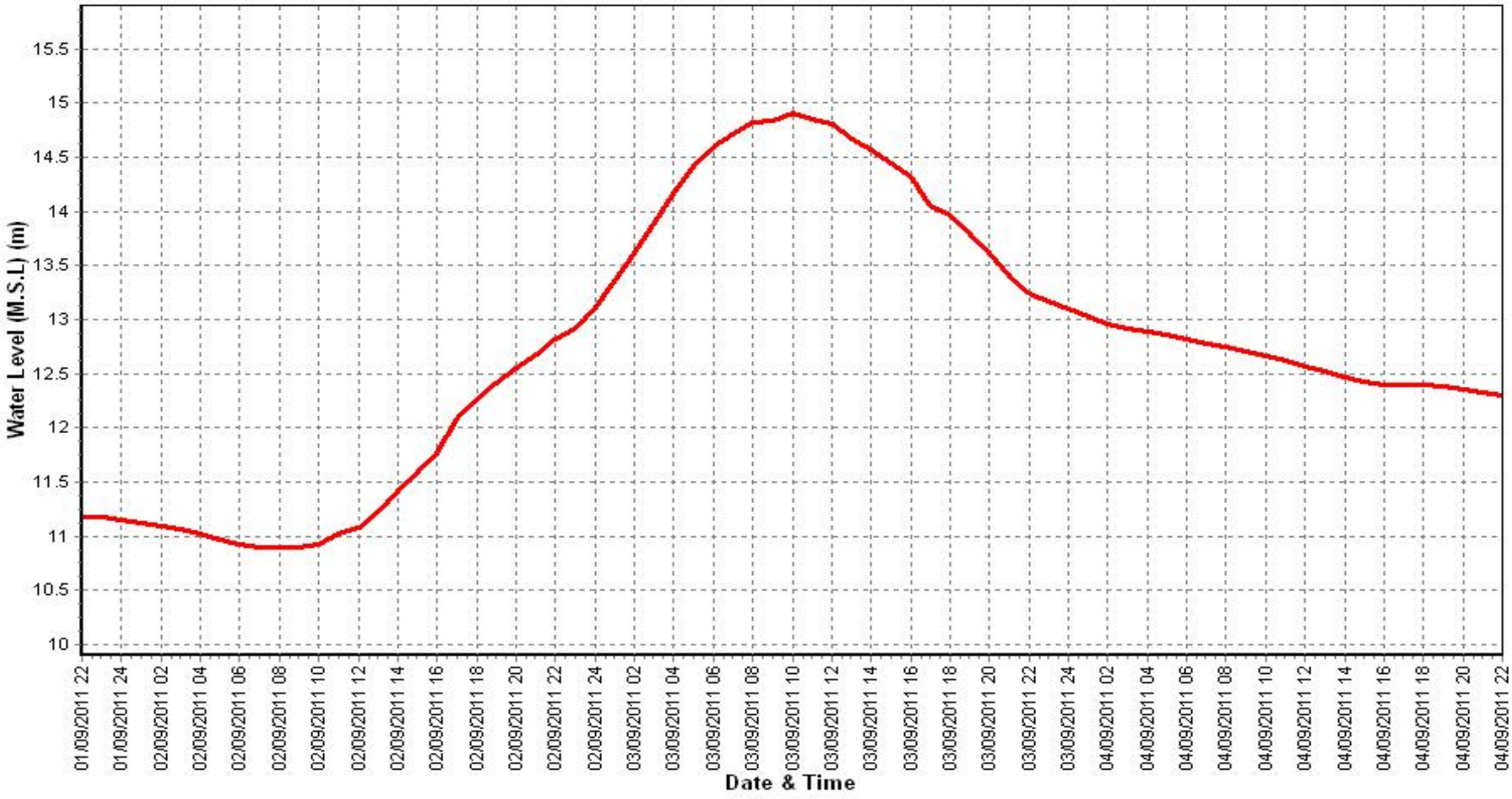


Time Span: 72 Hrs

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Mahi at Khanpur (01 02 13 012) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn., Kadana**



Time Span: 72 Hrs

HISTORY SHEET

			Water Year	**:**	**2011-2012**
Site	**:**	**Anas at Chakaliya**	**Code**	**:**	**01 02 13 007**
State	:	Gujarat	District		Panchmahal
Basin	:	Mahi	Independent Rive	:	Mahi
Tributary	:	Anas	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Anas
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	Mahi Sub Divn., Kadana
Drainage Area	:	3121 Sq. Km.	Bank	:	Left
Latitude	:	23°02'58" N	Longitude	:	74°19'14" E
Zero of Gauge (m)	:	180 (m.s.l) 215 (m.s.l)	01/03/1991 01/05/2003	- -	30/04/2003
		Opening Date	Closing Date		
Gauge	:	13/02/1991			
Discharge	:	13/02/1991			
Sediment	:	-			
Water Quality	:	-			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1991-1992	2583	188.125	31/07/1991	0.000	181.360	29/04/1992
1992-1993	674.3	183.925	07/09/1992	0.000	180.890	15/06/1992
1993-1994	3717	192.100	17/07/1993	0.000	181.350	04/04/1994
1994-1995	4128	190.000	07/09/1994	0.000	181.440	17/04/1995
1995-1996	1387	184.350	25/07/1995	0.000	180.760	09/05/1996
1996-1997	3933	188.525	28/07/1996	0.000	181.400	22/04/1997
1997-1998	3419	187.400	01/08/1997	0.000	181.490	12/05/1998
1998-1999	1505	182.320	26/09/1998	0.000	181.160	11/06/1998
1999-2000	223.0	182.950	20/06/1999	0.000	181.350	13/01/2000
2000-2001	60.00	182.200	13/08/2000	0.000	181.370	14/11/2000
2001-2002	1525	185.050	18/06/2001	0.000	River Dry	23/01/2002
2002-2003	4226	189.800	03/09/2002	0.000	River Dry	25/03/2003
2003-2004	3228	223.950	24/08/2003	0.000	217.410	22/02/2004
2004-2005	5874	224.250	14/08/2004	0.000	217.250	01/03/2005
2005-2006	6956	224.350	28/07/2005	0.000	216.920	01/06/2005
2006-2007	5474	226.900	11/08/2006	0.000	River Dry	01/06/2006
2007-2008	3227	224.650	08/08/2007	0.000	217.360	01/06/2007
2008-2009	691.0	219.700	12/08/2008	0.000	217.020	12/05/2009
2009-2010	736.2	220.675	23/07/2009	0.000	218.200	04/11/2009
2010-2011	630.5	220.550	31/08/2010	0.000	218.060	20/05/2011
2011-2012	258.5	219.700	02/09/2011	0.000	River Dry	21/06/2011

Stage-Discharge Data for the period 2011 - 2012

Station Name : Anas at Chakaliya (01 02 13 007) **Division : Mahi Division, Gandhinagar**

Local River : Anas **Sub-Division : Mahi Sub Divn., Kadana**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	218.060	0.000 *	R.Dry	0.000	218.600	21.29	219.580	196.7	218.390	20.01	218.300	1.952
2	218.060	0.000 *	R.Dry	0.000	218.430	12.20	219.700	258.5	218.390	12.27 *	218.300	1.896
3	218.060	0.000 *	R.Dry	0.000	218.400	11.97	219.400	166.8	218.380	20.07	218.300	1.817
4	218.060	0.000 *	R.Dry	0.000	218.400	10.89	219.350	163.5 *	218.380	19.82	218.300	1.683
5	218.060	0.000 *	R.Dry	0.000	218.540	21.03	219.400	169.4	218.380	20.18	218.300	5.090 *
6	218.050	0.000 *	R.Dry	0.000	218.470	18.85	219.260	156.5	218.370	10.51 *	218.290	4.420 *
7	218.050	0.000 *	R.Dry	0.000	218.450	18.06 *	219.080	149.3	218.370	16.72	218.290	4.420 *
8	R Dry	0.000	R.Dry	0.000	218.440	17.54	219.000	135.9	218.370	18.62	218.290	1.313
9	R Dry	0.000	218.400	13.18 *	218.760	37.58	218.980	108.7	218.370	10.51 *	218.290	1.196
10	R Dry	0.000	218.280	3.780 *	219.625	198.5	218.900	101.2	218.360	18.40	218.280	0.000 *
11	R Dry	0.000	218.280	3.780 *	219.760	234.7	218.820	66.51 *	218.360	16.79	218.280	0.000 *
12	R Dry	0.000	218.280	3.780 *	219.410	169.6	218.840	44.58	218.360	17.23	218.280	0.000 *
13	R Dry	0.000	218.280	3.780 *	219.200	145.1	218.800	43.07	218.360	16.61	218.280	0.000 *
14	R Dry	0.000	218.300	5.090 *	219.020	99.83 *	218.810	41.81	218.360	16.67	218.270	0.000 *
15	R Dry	0.000	218.350	8.830 *	218.950	87.68 *	218.790	35.51	218.350	16.55	218.270	0.000 *
16	R Dry	0.000	218.370	10.51 *	219.000	141.8	218.770	34.98	218.340	8.030 *	218.270	0.000 *
17	R Dry	0.000	218.370	10.51 *	219.700	257.4	218.750	34.77	218.340	8.030 *	218.260	0.000 *
18	R Dry	0.000	218.350	8.830 *	219.440	199.8	218.740	54.45 *	218.340	8.030 *	218.260	0.000 *
19	R Dry	0.000	218.350	8.830 *	219.350	150.1	218.710	29.43	218.340	8.030 *	218.260	0.000 *
20	R Dry	0.000	218.350	8.830 *	219.200	150.2	218.790	35.51	218.340	15.55	218.260	0.000 *
21	R Dry	0.000	218.400	13.18 #	219.000	96.30 *	218.710	29.40	218.330	15.20	218.250	0.000 *
22	R Dry	0.000	218.400	12.64	219.020	99.83 *	218.680	46.57	218.330	15.03	218.250	0.000 *
23	R Dry	0.000	218.400	10.62	219.000	141.2	218.640	45.90	218.330	7.260 *	218.250	0.000 *
24	R Dry	0.000	218.380	11.38 *	218.820	42.20	218.620	44.08	218.330	14.12	218.250	0.000 *
25	R Dry	0.000	218.380	9.669	219.080	147.3	218.600	35.32 *	218.320	13.59	218.250	0.000 *
26	R Dry	0.000	218.380	8.990	219.300	150.0	218.570	37.14	218.320	6.510 *	218.250	0.000 *
27	R Dry	0.000	218.400	12.13	219.000	141.6	218.500	36.58	218.320	6.510 *	218.250	0.000 *
28	R Dry	0.000	218.400	12.00	219.700	241.0 *	218.430	29.22	218.310	5.780 *	218.250	0.000 *
29	R Dry	0.000	218.400	11.90	220.300	394.6 *	218.400	27.88	218.310	4.674	218.250	0.000 *
30	R Dry	0.000	218.600	21.64	220.100	340.7 *	218.390	21.18	218.310	5.780 *	218.250	0.000 *
31			218.660	43.20 *	219.820	269.8 *			218.310	3.158		
Ten-Daily Mean												
I Ten-Daily	218.057	0.000	218.340	1.696	218.611	36.79	219.265	160.6	218.376	16.71	218.294	2.379
II Ten-Daily		0.000	218.328	7.277	219.303	163.6	218.782	42.06	218.349	13.15	218.269	0.000
III Ten-Daily		0.000	218.436	15.21	219.376	187.7	218.554	35.33	218.320	8.874	218.250	0.000
Monthly												
Min.	218.050	0.000	218.280	0.000	218.400	10.89	218.390	21.18	218.310	3.158	218.250	0.000
Max.	218.060	0.000	218.660	43.20	220.300	394.6	219.700	258.5	218.390	20.18	218.300	5.090
Mean	218.057	0	218.381	8.293	219.106	131.2	218.867	79.34	218.347	12.78	218.271	0.793

Annual Runoff in MCM = 616 Annual Runoff in mm = 197

Peak Observed Discharge = 258.5 cumecs on 02/09/2011 Corres. Water Level :219.7 m

Lowest Observed Discharge = 0.000 cumecs on 08/06/2011

Stage-Discharge Data for the period 2011 - 2012

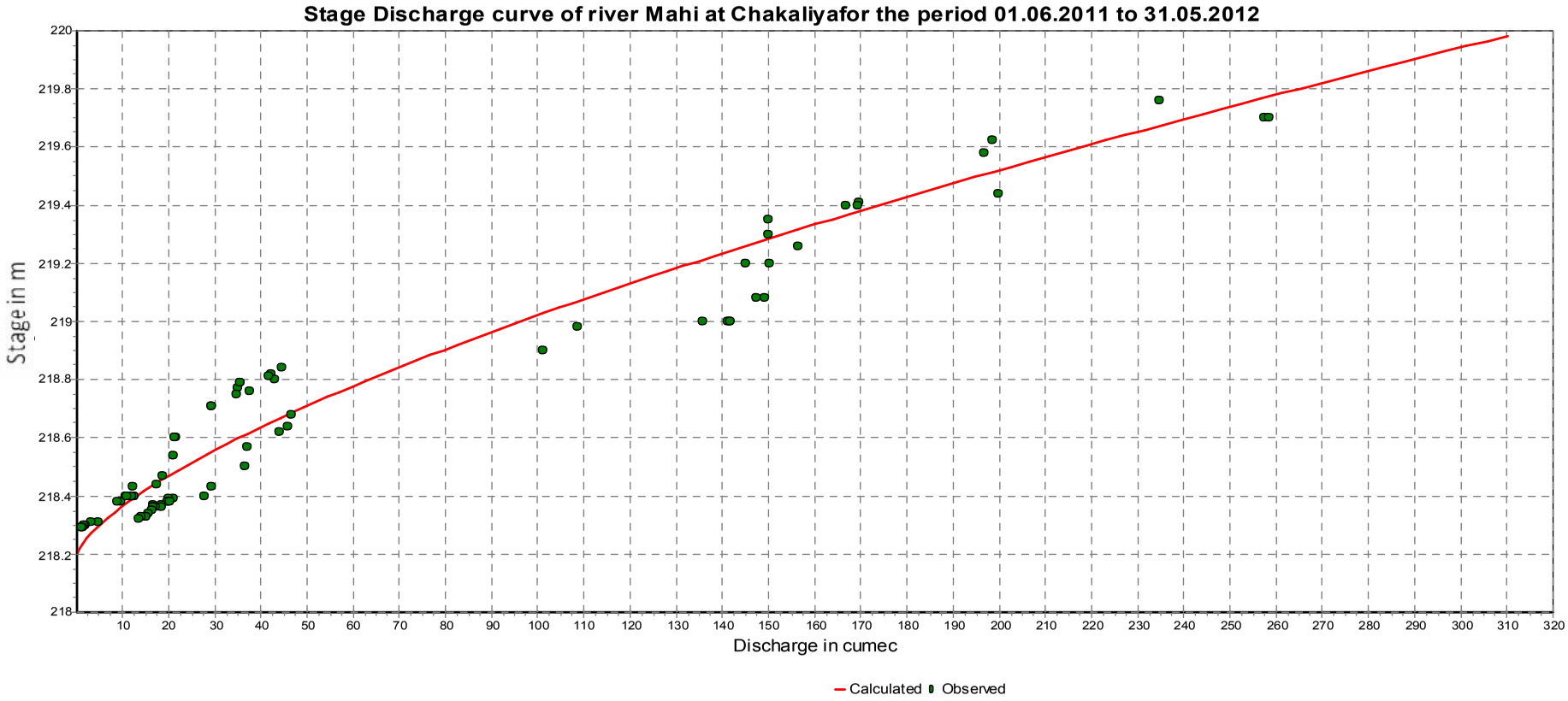
Station Name : Anas at Chakaliya (01 02 13 007) **Division : Mahi Division, Gandhinagar**

Local River : Anas **Sub-Division : Mahi Sub Divn., Kadana**

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	218.250	0.000 *	218.220	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.180	0.000 *
2	218.250	0.000 *	218.220	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.170	0.000 *
3	218.250	0.000 *	218.220	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.170	0.000 *
4	218.250	0.000 *	218.220	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.170	0.000 *
5	218.240	0.000 *	218.220	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.170	0.000 *
6	218.240	0.000 *	218.220	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.170	0.000 *
7	218.240	0.000 *	218.210	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.170	0.000 *
8	218.240	0.000 *	218.210	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.170	0.000 *
9	218.240	0.000 *	218.210	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.170	0.000 *
10	218.240	0.000 *	218.210	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.170	0.000 *
11	218.240	0.000 *	218.210	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.170	0.000 *
12	218.240	0.000 *	218.210	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.170	0.000 *
13	218.240	0.000 *	218.210	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.170	0.000 *
14	218.240	0.000 *	218.210	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.170	0.000 *
15	218.240	0.000 *	218.210	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.160	0.000 *
16	218.240	0.000 *	218.210	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.160	0.000 *
17	218.240	0.000 *	218.210	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.160	0.000 *
18	218.240	0.000 *	218.210	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.160	0.000 *
19	218.230	0.000 *	218.210	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.160	0.000 *
20	218.230	0.000 *	218.210	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.160	0.000 *
21	218.230	0.000 *	218.210	0.000 *	218.190	0.000 *	218.190	0.000 *	218.180	0.000 *	218.160	0.000 *
22	218.230	0.000 *	218.210	0.000 *	218.190	0.000 *	218.190	0.000 *	218.180	0.000 *	218.160	0.000 *
23	218.230	0.000 *	218.210	0.000 *	218.190	0.000 *	218.190	0.000 *	218.180	0.000 *	218.160	0.000 *
24	218.230	0.000 *	218.210	0.000 *	218.190	0.000 *	218.190	0.000 *	218.180	0.000 *	218.160	0.000 *
25	218.230	0.000 *	218.210	0.000 *	218.190	0.000 *	218.190	0.000 *	218.180	0.000 *	218.160	0.000 *
26	218.230	0.000 *	218.210	0.000 *	218.190	0.000 *	218.190	0.000 *	218.180	0.000 *	218.160	0.000 *
27	218.230	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.180	0.000 *	218.160	0.000 *
28	218.220	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.180	0.000 *	218.160	0.000 *
29	218.220	0.000 *	218.200	0.000 *	218.190	0.000 *	218.180	0.000 *	218.180	0.000 *	218.160	0.000 *
30	218.220	0.000 *	218.200	0.000 *			218.180	0.000 *	218.180	0.000 *	218.160	0.000 *
31	218.220	0.000 *	218.200	0.000 *			218.180	0.000 *			218.160	0.000 *
Ten-Daily Mean												
I Ten-Daily	218.244	0.000	218.216	0.000	218.200	0.000	218.190	0.000	218.180	0.000	218.171	0.000
II Ten-Daily	218.238	0.000	218.210	0.000	218.200	0.000	218.190	0.000	218.180	0.000	218.164	0.000
III Ten-Daily	218.226	0.000	218.205	0.000	218.190	0.000	218.185	0.000	218.180	0.000	218.160	0.000
Monthly												
Min.	218.220	0.000	218.200	0.000	218.190	0.000	218.180	0.000	218.180	0.000	218.160	0.000
Max.	218.250	0.000	218.220	0.000	218.200	0.000	218.190	0.000	218.180	0.000	218.180	0.000
Mean	218.236	0	218.210	0	218.197	0	218.188	0	218.180	0	218.165	0

Peak Computed Discharge = 394.6 cumecs on 29/08/2011 Corres. Water Level :220.3 m

Lowest Computed Discharge = 0.000 cumecs on 01/06/2011 Corres. Water Level :218.06 m



Procedure : Standard

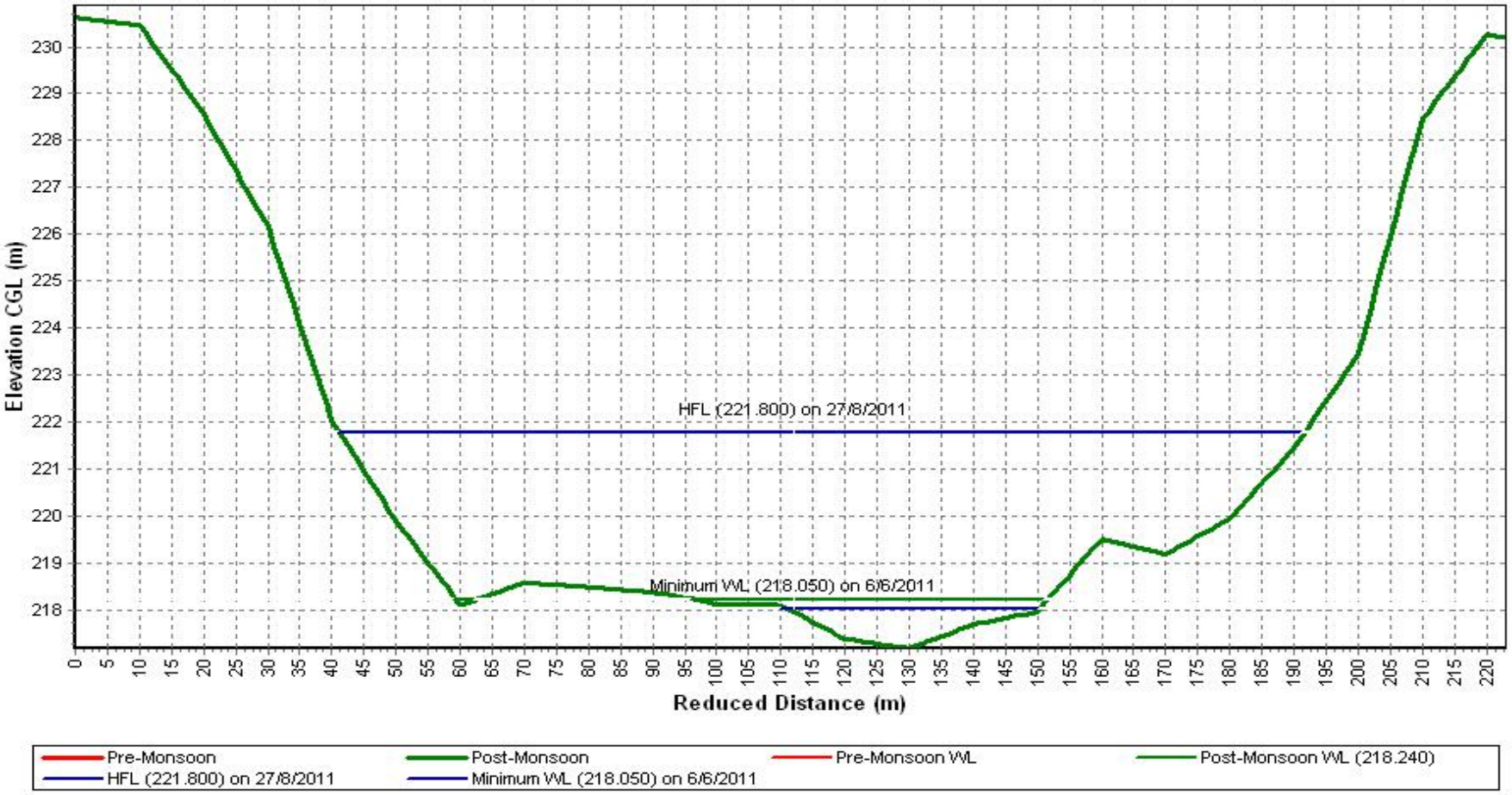
Equation type: Power

$Q = c\,(h+a)^{b}$, $a = -218.19$, $b = 1.473$, $c = 131.36$

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Anas at Chakaliya (01 02 13 007) **Division : Mahi Division, Gandhinagar**

Local River : Anas **Sub-Division : Mahi Sub Divn., Kadana**

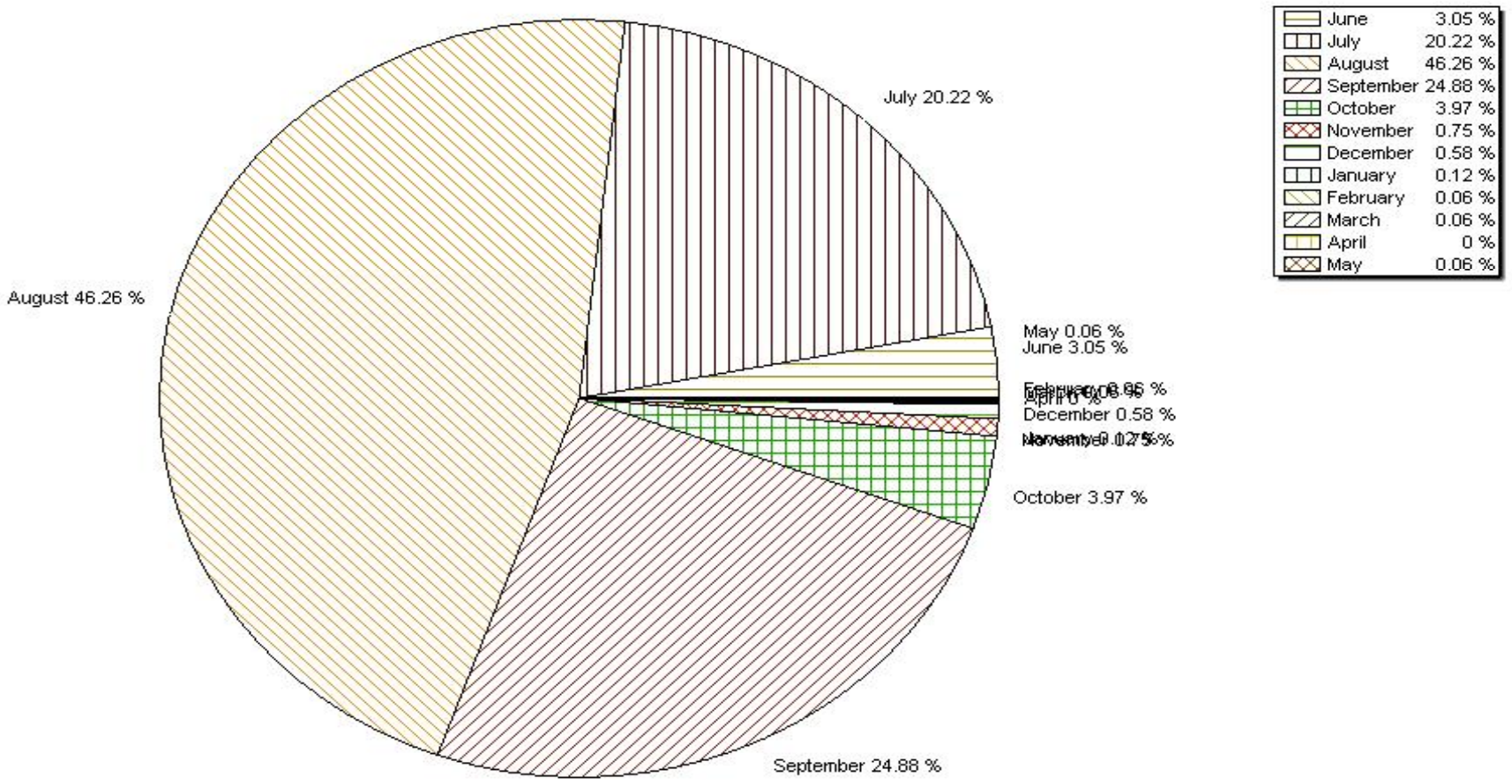


Histroic Flood Level -230.200 m on 11.08.2006 a 1400 hrs

Monthly Average Runoff based on period : 1991-2011

Station Name : Anas at Chakaliya (01 02 13 007)
Local River : Anas

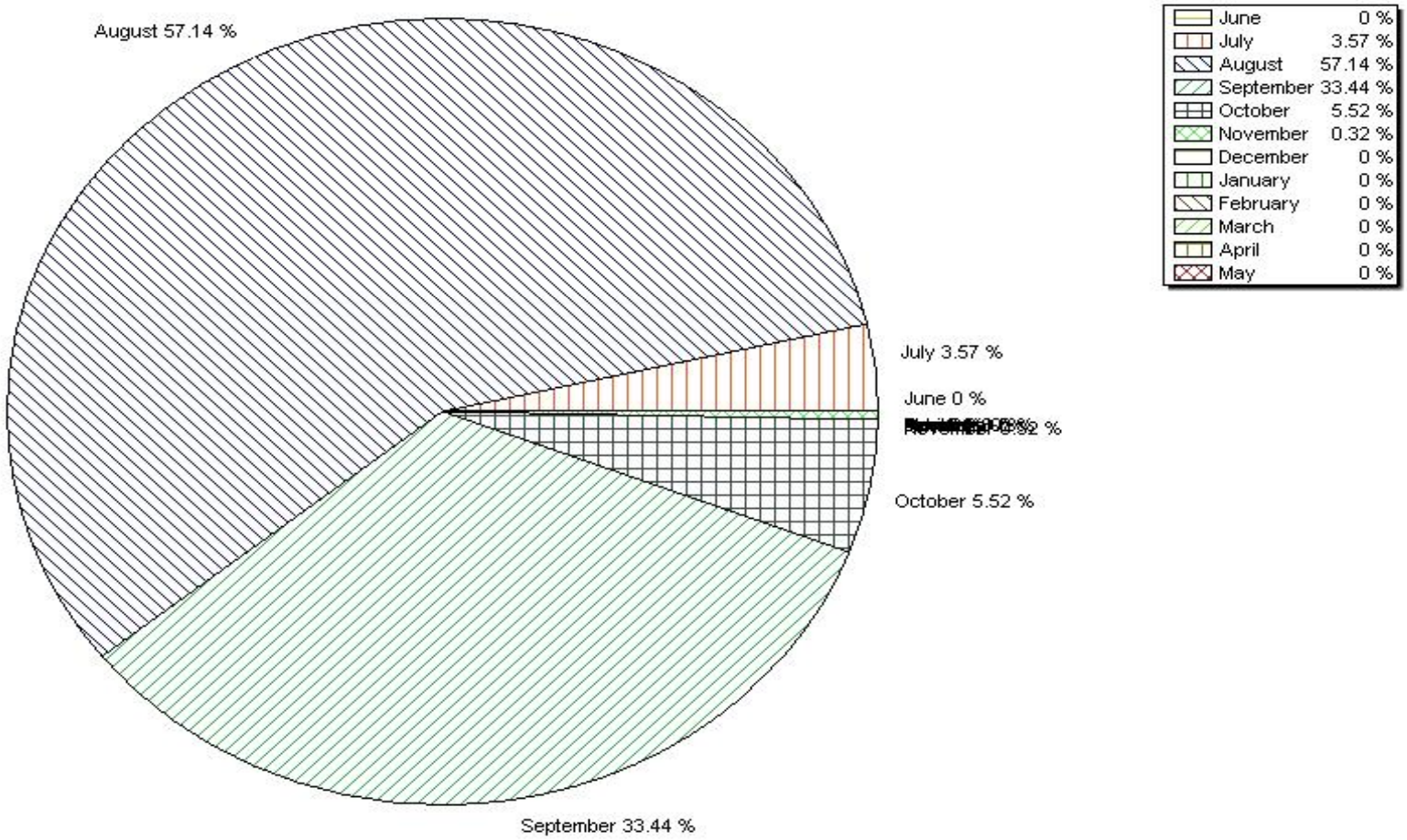
Division : Mahi Division, Gandhinagar
Sub-Division : Mahi Sub Divn., Kadana



Monthly Runoff for the Year : 2011-2012

Station Name : Anas at Chakaliya (01 02 13 007)
Local River : Anas

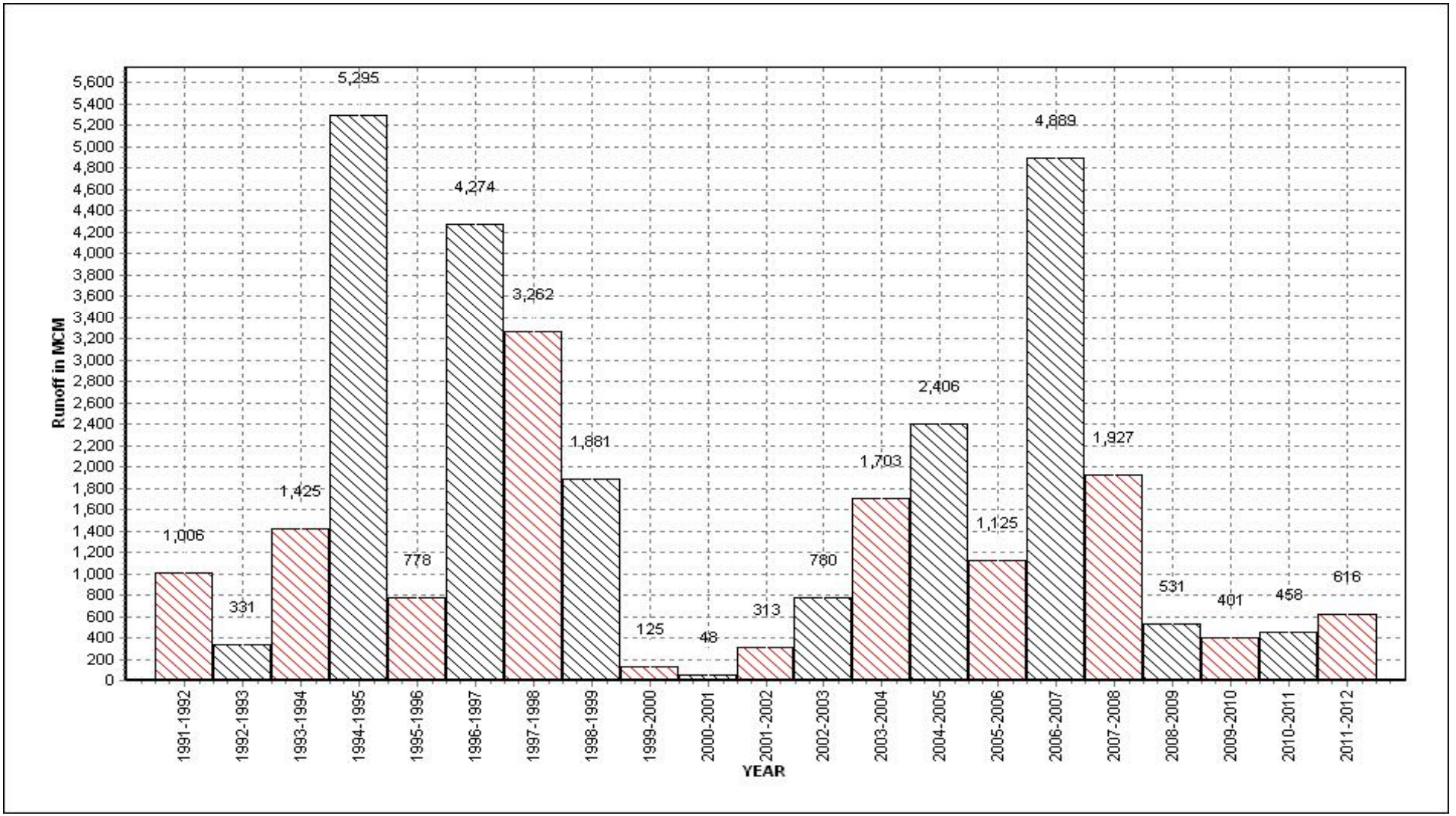
Division : Mahi Division, Gandhinagar
Sub-Division : Mahi Sub Divn.. Kadana



Annual Runoff Values for the period: 1991 - 2012

Station Name : Anas at Chakaliya (01 02 13 007)
Local River : Anas

Division : Mahi Division, Gandhinagar
Sub-Division : Mahi Sub Divn., Kadana

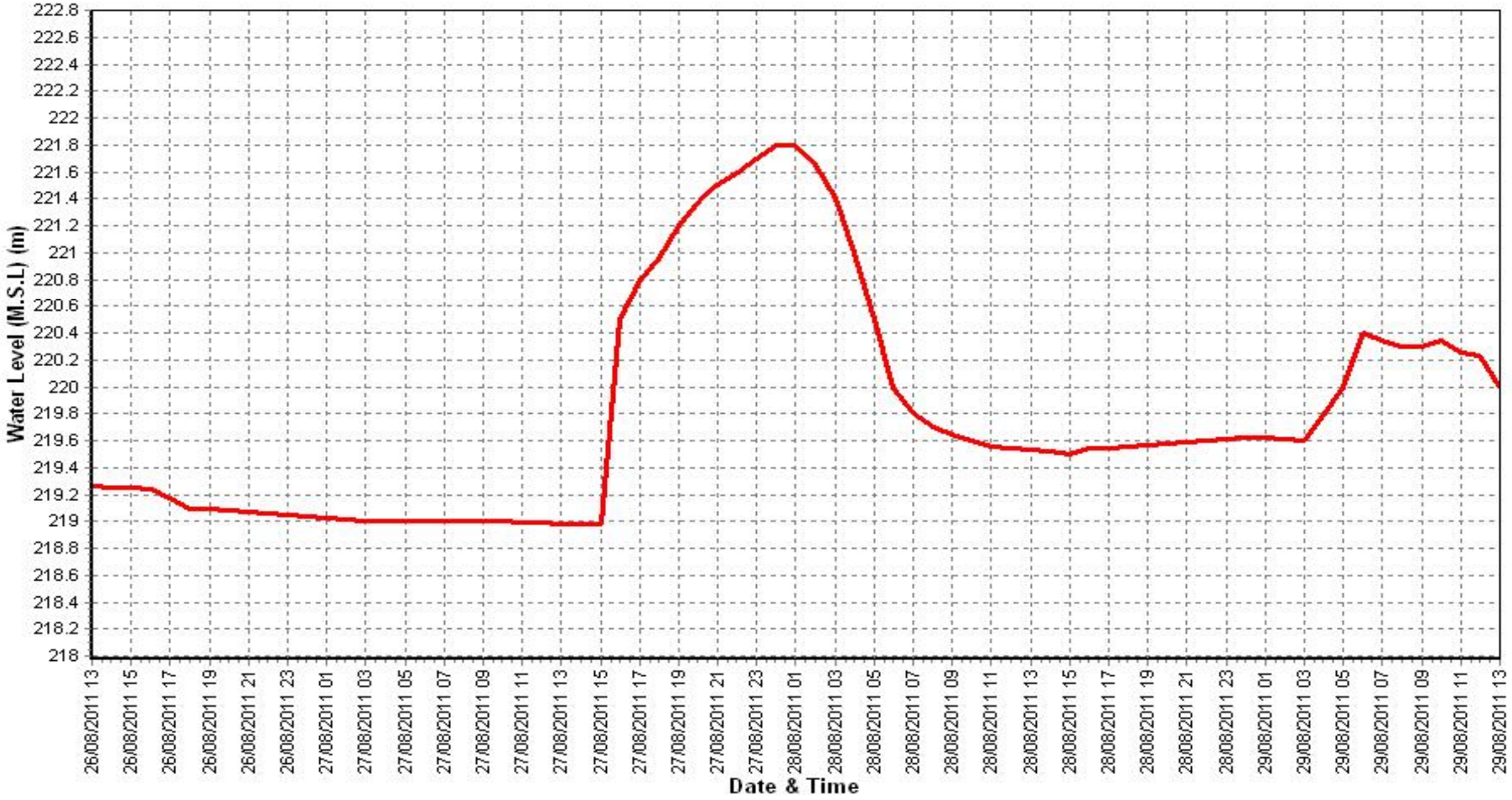


Note: Missing values have not been considered while arriving at Annual Runoff

Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Anas at Chakaliya (01 02 13 007) **Division : Mahi Division, Gandhinagar**

Local River : Anas **Sub-Division : Mahi Sub Divn.. Kadana**

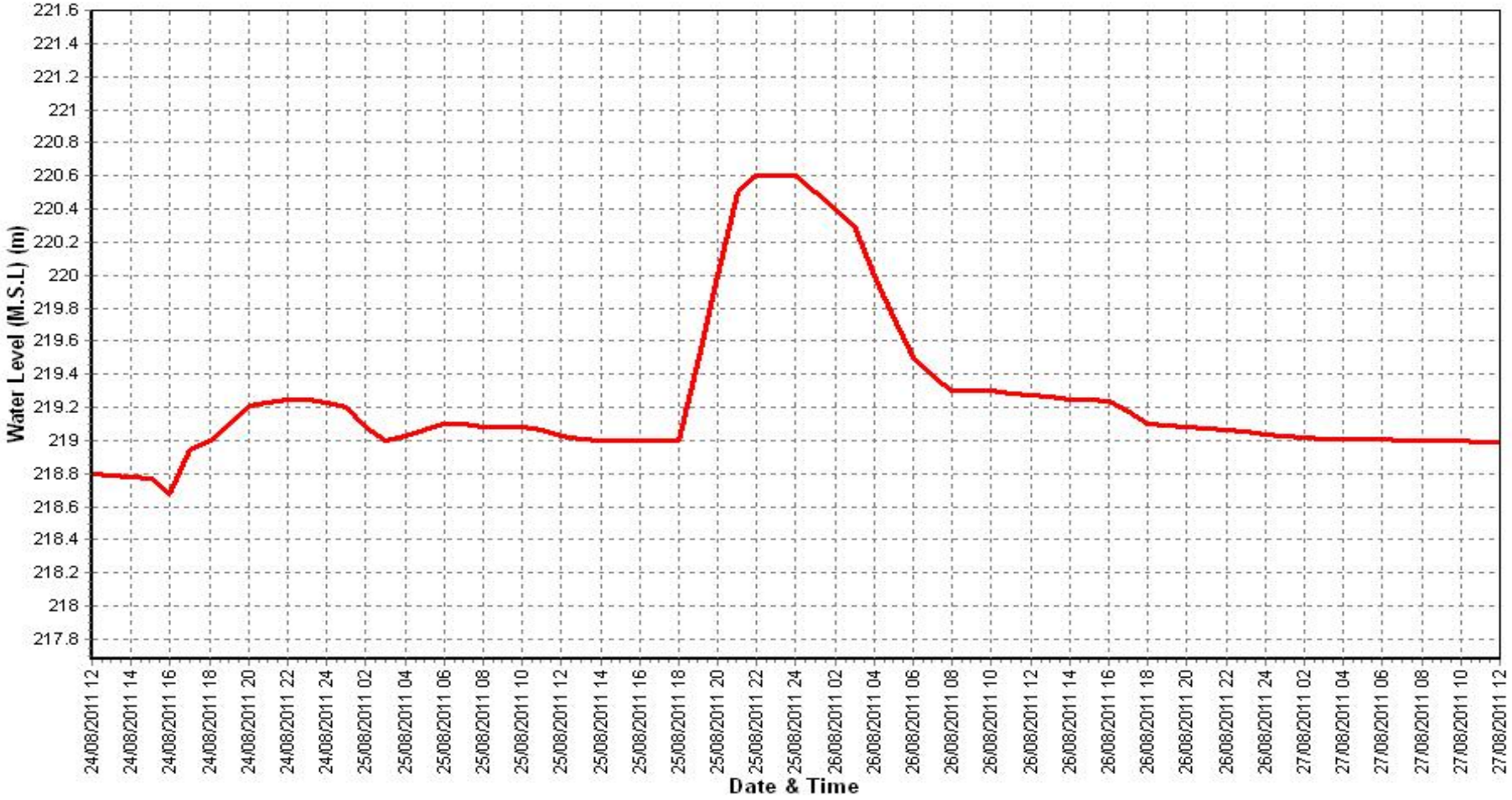


Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Anas at Chakaliya (01 02 13 007) **Division : Mahi Division, Gandhinagar**

Local River : Anas **Sub-Division : Mahi Sub Divn.. Kadana**



Time Span: 72 Hrs

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Anas at Chakaliya (01 02 13 007) **Division : Mahi Division, Gandhinagar**

Local River : Anas **Sub-Division : Mahi Sub Divn.. Kadana**



Time Span: 72 Hrs

HISTORY SHEET

			Water Year	**:**	**2011-2012**
Site	**:**	**Mahi at Paderdibadi**	**Code**	**:**	**01 02 13 006**
State	:	Rajasthan	District		Dungarpur
Basin	:	Mahi	Independent Rive	:	Mahi
Tributary	:	Mahi	Sub Tributary	:	
Sub Sub Tributary:			Local River	:	Mahi
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	Mahi Sub Divn., Kadana
Drianage Area :		16247 Sq. Km.	Bank	:	Right
Latitude	:	23°46'02" N	Longitude	:	74°08'12" E
Zero of Gauge(m):		131 (m.s.l)	17/09/1977	-	
		Opening Date	Closing Date		
Gauge	:	17/09/1977			
Discharge	:	24/06/1978			
Sediment	:	21/07/1980			
Water Quality	:	01/07/1978			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1978-1979	4615	141.355	17/08/1978	0.000	River Dry	31/05/1979
1979-1980	6206	141.390	10/08/1979	0.000	River Dry	12/05/1980
1980-1981	3886	140.050	31/08/1980	0.000	River Dry	02/05/1981
1981-1982	5720	142.100	17/08/1981	0.000	River Dry	15/06/1981
1982-1983	1725	137.700	19/08/1982	0.000	132.775	17/06/1982
1983-1984	1090	137.130	16/08/1983	0.100	132.970	06/06/1983
1984-1985	9343	143.080	20/08/1984	0.000	River Dry	13/05/1985
1985-1986	523.5	135.785	25/09/1985	0.000	132.840	08/07/1985
1986-1987	6818	141.800	16/08/1986	0.000	132.945	31/05/1987
1987-1988	2154	139.110	26/08/1987	0.000	132.970	09/08/1987
1988-1989	1320	137.450	06/08/1988	0.000	132.945	27/05/1989
1989-1990	584.7	135.970	02/09/1989	0.000	132.925	07/06/1989
1990-1991	4760	141.600	24/08/1990	2.000	133.150	30/05/1991
1991-1992	3037	139.897	24/08/1991	0.125	133.105	30/06/1991
1992-1993	328.6	135.088	09/09/1992	0.000	133.015	20/06/1992
1993-1994	1580	137.125	17/07/1993	0.000	133.090	07/06/1993
1994-1995	6684	142.250	02/08/1994	0.000	133.115	07/06/1994
1995-1996	303.4	134.983	26/07/1995	0.000	133.110	30/06/1995
1996-1997	3143	139.310	08/08/1996	0.000	132.795	13/06/1996
1997-1998	2440	138.250	24/08/1997	0.000	133.015	16/06/1997
1998-1999	6699	141.700	17/09/1998	0.000	133.070	29/04/1999
1999-2000	531.5	135.250	19/07/1999	0.000	132.890	13/05/2000
2000-2001	158.0	134.410	13/07/2000	0.000	132.350	22/12/2000
2001-2002	204.0	134.625	12/07/2001	0.000	River Dry	02/06/2001
2002-2003	243.9	134.880	04/09/2002	0.000	132.580	18/01/2003
2003-2004	1777	137.140	26/09/2003	0.000	133.075	21/06/2003

Contd\.

HISTORY SHEET

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
2004-2005	2888	139.990	24/08/2004	0.000	133.115	02/07/2004
2005-2006	3637	141.525	28/07/2005	0.558	133.180	17/05/2006
2006-2007	16153	147.525	19/08/2006	0.000	132.550	01/06/2006
2007-2008	3802	140.080	09/08/2007	0.000	133.130	02/05/2008
2008-2009	262.7	135.150	12/08/2008	0.000	132.930	27/05/2009
2009-2010	438.9	135.850	05/09/2009	0.000	133.180	17/03/2010
2010-2011	204.9	134.180	09/09/2010	1.619	133.190	12/04/2011
2011-2012	2382.2	140.520	12/09/2011	0.000	133.000	16/05/2012

Stage-Discharge Data for the period 2011 - 2012

Station Name : Mahi at Paderdibadi (01 02 13 006) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn., Kadana**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	133.040	0.000 *	136.200	0.000 *	133.870	130.4	136.380	744.9	134.290	218.3	133.700	99.05
2	133.040	0.000 *	132.600	0.000 *	133.850	127.3	137.425	984.7	134.170	144.4 *	133.680	89.85
3	133.030	0.000 *	133.790	0.000 *	133.790	110.0	137.210	910.3	134.110	187.9	133.680	89.99
4	133.030	0.000 *	132.600	0.000 *	133.875	120.0	136.800	874.9 *	134.060	170.5	133.680	90.04
5	133.030	0.000 *	132.600	0.000 *	134.370	210.9	136.850	796.8	134.040	166.8	133.690	94.84
6	133.030	0.000 *	132.600	0.000 *	134.340	204.4	136.960	826.1	134.010	113.5 *	133.690	58.79 *
7	133.020	0.000 *	132.600	0.000 *	134.220	154.5 *	136.780	777.2	134.000	159.0	133.690	58.79 *
8	133.020	0.000 *	132.600	0.000 *	133.900	135.1	135.840	598.9	134.000	157.8	133.700	96.46
9	133.010	0.000 *	132.610	0.000 *	136.000	479.4	135.800	584.5	133.980	107.9 *	133.700	96.42
10	133.000	0.000 *	132.610	0.000 *	138.600	1542 #	135.800	584.1	133.970	145.0	133.700	60.34 *
11	132.900	0.000 *	132.630	0.000 *	136.425	750.7 #	136.200	715.0	133.960	141.1	133.690	93.42
12	132.800	0.000 *	132.650	0.000 *	135.885	729.0	140.520	2382	133.950	137.6	133.600	32.09
13	132.700	0.000 *	132.650	0.000 *	135.720	657.6	137.800	1123	133.940	134.9	133.400	19.80 *
14	132.650	0.000 *	132.660	0.000 *	135.160	376.6 *	137.235	958.0	133.940	134.8	133.250	14.68
15	132.650	0.000 *	132.680	0.000 *	134.900	309.6 *	136.560	756.4	133.900	130.4	133.250	13.30
16	132.630	0.000 *	132.710	0.000 *	134.690	337.8	136.315	708.7	133.860	86.55 *	133.270	13.76
17	132.610	0.000 *	133.300	9.620 *	134.585	295.0	136.230	687.7	133.840	123.4	133.300	14.91
18	132.600	0.000 *	133.765	70.65 #	134.775	354.3	136.110	650.7 *	133.820	120.3	133.320	15.16
19	132.600	0.000 *	133.630	21.98	134.600	237.4 #	135.940	617.7	133.810	117.9	133.330	15.45
20	132.600	0.000 *	133.590	20.42	134.620	347.0	135.850	581.7	133.800	116.6	133.330	12.45 *
21	132.600	0.000 *	133.520	18.45	134.650	249.0 *	135.720	557.2	133.790	114.9	133.330	13.71
22	132.600	0.000 *	133.505	18.47	135.200	387.2 *	135.390	478.1	133.780	113.8	133.330	13.94
23	132.600	0.000 *	133.570	19.78	135.590	493.5	135.040	398.6	133.770	71.47 *	133.350	14.59
24	132.600	0.000 *	133.550	38.47 *	135.510	473.4	134.490	281.7	133.760	110.5	133.350	14.28
25	132.610	0.000 *	133.520	18.49	135.900	586.4 #	134.410	194.7 *	133.760	69.84 *	133.340	13.91
26	132.610	0.000 *	133.490	17.28	135.960	604.6 #	134.330	245.1	133.750	68.23 *	133.340	13.80
27	132.610	0.000 *	134.110	163.6	135.740	581.9	134.320	239.3	133.750	106.2	133.340	13.44 *
28	132.610	0.000 *	133.780	124.0	137.000	943.4 *	134.310	234.9	133.740	66.63 *	133.350	14.55
29	132.610	0.000 *	134.250	183.2	136.850	932.9	134.300	233.5	133.720	99.93	133.350	14.43
30	132.610	0.000 *	134.130	158.2	137.985	1285	134.290	220.5	133.710	61.89 *	133.370	16.93
31			133.890	91.76 *	137.700	1195 *			133.700	60.34 *		
Ten-Daily Mean												
I Ten-Daily	133.025	0.000	133.081	0.000	134.681	321.4	136.585	768.2	134.063	157.1	133.691	83.46
II Ten-Daily	132.674	0.000	133.026	12.27	135.136	439.5	136.876	918.1	133.882	124.4	133.374	24.50
III Ten-Daily	132.606	0.000	133.756	77.42	136.190	702.9	134.660	308.4	133.748	85.79	133.345	14.36
Monthly												
Min.	132.600	0.000	132.600	0.000	133.790	110.0	134.290	194.7	133.700	60.34	133.250	12.45
Max.	133.040	0.000	136.200	183.2	138.600	1542	140.520	2382	134.290	218.3	133.700	99.05
Mean	132.768	0	133.303	31.43	135.363	494.8	136.040	664.9	133.893	121.2	133.470	40.77

Annual Runoff in MCM = 3778 Annual Runoff in mm = 232

Peak Observed Discharge = 2382 cumecs on 12/09/2011 Corres. Water Level :140.52 m

Lowest Observed Discharge = 0.000 cumecs on 06/05/2012 Corres. Water Level :133.08 m

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Mahi at Paderdibadi (01 02 13 006) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn., Kadana**

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	133.370	19.03	133.410	20.93 *	133.310	14.59	133.390	14.58	133.410	20.93 *	133.170	2.971
2	133.380	20.07	133.420	19.49	133.350	15.55	133.400	17.23	133.410	12.93	133.160	2.540
3	133.380	19.25	133.420	19.01	133.400	18.30	133.400	17.13	133.390	12.28	133.140	2.387
4	133.380	17.60 *	133.420	17.55	133.420	18.88	133.420	22.08 *	133.380	11.86	133.120	2.215
5	133.380	19.39	133.420	18.39	133.420	22.08 *	133.430	17.81	133.370	16.53 *	133.100	2.090
6	133.380	17.60 *	133.440	19.40	133.420	18.78	133.430	17.68	133.360	15.48 *	133.080	0.000
7	133.370	18.64	133.440	18.90	133.420	18.24	133.430	17.40	133.350	11.32	133.060	0.000
8	133.370	18.51	133.440	24.42 *	133.410	17.37	133.430	23.24 *	133.350	14.45 *	133.050	0.000
9	133.370	18.26	133.440	18.63	133.450	18.56	133.440	17.72	133.340	10.84	133.040	0.000
10	133.370	18.17	133.450	19.03	133.450	18.35	133.440	17.61	133.330	11.71	133.030	0.000
11	133.390	18.69 *	133.450	19.10	133.450	17.91	133.430	23.24 *	133.320	9.060	133.020	0.000
12	133.400	20.31	133.450	19.10	133.450	25.62 *	133.430	17.23	133.310	8.459	133.010	0.000
13	133.400	20.17	133.450	18.51	133.450	17.48	133.430	17.05	133.310	7.277	133.010	0.000
14	133.400	19.72	133.470	19.52	133.440	16.98	133.430	16.78	133.310	10.54 *	133.000	0.000
15	133.390	18.76	133.470	28.07 *	133.440	16.81	133.430	16.72	133.300	9.620 *	133.000	0.000
16	133.390	19.02	133.460	18.78	133.440	16.88	133.430	16.62	133.300	7.790	133.000	0.000
17	133.380	18.36	133.460	18.30	133.440	16.71	133.410	16.30	133.290	7.520	133.000	0.000
18	133.380	17.60 *	133.450	17.70	133.440	16.68	133.420	22.08 *	133.280	7.101	132.990	0.000
19	133.380	18.20	133.450	17.86	133.430	23.24 *	133.420	15.89	133.270	6.914	132.990	0.000
20	133.390	18.69 *	133.450	17.91	133.420	22.08 *	133.410	15.67	133.260	6.072	132.790	0.000
21	133.390	18.69 *	133.450	17.61	133.410	15.85	133.410	15.49	133.240	6.111	132.790	0.000
22	133.390	18.69 *	133.450	25.62 *	133.410	15.74	133.400	14.97	133.220	3.280 *	132.780	0.000
23	133.390	18.69 *	133.450	17.38	133.410	15.58	133.380	14.14	133.210	2.640 *	132.780	0.000
24	133.380	17.60 *	133.450	17.19	133.400	15.08	133.370	13.63	133.210	2.640 *	132.770	0.000
25	133.380	17.60 *	133.450	17.18	133.400	14.98	133.370	16.53 *	133.200	5.464	132.770	0.000
26	133.380	17.60 *	133.450	25.62 *	133.400	19.80 *	133.370	13.41	133.200	4.591	132.760	0.000
27	133.380	17.60 *	133.450	18.39	133.390	14.67	133.360	13.07	133.200	3.808	132.760	0.000
28	133.380	17.60 *	133.400	19.34	133.390	14.68	133.350	12.57	133.190	3.535	132.760	0.000
29	133.380	17.60 *	133.360	15.48 *	133.390	14.63	133.400	14.56	133.190	1.490 *	132.760	0.000
30	133.400	19.80 *	133.340	16.07			133.410	15.10	133.190	3.162	132.750	0.000
31	133.400	19.80 *	133.320	15.18			133.410	14.71			132.750	0.000
Ten-Daily Mean												
I Ten-Daily	133.375	18.65	133.430	19.58	133.405	18.07	133.421	18.25	133.369	13.83	133.095	1.220
II Ten-Daily	133.390	18.95	133.456	19.49	133.440	19.04	133.424	17.76	133.295	8.035	132.981	0.000
III Ten-Daily	133.386	18.30	133.415	18.64	133.400	15.67	133.385	14.38	133.205	3.672	132.766	0.000
Monthly												
Min.	133.370	17.60	133.320	15.18	133.310	14.59	133.350	12.57	133.190	1.490	132.750	0.000
Max.	133.400	20.31	133.470	28.07	133.450	25.62	133.440	23.24	133.410	20.93	133.170	2.971
Mean	133.384	18.62	133.433	19.22	133.416	17.66	133.409	16.72	133.290	8.514	132.942	0.394

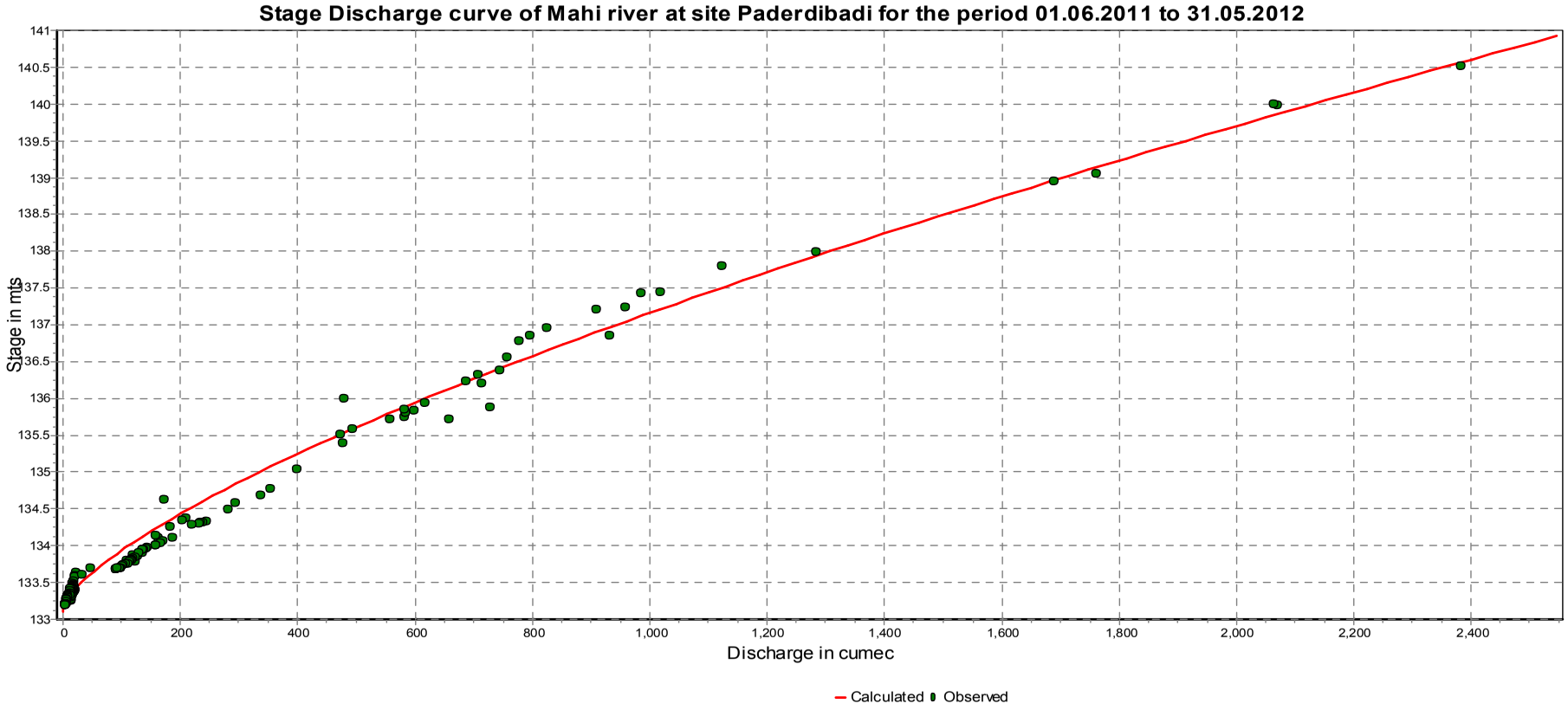
Peak Computed Discharge = 1195 cumecs on 31/08/2011 Corres. Water Level :137.7 m

Lowest Computed Discharge = 0.000 cumecs on 01/06/2011 Corres. Water Level :133.04 m

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff



Procedure : Standard

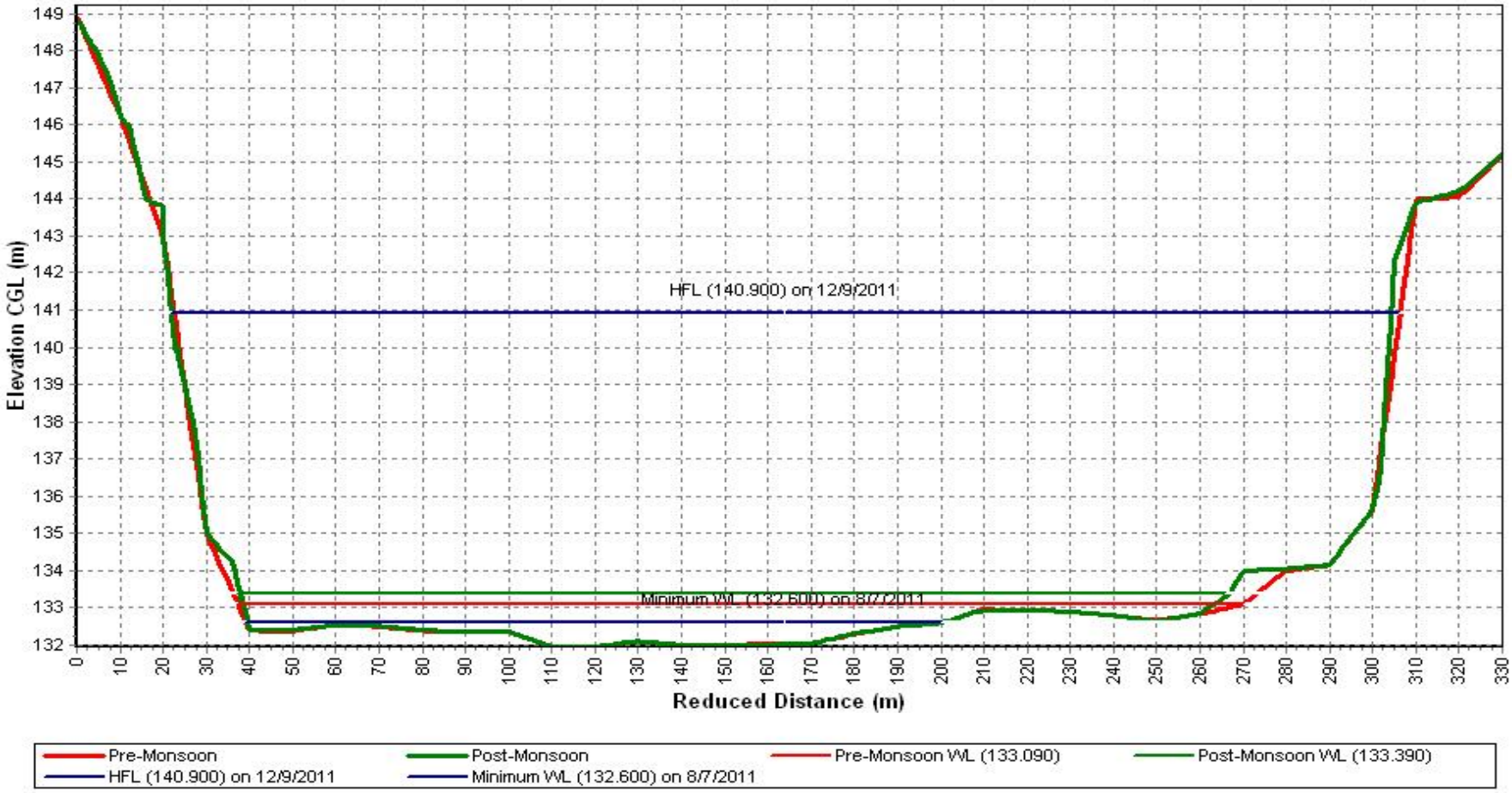
Equation type: Power

Q = c (h+a)^b, a = -133.15, b = 1.413, c = 140.43

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Mahi at Paderdibadi (01 02 13 006) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn., Kadana**

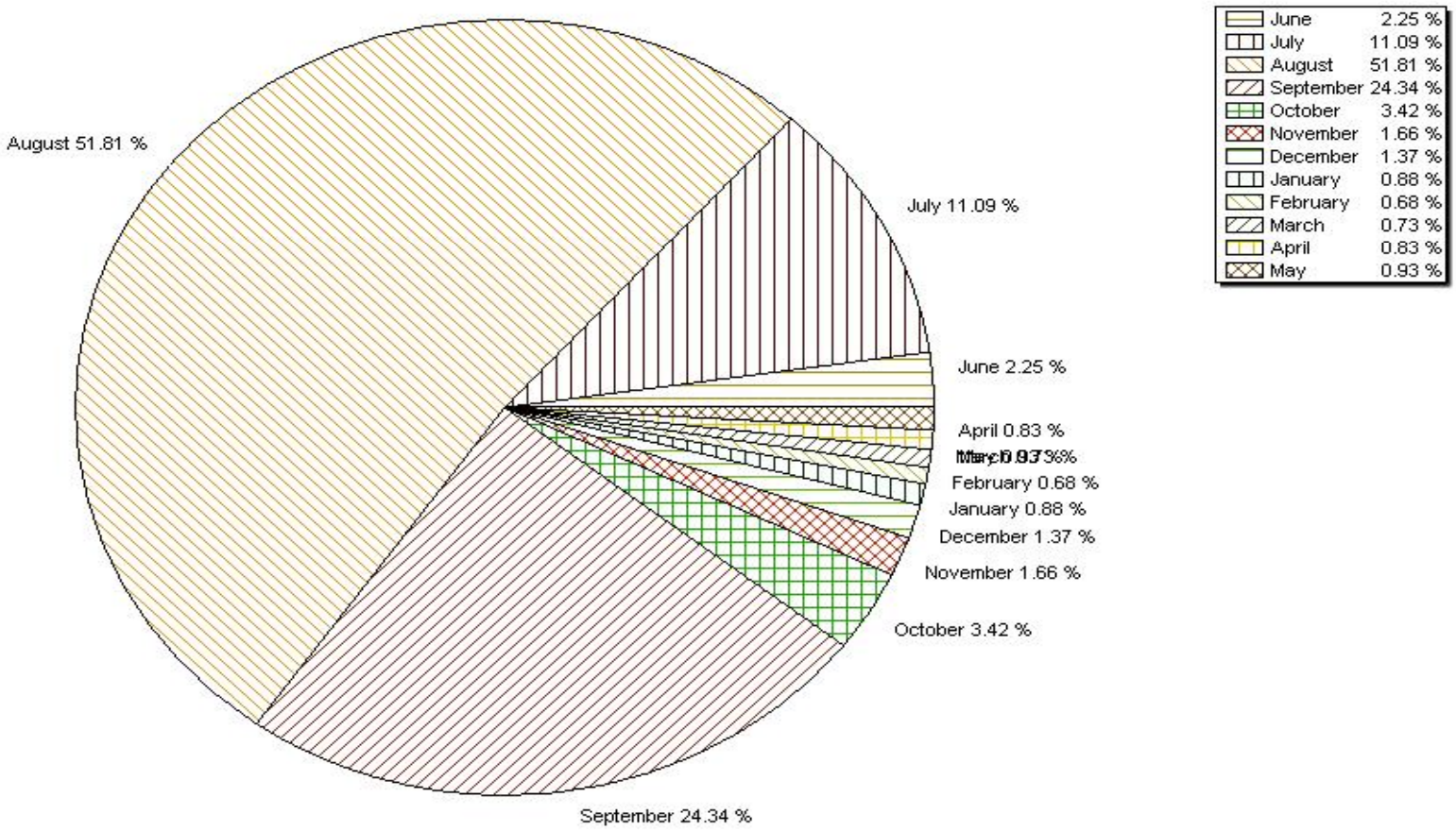


Historic Flood Level- 149.650m on 19.08.2006 at 1600 hrs

Monthly Average Runoff based on period : 1978-2011

Station Name : Mahi at Paderdibadi (01 02 13 006)
Local River : Mahi

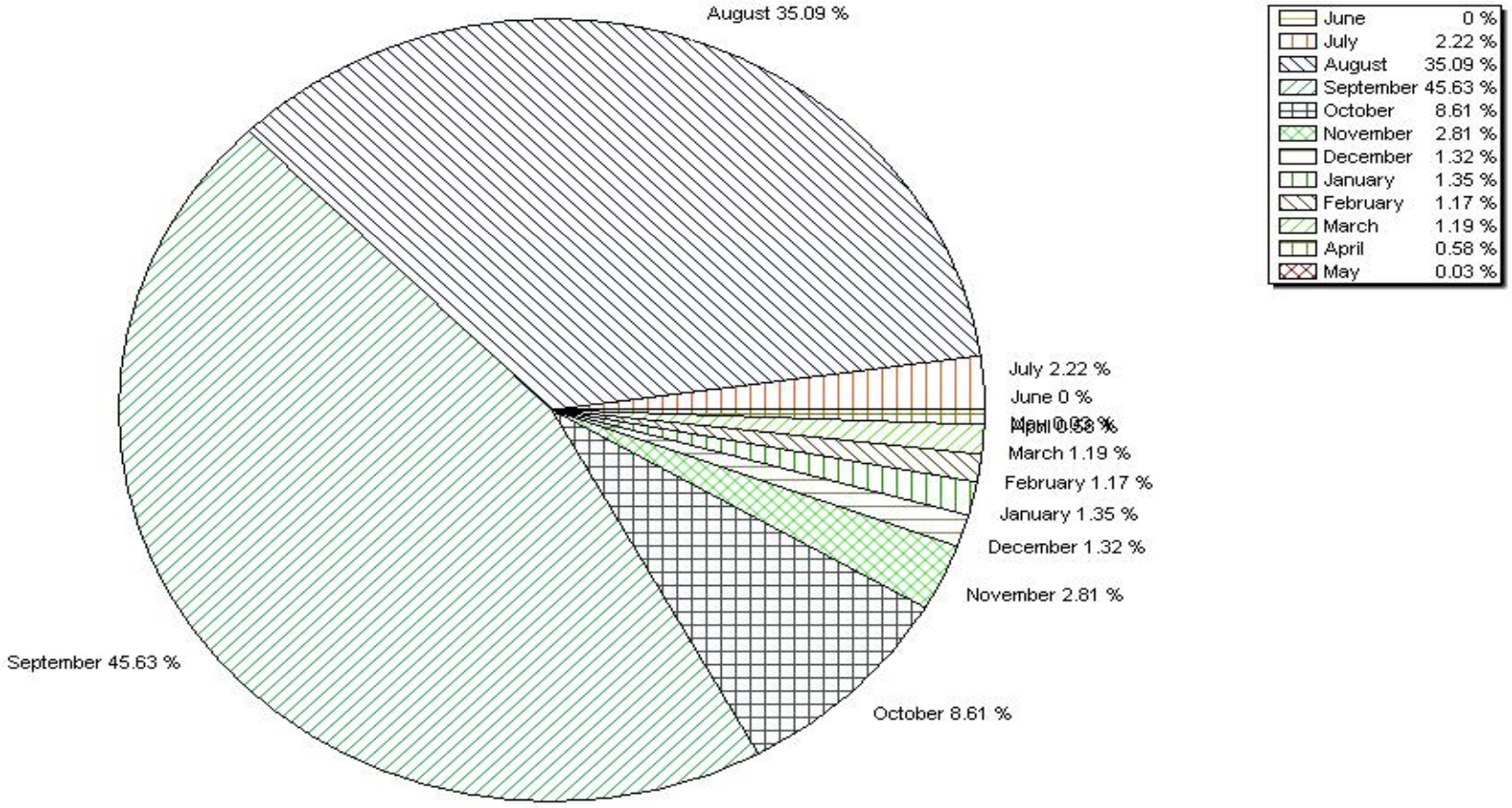
Division : Mahi Division, Gandhinagar
Sub-Division : Mahi Sub Divn., Kadana



Monthly Runoff for the Year : 2011-2012

Station Name : Mahi at Paderdibadi (01 02 13 006)
Local River : Mahi

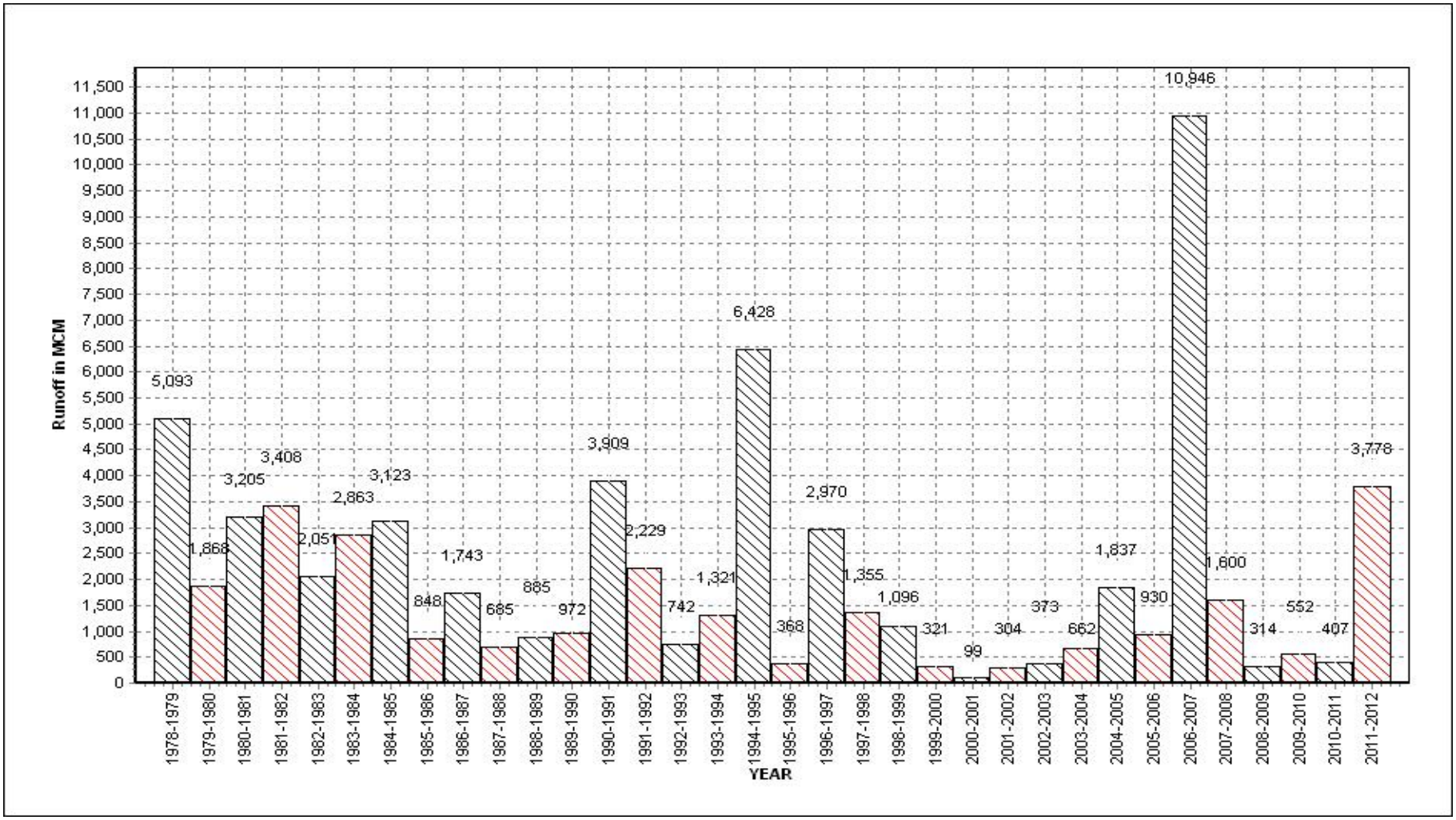
Division : Mahi Division, Gandhinagar
Sub-Division : Mahi Sub Divn., Kadana



Annual Runoff Values for the period: 1978 - 2012

Station Name : Mahi at Paderdibadi (01 02 13 006)
Local River : Mahi

Division : Mahi Division, Gandhinagar
Sub-Division : Mahi Sub Divn., Kadana

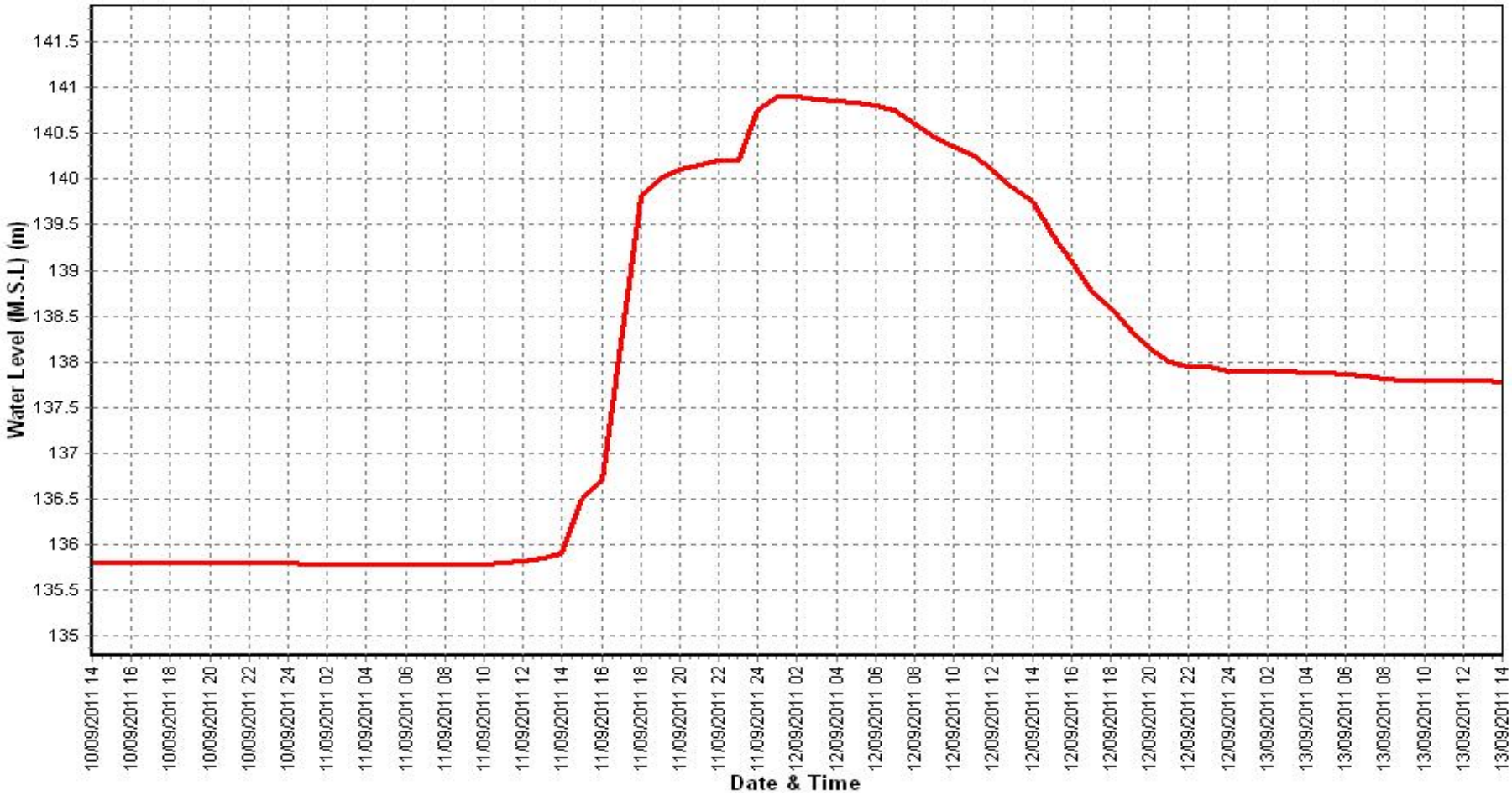


Note: Missing values have not been considered while arriving at Annual Runoff

Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Mahi at Paderdibadi (01 02 13 006) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn., Kadana**

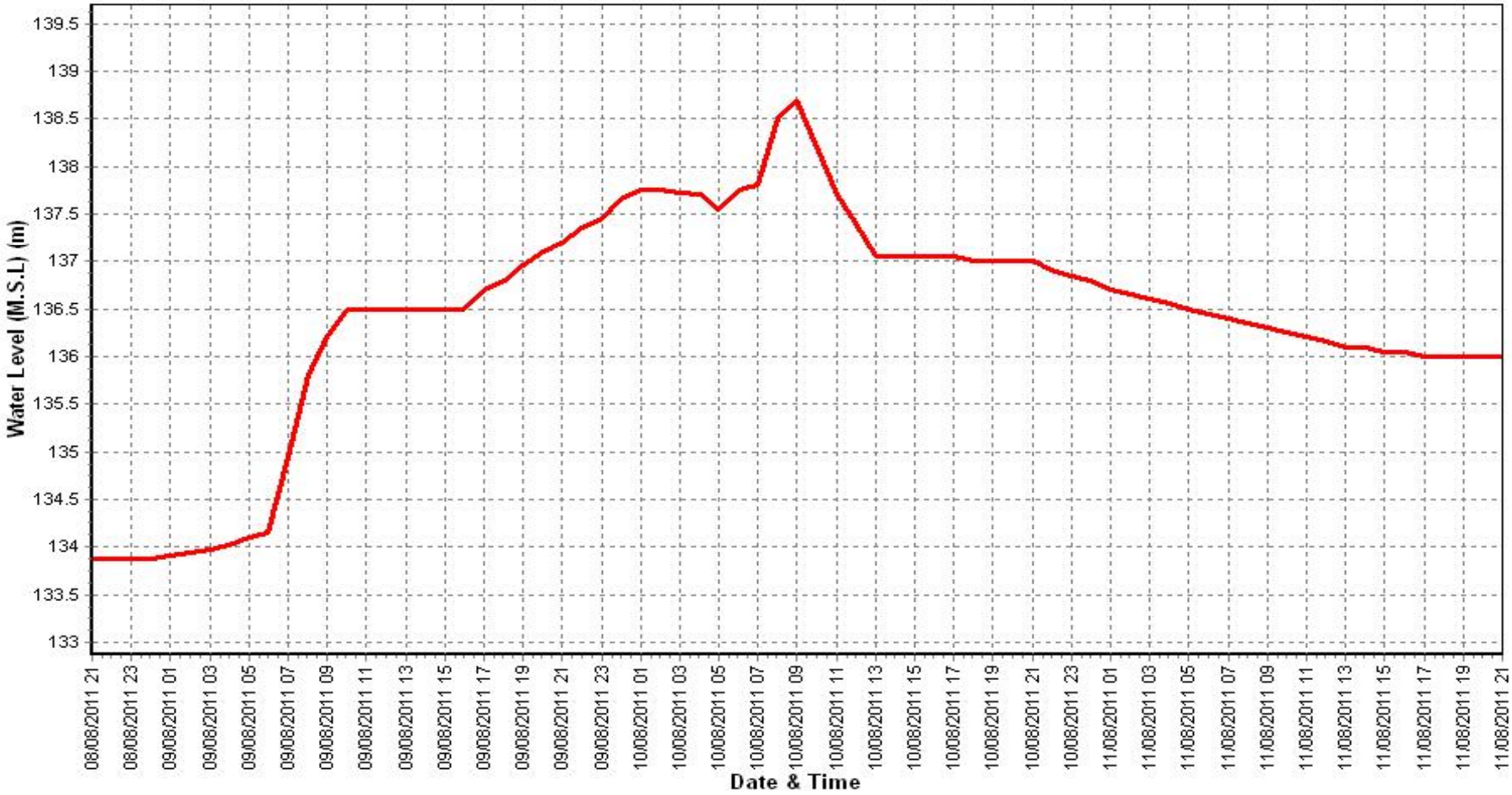


Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Mahi at Paderdibadi (01 02 13 006) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn., Kadana**

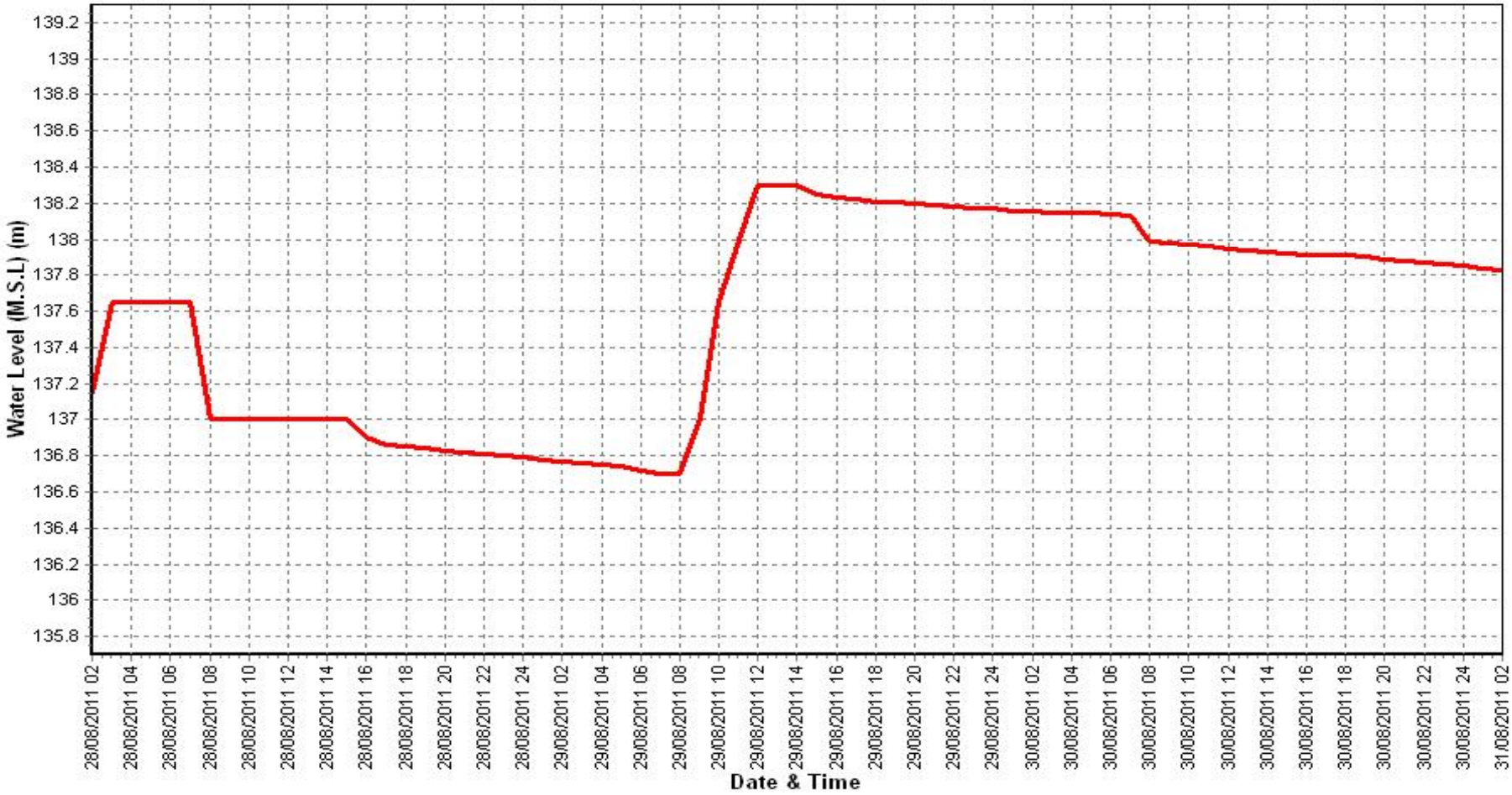


Time Span: 72 Hrs

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Mahi at Paderdibadi (01 02 13 006) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn., Kadana**



Time Span: 72 Hrs

HISTORY SHEET

			Water Year	**:**	**2011-2012**
Site	**:**	**Som at Rangeli**	**Code**	**:**	**01 02 13 005**
State	:	Rajasthan	District		Dungarpur
Basin	:	Mahi	Independent River	:	Mahi
Tributary	:	Som	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Som
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	Mahi Sub Divn., Kadana
Drainage Area	:	8329 Sq. Km.	Bank	:	Right
Latitude	:	23°52'22" N	Longitude	:	74°13'25" E
Zero of Gauge (m	:	150 (m.s.l)	01/01/1978	-	
		Opening Date	Closing Date		
Gauge	:	15/07/1978			
Discharge	:	15/07/1978			
Sediment	:	-			
Water Quality	:	01/07/1988			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1979-1980	205.0	152.650	11/08/1979	0.000	River Dry	27/05/1980
1980-1981	707.1	154.350	24/06/1980	0.000	River Dry	13/06/1980
1981-1982	560.0	154.310	10/07/1981	0.000	River Dry	24/06/1981
1982-1983	664.4	153.990	23/08/1982	0.000	151.545	05/06/1982
1983-1984	715.0	154.550	16/08/1983	0.000	River Dry	08/06/1983
1984-1985	1020	155.405	20/08/1984	0.000	151.510	06/06/1984
1985-1986	444.3	154.075	05/08/1985	0.000	151.375	13/04/1986
1986-1987	958.6	155.190	16/08/1986	0.000	River Dry	16/06/1986
1987-1988	720.0	153.900	26/08/1987	0.000	151.510	14/08/1987
1988-1989	1261	155.400	06/08/1988	0.100	151.460	31/05/1989
1989-1990	401.3	153.945	29/08/1989	0.063	151.435	13/06/1989
1990-1991	920.3	155.095	24/08/1990	2.040	151.715	25/05/1991
1991-1992	1984	155.609	31/07/1991	1.025	151.551	11/07/1991
1992-1993	233.0	153.475	09/09/1992	1.065	151.515	10/07/1992
1993-1994	978.9	154.910	18/07/1993	0.288	151.490	14/06/1993
1994-1995	3072	156.800	02/08/1994	1.000	151.550	09/06/1994
1995-1996	83.50	152.490	26/07/1995	0.000	151.050	30/05/1996
1996-1997	269.0	153.925	08/09/1996	0.000	River Dry	19/06/1996
1997-1998	147.0	152.945	08/09/1997	0.000	150.970	23/06/1997
1998-1999	77.72	152.105	24/09/1998	0.000	151.070	17/05/1999
1999-2000	268.6	153.360	19/07/1999	0.000	151.065	25/04/2000
2000-2001	58.50	152.230	13/07/2000	0.000	River Dry	19/06/2000
2001-2002	118.0	152.125	12/07/2001	0.000	River Dry	09/06/2001
2002-2003	215.2	152.420	04/09/2002	0.000	River Dry	25/12/2002
2003-2004	98.71	152.240	20/09/2003	0.000	151.030	26/03/2004
2004-2005	412.8	154.250	24/08/2004	0.000	151.020	29/05/2005
2005-2006	905.3	155.480	28/07/2005	0.810	151.240	30/04/2006
2006-2007	5179	158.240	19/08/2006	0.000	River Dry	01/06/2006
2007-2008	187.5	153.315	30/08/2007	0.000	151.110	01/06/2007
2008-2009	228.7	153.370	11/07/2008	0.000	151.100	16/05/2009
2009-2010	331.3	153.725	23/07/2009	0.476	151.270	09/07/2009
2010-2011	284.6	153.750	10/09/2010	0.083	151.250	30/04/2011
2011-2012	1195.0	156.650	11/09/2011	0.000	River Dry	22/06/2012

Stage-Discharge Data for the period 2011 - 2012

Station Name : Som at Rangeli (01 02 13 005) **Division : Mahi Division, Gandhinagar**

Local River : Som **Sub-Division : Mahi Sub Divn., Kadana**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	R Dry	0.000	R Dry	0.000	151.680	17.70	153.400	234.8	152.190	52.52	151.650	17.39
2	R Dry	0.000	R Dry	0.000	151.540	13.32	153.520	269.8	152.150	57.28 *	151.650	17.69
3	R Dry	0.000	R Dry	0.000	151.510	12.76	153.400	253.6	152.110	45.29	151.650	17.65
4	R Dry	0.000	R Dry	0.000	151.930	54.79	153.540	269.7 *	152.070	49.73 *	151.640	16.95
5	R Dry	0.000	R Dry	0.000	151.900	44.65	153.560	245.8	152.060	44.29	151.670	17.90
6	R Dry	0.000	R Dry	0.000	151.610	14.89	153.550	238.9	152.050	47.84 *	151.660	17.77 *
7	R Dry	0.000	R Dry	0.000	151.800	27.07 *	153.400	251.5	152.100	49.35	151.660	17.77 *
8	R Dry	0.000	R Dry	0.000	151.750	19.96	153.430	265.1	152.090	47.34	151.650	17.63
9	R Dry	0.000	R Dry	0.000	153.600	299.9	153.500	275.1	152.080	50.68 *	151.650	17.55
10	R Dry	0.000	R Dry	0.000	154.050	388.2	153.480	254.6	152.080	47.35	151.640	16.58 *
11	R Dry	0.000	151.510	5.995	152.900	186.7	156.650	1195 #	152.070	47.13	151.640	17.19
12	R Dry	0.000	151.380	1.247	152.640	160.7	155.000	631.5 #	152.000	43.52	151.640	17.27
13	R Dry	0.000	151.350	1.141	152.500	131.5	154.400	523.5	151.980	50.13	151.620	15.25
14	R Dry	0.000	151.340	1.073	152.450	91.50 *	153.600	281.1	151.960	47.91	151.620	15.01
15	R Dry	0.000	151.900	51.33	152.400	85.36 *	153.560	242.8	152.000	43.76	151.620	15.25
16	R Dry	0.000	151.930	53.44	152.190	52.52	153.550	244.7	152.060	48.78 *	151.610	14.96
17	R Dry	0.000	151.600	14.32 *	152.210	55.44	153.490	269.8	152.070	42.00	151.610	14.88
18	R Dry	0.000	151.400	1.346	152.480	113.6	153.380	238.4 *	152.070	44.54	151.610	14.96
19	R Dry	0.000	151.460	2.655	152.470	116.1	153.280	259.1	152.000	39.22	151.600	14.41
20	R Dry	0.000	151.410	1.343	152.460	127.9	153.260	192.7	151.800	20.60	151.600	14.32 *
21	R Dry	0.000	151.380	1.238	152.590	109.7 *	152.350	80.36	151.670	18.38	151.600	14.43
22	R Dry	0.000	151.380	1.233	152.850	147.2 *	152.590	102.2	151.670	18.01	151.590	12.43
23	R Dry	0.000	151.380	1.235	152.410	86.67	152.570	101.3	151.660	17.77 *	151.580	12.30
24	R Dry	0.000	151.380	4.610 *	152.410	81.98	152.560	97.59	151.675	18.13	151.580	12.59
25	R Dry	0.000	151.370	1.167	153.070	218.9	152.560	105.6 *	151.675	18.03	151.580	12.56
26	R Dry	0.000	152.120	84.71	153.000	229.4	152.560	105.6 *	151.670	18.38 *	151.580	12.27
27	R Dry	0.000	151.740	19.68	152.880	175.0	152.560	105.6 *	151.670	17.91	151.580	13.24 *
28	R Dry	0.000	151.900	50.42	152.880	151.8 *	152.560	105.6 *	151.660	17.65	151.580	12.59
29	R Dry	0.000	152.300	92.43	153.370	208.9	152.550	104.3 *	151.660	17.71	151.580	12.28
30	R Dry	0.000	151.650	17.09	153.600	298.2	152.470	94.00 *	151.650	17.17 *	151.580	12.26
31			151.800	27.07 *	153.500	261.8 *			151.650	17.41		
Ten-Daily Mean												
I Ten-Daily		0.000		0.000	152.137	89.33	153.478	255.9	152.098	49.17	151.652	17.49
II Ten-Daily		0.000	151.528	13.39	152.470	112.1	154.017	407.9	152.001	42.76	151.617	15.35
III Ten-Daily		0.000	151.673	27.35	152.960	179.0	152.533	100.2	151.665	17.87	151.583	12.70
Monthly												
Min.		0.000	151.340	0.000	151.510	12.76	152.350	80.36	151.650	17.17	151.580	12.26
Max.		0.000	152.300	92.43	154.050	388.2	156.650	1195	152.190	57.28	151.670	17.90
Mean		0	151.604	14.02	152.536	128.5	153.343	254.7	151.913	35.99	151.617	15.18

Annual Runoff in MCM = 1299 Annual Runoff in mm = 156

Peak Observed Discharge = 1195 cumecs on 11/09/2011 Corres. Water Level :156.65 m

Lowest Observed Discharge = 0.000 cumecs on 03/06/2011

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Som at Rangeli (01 02 13 005) **Division : Mahi Division, Gandhinagar**

Local River : Som **Sub-Division : Mahi Sub Divn., Kadana**

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	151.590	12.43	151.600	14.32 *	151.520	10.47	151.420	8.737	151.300	2.310 *	151.200	0.555
2	151.590	12.37	151.600	14.69	151.520	10.43	151.410	7.872	151.290	1.899	151.190	0.484
3	151.590	12.77	151.600	14.68	151.520	10.32	151.410	7.839	151.290	1.869	151.190	0.530
4	151.580	13.24 *	151.580	11.95	151.520	10.39	151.410	5.650 *	151.290	1.860	151.190	0.443
5	151.580	12.65	151.580	14.17	151.520	10.24 *	151.410	7.774	151.280	1.840 *	151.180	0.411
6	151.590	13.78 *	151.580	14.02	151.520	10.39	151.410	7.647	151.280	1.840 *	151.180	0.260 *
7	151.590	12.73	151.580	14.09	151.500	9.021	151.410	7.598	151.280	1.765	151.180	0.411
8	151.600	14.41	151.600	14.32 *	151.500	9.006	151.410	5.650 *	151.270	1.630 *	151.220	0.761
9	151.600	14.41	151.600	14.50	151.470	6.776	151.400	7.383	151.270	1.648	151.220	0.784
10	151.610	14.54	151.600	14.46	151.580	12.30	151.400	7.271	151.250	0.923	151.220	0.781
11	151.610	14.87 *	151.600	14.46	151.580	12.18	151.400	5.290 *	151.250	0.913	151.220	0.786
12	151.610	14.51	151.630	17.03	151.580	13.24 *	151.400	7.271	151.240	1.015	151.220	0.777
13	151.620	15.25	151.630	17.01	151.570	11.79	151.400	7.249	151.240	0.905	151.200	0.470 *
14	151.620	15.62	151.630	17.01	151.580	12.30	151.400	7.262	151.240	1.050 *	151.170	0.330
15	151.620	15.19	151.620	15.43 *	151.570	12.25	151.390	6.993	151.240	1.050 *	151.125	0.000 *
16	151.620	15.91	151.600	14.68	151.570	11.88	151.390	7.027	151.240	0.900	151.125	0.000 *
17	151.610	14.54	151.600	15.45	151.570	11.83	151.390	7.007	151.240	0.889	151.120	0.000 *
18	151.610	14.87 *	151.600	14.54	151.550	11.70 *	151.390	4.940 *	151.240	0.887	151.120	0.000 *
19	151.610	14.49	151.590	12.77	151.550	11.70 *	151.380	6.935	151.230	0.826	151.110	0.000 *
20	151.610	14.50	151.580	14.09	151.550	11.70 *	151.380	6.532	151.230	0.821	151.110	0.000 *
21	151.610	14.48	151.580	14.09	151.580	14.17	151.380	6.874	151.230	0.821	151.110	0.000 *
22	151.600	14.32 *	151.570	12.72 *	151.540	14.18	151.380	6.851	151.230	0.890 *	151.100	0.000 *
23	151.590	12.73	151.550	12.49	151.520	10.72	151.380	6.874	151.230	0.817	151.090	0.000 *
24	151.590	12.67	151.550	12.59	151.500	10.60	151.370	6.387	151.220	0.799	151.090	0.000 *
25	151.580	13.24 *	151.550	12.46	151.450	9.662	151.360	3.970 *	151.210	0.764	151.090	0.000 *
26	151.580	12.56	151.550	11.70 *	151.450	7.180 *	151.360	5.597	151.210	0.600 *	151.090	0.000 *
27	151.580	13.24 *	151.550	12.45	151.450	9.268	151.330	4.065	151.200	0.566	151.090	0.000 *
28	151.580	11.95	151.550	12.35	151.450	9.208	151.310	3.350	151.200	0.558	151.080	0.000 *
29	151.580	11.85	151.550	11.70 *	151.440	8.800	151.310	3.267	151.200	0.470 *	151.080	0.000 *
30	151.570	12.72 *	151.550	12.35			151.300	2.382	151.200	0.461	151.080	0.000 *
31	151.570	11.21	151.550	12.27			151.300	2.116			151.080	0.000 *
Ten-Daily Mean												
I Ten-Daily	151.592	13.33	151.592	14.12	151.517	9.935	151.409	7.342	151.280	1.758	151.197	0.542
II Ten-Daily	151.614	14.97	151.608	15.25	151.567	12.06	151.392	6.651	151.239	0.926	151.152	0.236
III Ten-Daily	151.585	12.81	151.555	12.47	151.487	10.42	151.344	4.703	151.213	0.675	151.089	0.000
Monthly												
Min.	151.570	11.21	151.550	11.70	151.440	6.776	151.300	2.116	151.200	0.461	151.080	0.000
Max.	151.620	15.91	151.630	17.03	151.580	14.18	151.420	8.737	151.300	2.310	151.220	0.786
Mean	151.596	13.68	151.584	13.9	151.525	10.82	151.380	6.183	151.244	1.12	151.144	0.251

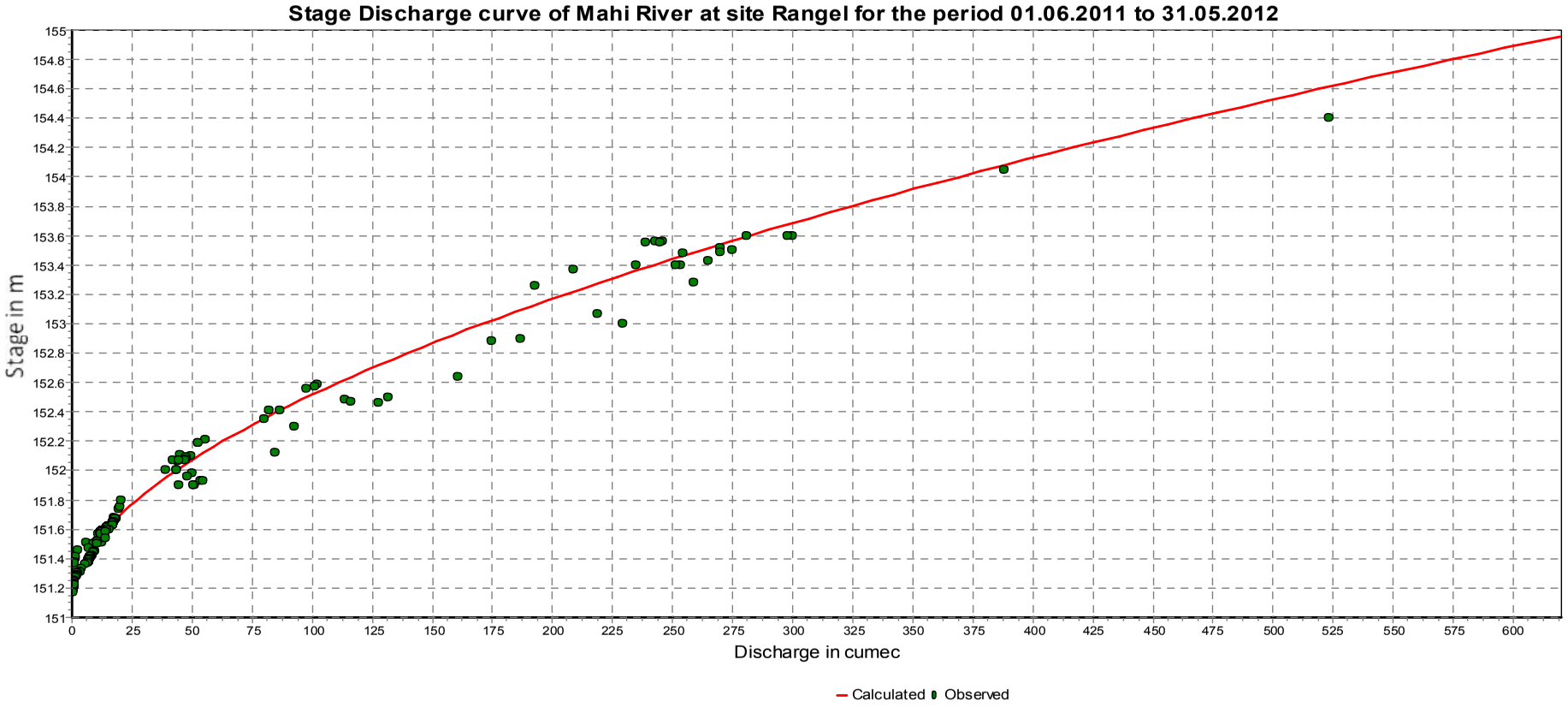
Peak Computed Discharge = 269.7 cumecs on 04/09/2011 Corres. Water Level :153.54 m

Lowest Computed Discharge = 0.000 cumecs on 15/05/2012 Corres. Water Level :151.125 m

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff



Procedure : Standard

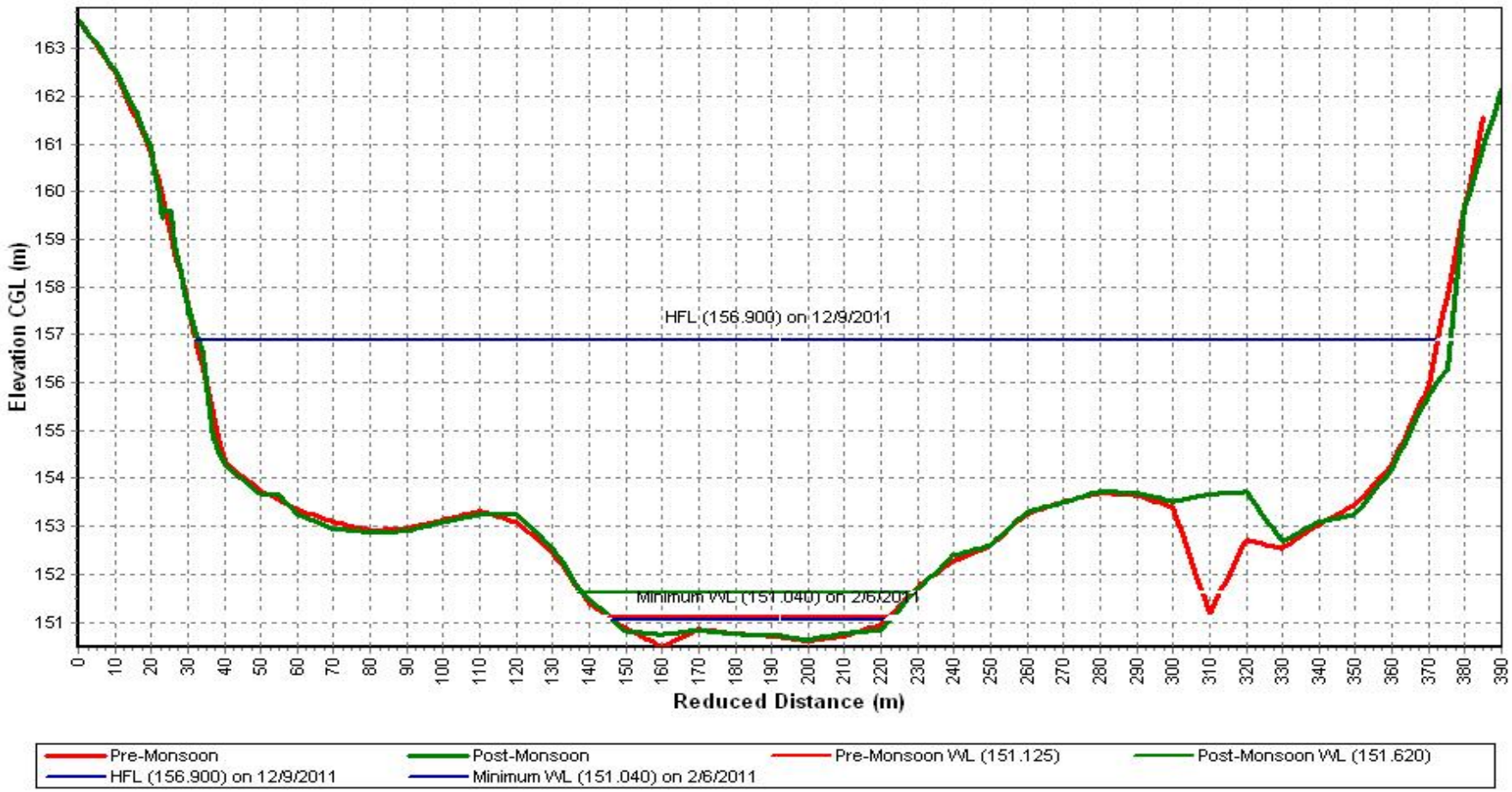
Equation type: Power

Q = c (h+a)^b, a = -151.13, b = 1.796, c = 55.571

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Som at Rangeli (01 02 13 005)
Local River : Som

Division : Mahi Division, Gandhinagar
Sub-Division : Mahi Sub Divn., Kadana

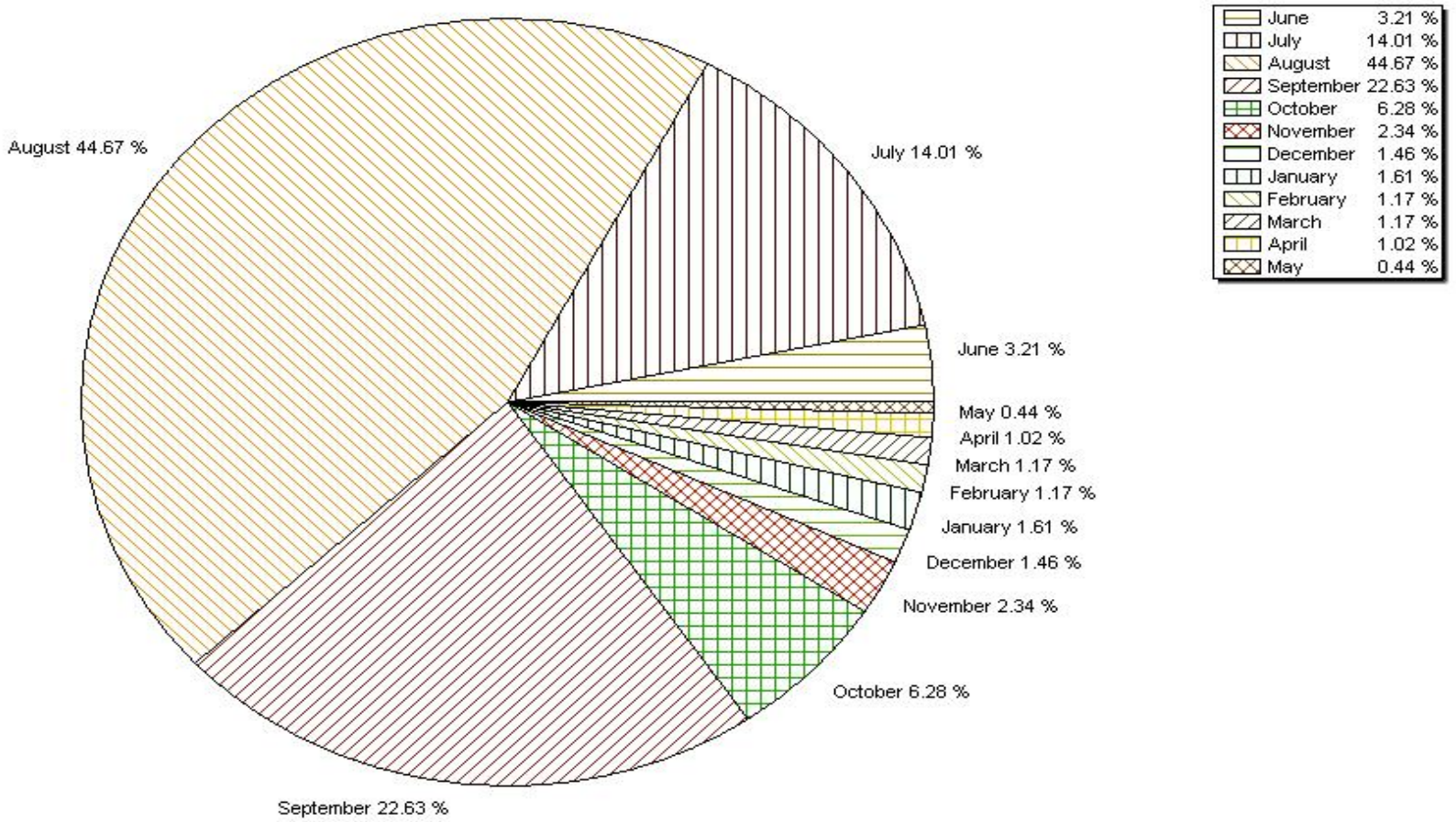


Historical Flood level - 160.86 m on 19.08.2006 at 1700 hrs

Monthly Average Runoff based on period : 1979-2011

Station Name : Som at Rangeli (01 02 13 005)
Local River : Som

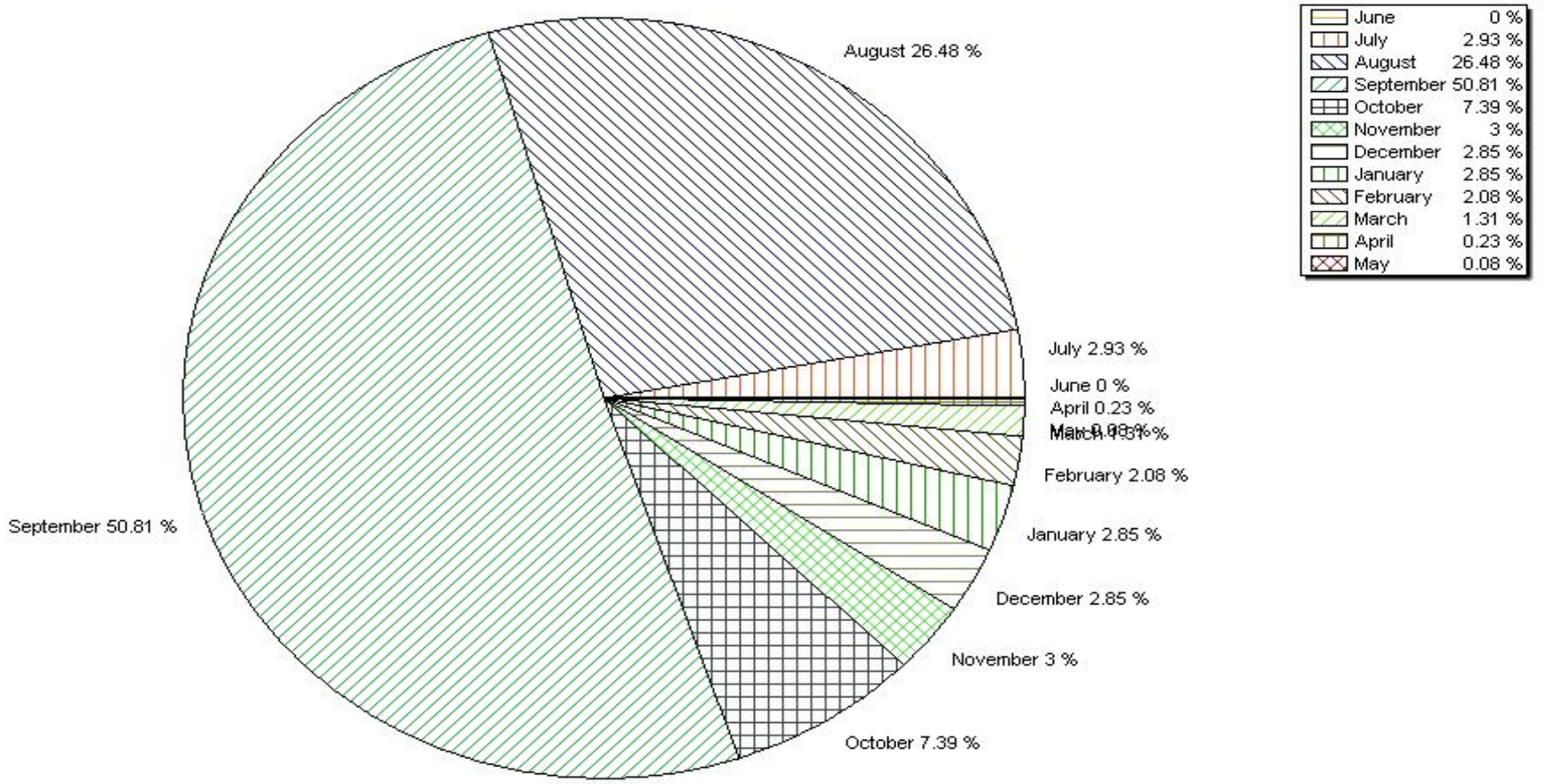
Division : Mahi Division, Gandhinagar
Sub-Division : Mahi Sub Divn., Kadana



Monthly Runoff for the Year : 2011-2012

Station Name : Som at Rangeli (01 02 13 005)
Local River : Som

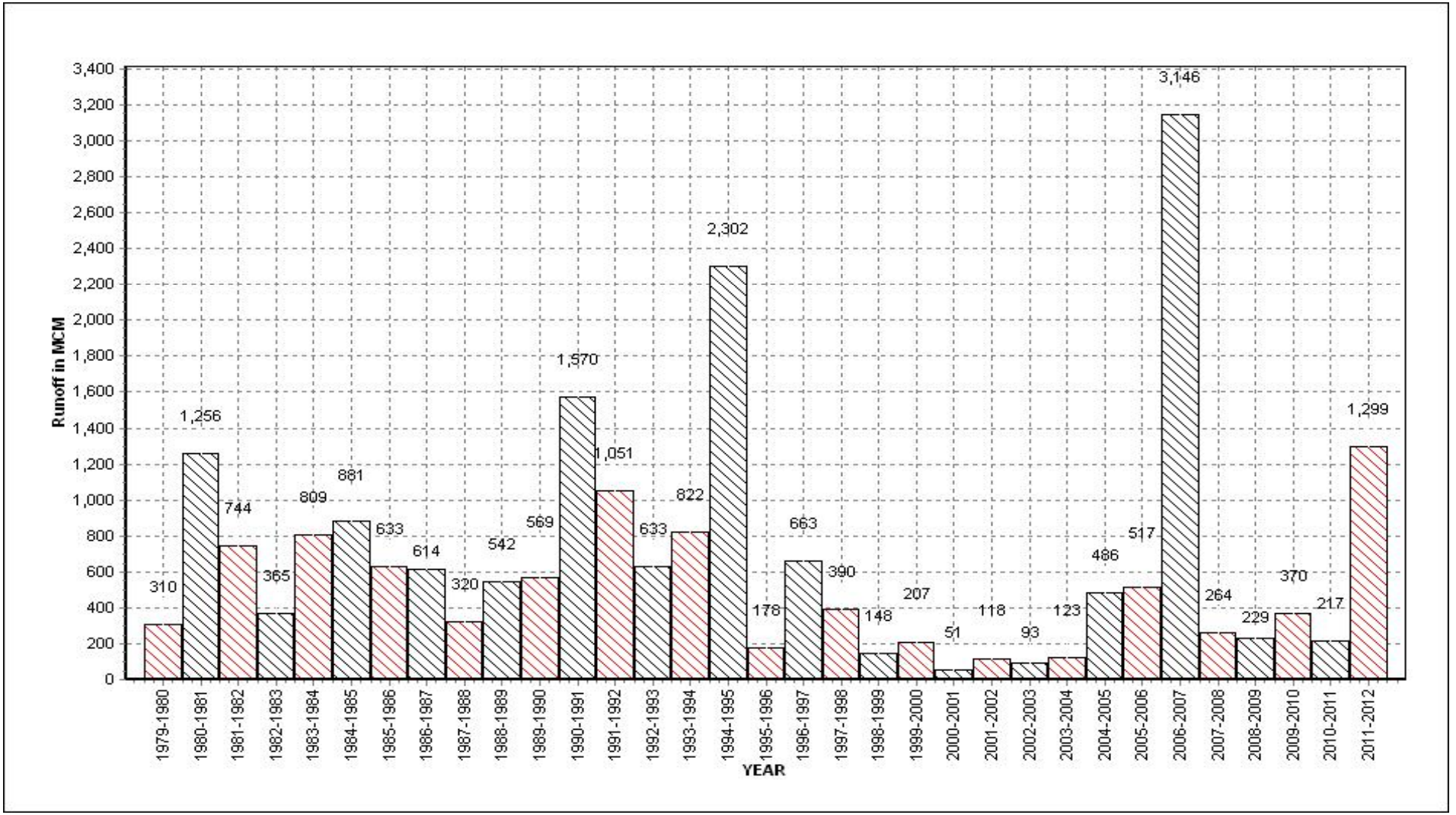
Division : Mahi Division, Gandhinagar
Sub-Division : Mahi Sub Divn., Kadana



Annual Runoff Values for the period: 1979 - 2012

Station Name : Som at Rangeli (01 02 13 005)
Local River : Som

Division : Mahi Division, Gandhinagar
Sub-Division : Mahi Sub Divn., Kadana

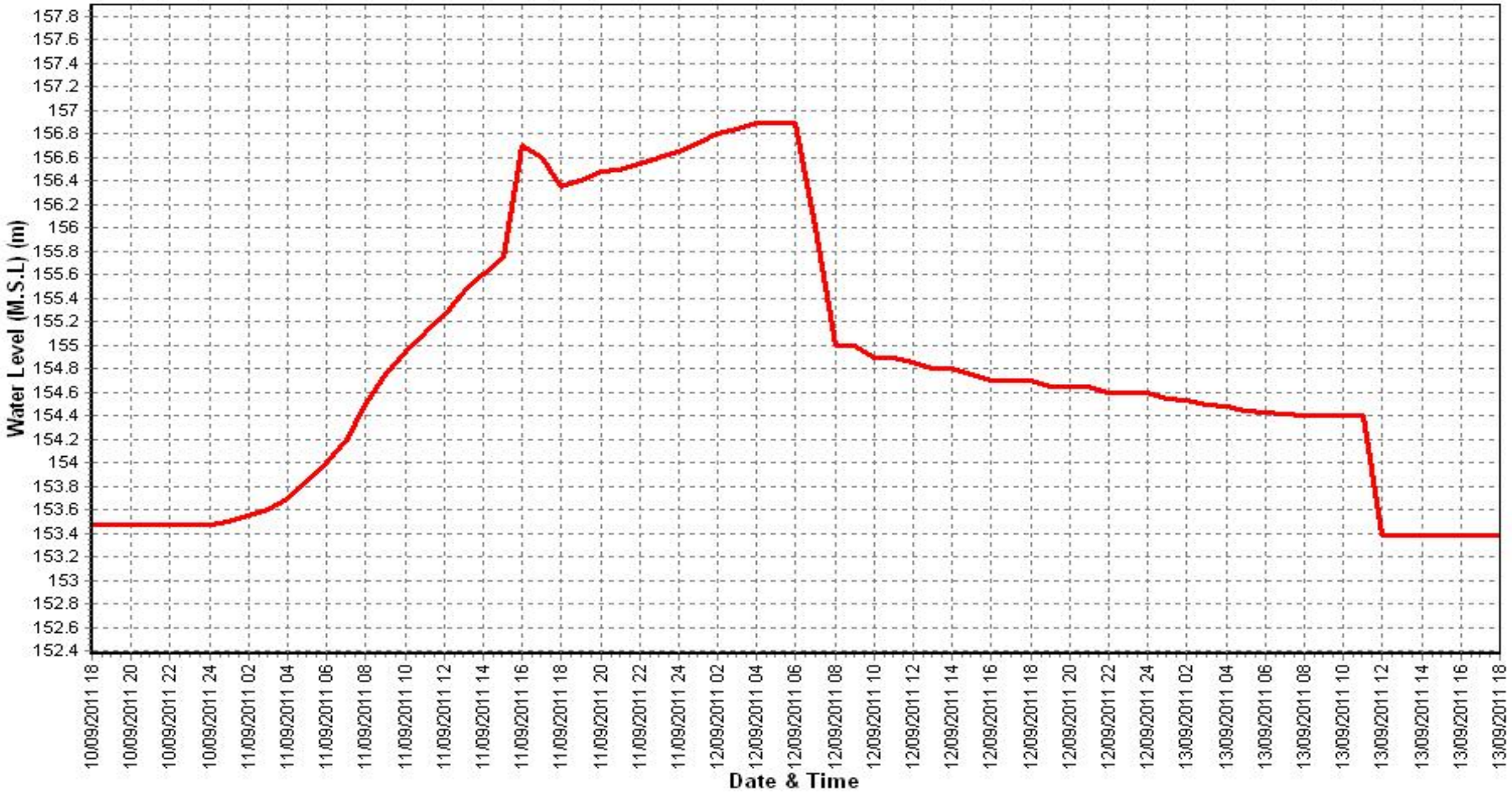


Note: Missing values have not been considered while arriving at Annual Runoff

Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Som at Rangeli (01 02 13 005) **Division : Mahi Division, Gandhinagar**

Local River : Som **Sub-Division : Mahi Sub Divn., Kadana**

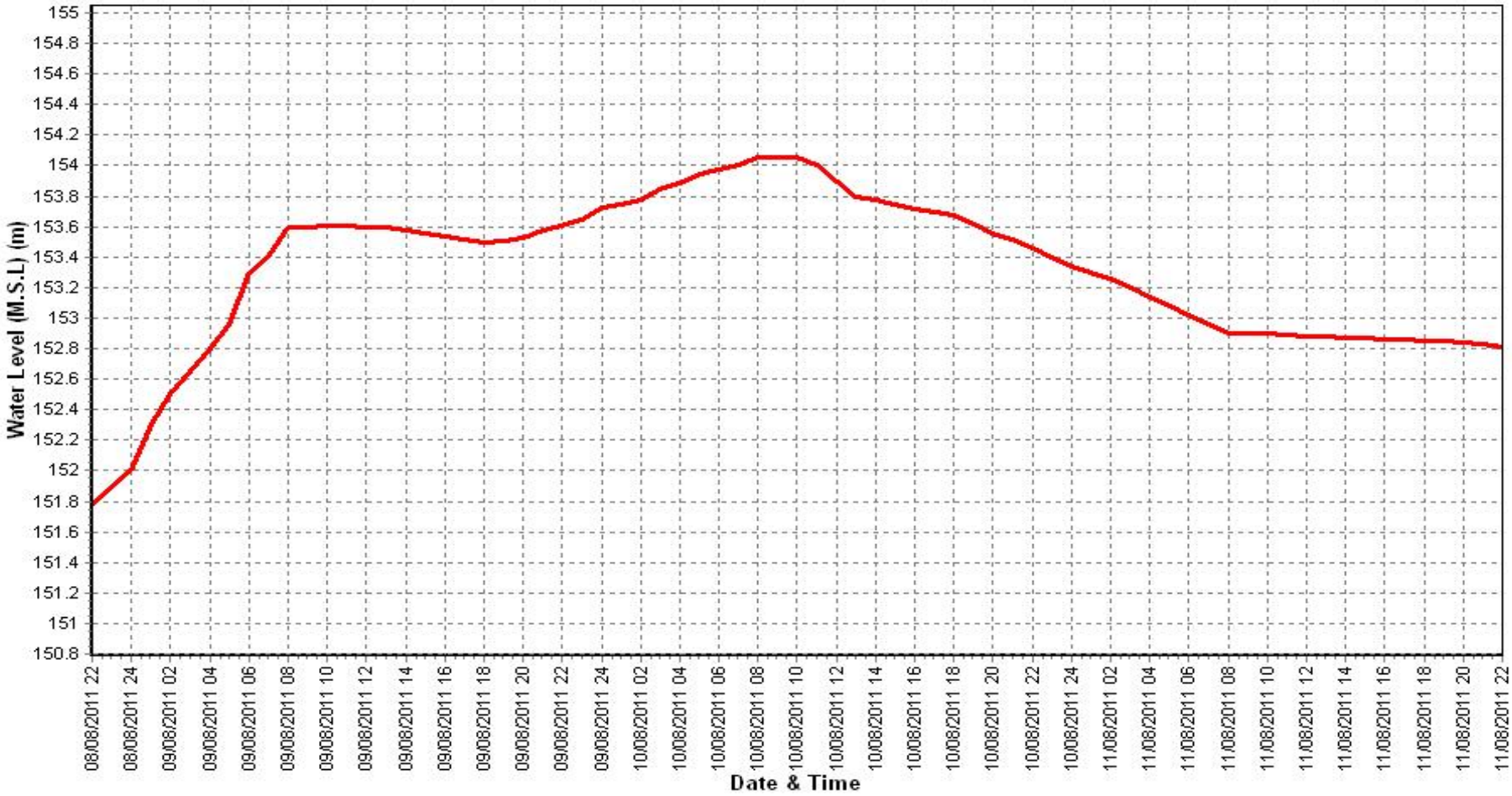


Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Som at Rangeli (01 02 13 005) **Division : Mahi Division, Gandhinagar**

Local River : Som **Sub-Division : Mahi Sub Divn., Kadana**

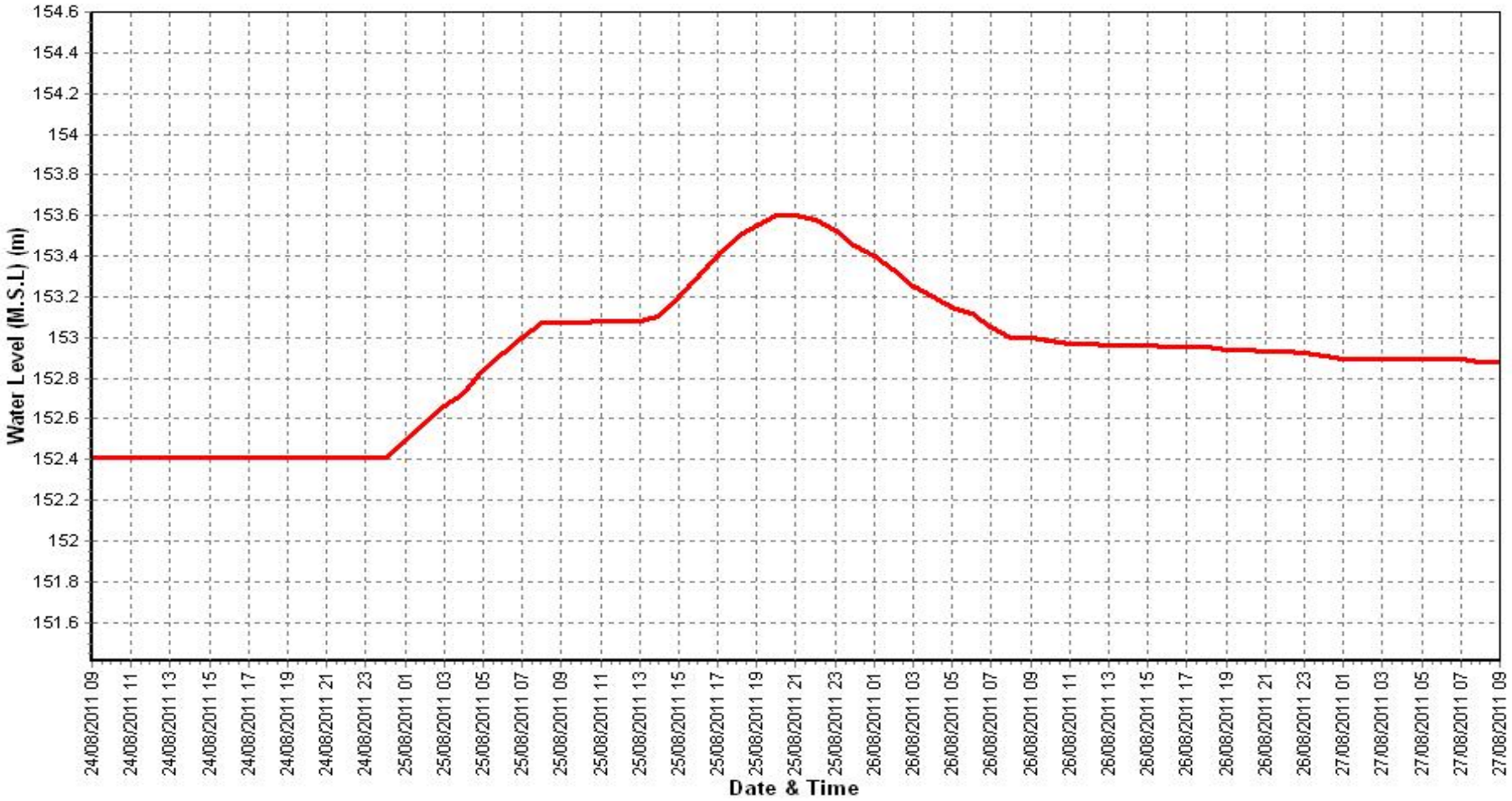


Time Span: 72 Hrs

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Som at Rangeli (01 02 13 005) **Division : Mahi Division, Gandhinagar**

Local River : Som **Sub-Division : Mahi Sub Divn., Kadana**



Time Span: 72 Hrs

HISTORY SHEET

			Water Year	**:**	**2011-2012**
Site	**:**	**Jakham at Dhariawad**	**Code**	**:**	**01 02 13 004**
State	:	Rajasthan	District		Udaipur
Basin	:	Mahi	Independent River	:	Mahi
Tributary	:	Jakham	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Jakham
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	Mahi Sub Divn., Kadana
Drainage Area	:	1510 Sq. Km.	Bank	:	Right
Latitude	:	24°04'43" N	Longitude	:	74°28'02" E
Zero of Gauge (m)	:	203 (m.s.l)	17/07/1984	-	
		Opening Date	Closing Date		
Gauge	:	17/07/1984			
Discharge	:	01/06/1988			
Sediment	:	-			
Water Quality	:	-			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1988-1989	219.3	204.080	05/08/1988	0.000	River Dry	01/04/1989
1989-1990	Data not published					
1990-1991	484.2	206.300	07/09/1990	0.000	River Dry	23/05/1991
1991-1992	278.9	205.460	25/08/1991	0.000	203.170	11/12/1991
1992-1993	25.47	204.650	17/08/1992	0.060	203.120	08/06/1992
1993-1994	210.2	203.890	16/08/1993	0.040	203.120	06/06/1993
1994-1995	281.7	206.600	03/09/1994	0.000	203.250	11/06/1994
1995-1996	21.58	204.250	25/07/1995	0.000	203.270	25/02/1996
1996-1997	295.1	205.980	16/09/1996	0.000	203.100	16/06/1996
1997-1998	41.00	204.525	10/09/1997	0.000	203.190	05/07/1997
1998-1999	12.37	204.030	18/10/1998	0.000	203.240	07/04/1999
1999-2000	51.60	204.440	31/07/1999	0.000	203.140	17/05/2000
2000-2001	265.4	205.780	21/07/2000	0.000	203.180	25/01/2001
2001-2002	16.10	204.100	08/07/2001	0.000	River Dry	06/06/2001
2002-2003	64.41	204.560	06/09/2002	0.000	203.200	24/12/2002
2003-2004	17.25	204.400	25/09/2003	0.000	203.190	07/04/2004
2004-2005	682.4	207.350	24/08/2004	0.000	203.300	02/04/2005
2005-2006	939.8	207.600	28/07/2005	0.582	203.360	05/09/2005
2006-2007	1980	209.350	11/08/2006	0.285	203.360	12/12/2006
2007-2008	198.1	205.450	21/08/2007	0.000	203.280	01/06/2007
2008-2009	533.5	206.590	11/07/2008	0.410	203.380	12/06/2008
2009-2010	396.7	206.500	23/07/2009	0.498	203.370	20/10/2009
2010-2011	397.8	206.450	10/09/2010	0.658	203.390	03/03/2011
2011-2012	1296.7	208.000	12/09/2011	0.000	203.350	15/04/2012

Stage-Discharge Data for the period 2011 - 2012

Station Name : Jakham at Dhariawad (01 02 13 004) **Division : Mahi Division, Gandhinagar**

Local River : Jakham **Sub-Division : Mahi Sub Divn., Kadana**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	203.200	0.000 *	203.350	0.230 *	203.610	3.956	204.990	142.4	204.200	31.10 *	203.550	1.776
2	203.200	0.000 *	203.350	0.230 *	203.620	3.740	205.390	233.5	204.190	30.36 *	203.550	1.805
3	203.200	0.000 *	203.350	0.230 *	203.510	2.308	205.350	223.4	204.160	20.08	203.540	1.692
4	203.200	0.000 *	203.320	0.120 *	204.130	21.08	206.000	363.1 *	204.140	21.08	203.540	1.686
5	203.200	0.000 *	203.310	0.090 *	203.640	3.878	205.830	308.4	204.100	18.17	203.540	1.692
6	203.200	0.000 *	203.330	0.015 *	204.800	109.7	205.400	224.1	204.080	22.83 *	203.530	1.990 *
7	203.190	0.000 *	203.330	0.015 *	203.800	8.950 *	205.260	205.3	204.070	18.38	203.530	1.990 *
8	203.190	0.000 *	203.340	0.190 *	203.710	4.724	205.100	187.9	204.070	17.37	203.520	1.524
9	203.190	0.000 *	203.350	0.230 *	204.990	151.4	205.100	183.4	204.060	21.59 *	203.510	1.460
10	203.190	0.000 *	203.470	1.180 *	205.040	182.3	205.000	161.9	204.040	15.47	203.510	1.690 *
11	203.190	0.000 *	203.360	0.280 *	204.790	124.8	207.300	751.5	204.030	14.62	203.490	1.362
12	203.190	0.000 *	203.340	0.190 *	204.720	111.1	208.000	1297 #	204.030	14.62	203.490	1.363
13	203.190	0.000 *	203.360	0.280 *	204.700	107.9	206.150	416.4	204.020	13.69	203.480	1.300 *
14	203.190	0.000 *	204.360	47.90	204.560	65.14 *	205.650	276.1	204.020	13.33	203.470	1.266
15	203.190	0.000 *	203.450	1.074	204.400	48.24 *	205.320	212.2	203.915	9.410	203.470	1.271
16	203.180	0.000 *	203.510	1.956	204.220	43.58	205.130	180.7	203.870	11.74 *	203.460	1.239
17	203.180	0.000 *	203.430	0.770 *	204.250	48.40	205.020	156.0	203.850	7.388	203.460	1.245
18	203.180	0.000 *	203.380	0.676	204.800	135.3	205.060	137.5 *	203.810	6.409	203.460	1.240
19	203.180	0.000 *	203.370	0.330 *	204.800	127.9	204.940	150.6	203.780	5.850	203.460	1.241
20	203.180	0.000 *	203.550	2.799	204.810	138.4	204.900	143.3	203.750	5.417	203.460	1.070 *
21	203.180	0.000 *	203.450	0.960 *	204.820	98.95 *	204.880	141.4	203.740	5.235	203.450	1.183
22	203.170	0.000 *	203.425	0.876	205.100	210.3	204.800	117.5	203.720	4.670	203.450	1.184
23	203.600	3.250 #	203.380	0.390 *	204.900	154.5	204.780	112.9	203.710	5.990 *	203.510	1.575
24	203.340	0.190 *	203.540	2.150 *	204.810	137.5	204.730	104.4	203.700	4.315	203.510	1.571
25	203.370	0.330 *	203.840	8.583	205.200	203.7	204.700	82.34 *	203.690	4.164	203.520	1.628
26	203.350	0.230 *	203.720	6.280 *	205.300	195.0	204.680	79.74 *	203.680	5.150 *	203.520	1.610
27	203.350	0.230 *	204.230	42.22	205.130	179.9	204.620	72.23 *	203.680	3.899	203.520	1.840 *
28	203.360	0.280 *	203.700	5.711	205.000	127.2 *	204.530	61.75 *	203.670	3.405	203.530	1.682
29	203.360	0.280 *	203.550	2.783	205.050	167.6	204.300	39.14 *	203.630	3.054	203.530	1.739
30	203.350	0.230 *	203.740	5.608	205.110	182.3	204.210	31.86 *	203.590	3.050 *	203.540	1.794
31			203.690	5.420 *	205.050	135.8 *			203.560	1.884		
Ten-Daily Mean												
I Ten-Daily	203.196	0.000	203.350	0.253	204.085	49.20	205.342	223.3	204.111	21.64	203.532	1.730
II Ten-Daily	203.185	0.000	203.511	5.625	204.605	95.08	205.747	372.1	203.908	10.25	203.470	1.260
III Ten-Daily	203.343	0.502	203.660	7.362	205.043	163.0	204.623	84.33	203.670	4.074	203.508	1.580
Monthly												
Min.	203.170	0.000	203.310	0.015	203.510	2.308	204.210	31.86	203.560	1.884	203.450	1.070
Max.	203.600	3.250	204.360	47.90	205.300	210.3	208.000	1297	204.200	31.10	203.550	1.990
Mean	203.241	0.167	203.512	4.509	204.593	104.4	205.237	226.6	203.889	11.73	203.503	1.524

Annual Runoff in MCM = 937 Annual Runoff in mm = 621

Peak Observed Discharge = 1297 cumecs on 12/09/2011 Corres. Water Level :208 m

Lowest Observed Discharge = 0.000 cumecs on 01/04/2012 Corres. Water Level :203.36 m

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Jakham at Dhariawad (01 02 13 004) **Division : Mahi Division, Gandhinagar**

Local River : Jakham **Sub-Division : Mahi Sub Divn., Kadana**

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	203.540	1.592	203.590	3.050 *	203.660	3.584	203.620	2.649	203.360	0.000	203.340	0.000
2	203.540	1.589	203.600	2.487	203.660	3.625	203.640	3.077	203.360	0.000	203.340	0.000
3	203.540	1.797	203.590	2.303	203.660	3.610	203.640	4.140 *	203.360	0.000	203.340	0.000
4	203.560	2.490 *	203.600	2.499	203.660	4.630 *	203.640	4.140 *	203.360	0.000	203.340	0.000
5	203.570	2.110	203.600	2.491	203.670	4.880 *	203.650	3.316	203.360	0.000	203.340	0.000
6	203.580	2.860 *	203.610	2.671	203.670	4.880 *	203.650	3.283	203.360	0.000	203.340	0.000
7	203.590	2.457	203.610	2.686	203.670	4.880 *	203.650	3.254	203.360	0.000	203.340	0.000
8	203.600	2.622	203.640	4.140 *	203.670	4.880 *	203.650	4.380 *	203.360	0.000	203.340	0.000
9	203.590	2.428	203.660	4.630 *	203.670	3.750	203.660	3.258	203.360	0.000	203.340	0.000
10	203.560	2.014	203.680	3.876	203.670	3.769	203.660	3.332	203.360	0.000	203.330	0.000
11	203.530	1.990 *	203.680	3.864	203.650	4.380 *	203.660	4.630 *	203.350	0.000	203.250	0.000
12	203.480	1.528	203.580	2.139	203.570	2.670 *	203.660	3.282	203.350	0.000	203.250	0.000
13	203.460	1.179	203.420	0.915	203.480	1.411	203.600	2.499	203.350	0.000	203.250	0.000
14	203.440	1.003	203.410	0.866	203.440	1.001	203.450	1.184	203.350	0.000	203.250	0.000
15	203.420	0.911	203.400	0.530 *	203.420	0.907	203.400	0.926	203.350	0.000	203.250	0.000
16	203.420	0.927	203.400	0.778	203.420	0.926	203.420	0.911	203.350	0.000	203.250	0.000
17	203.410	0.866	203.400	0.791	203.420	0.680 *	203.420	0.921	203.350	0.000	203.250	0.000
18	203.410	0.600 *	203.400	0.793	203.420	0.680 *	203.410	0.600 *	203.350	0.000	203.250	0.000
19	203.400	0.783	203.500	1.882	203.420	0.680 *	203.410	0.885	203.350	0.000	203.250	0.000
20	203.400	0.792	203.520	2.080	203.420	0.680 *	203.410	0.886	203.350	0.000	203.250	0.000
21	203.410	0.861	203.550	2.275	203.420	0.680 *	203.400	0.625	203.350	0.000	203.250	0.000
22	203.420	0.927	203.560	2.490 *	203.440	0.860 *	203.400	0.625	203.350	0.000	203.250	0.000
23	203.440	1.014	203.600	2.708	203.450	0.960 *	203.380	0.553	203.350	0.000	203.250	0.000
24	203.450	1.093	203.600	2.676	203.490	1.420 *	203.380	0.559	203.350	0.000	203.250	0.000
25	203.460	1.070 *	203.620	2.742	203.500	1.560 *	203.380	0.390 *	203.350	0.000	203.250	0.000
26	203.500	1.601	203.630	3.910 *	203.520	1.840 *	203.380	0.558	203.350	0.000	203.250	0.000
27	203.520	1.722	203.640	4.140 *	203.540	1.814	203.370	0.423	203.350	0.000	203.250	0.000
28	203.540	1.783	203.650	4.380 *	203.560	2.014	203.360	0.280 *	203.350	0.000	203.240	0.000
29	203.560	2.084	203.650	4.380 *	203.600	2.426	203.360	0.280 *	203.350	0.000	203.240	0.000
30	203.570	2.144	203.650	3.423			203.360	0.280 *	203.350	0.000	203.240	0.000
31	203.590	3.050 *	203.660	3.601			203.360	0.280 *			203.240	0.000
Ten-Daily Mean												
I Ten-Daily	203.567	2.196	203.618	3.083	203.666	4.249	203.646	3.483	203.360	0.000	203.339	0.000
II Ten-Daily	203.437	1.058	203.471	1.464	203.466	1.402	203.484	1.672	203.350	0.000	203.250	0.000
III Ten-Daily	203.496	1.577	203.619	3.339	203.502	1.508	203.375	0.441	203.350	0.000	203.246	0.000
Monthly												
Min.	203.400	0.600	203.400	0.530	203.420	0.680	203.360	0.280	203.350	0.000	203.240	0.000
Max.	203.600	3.050	203.680	4.630	203.670	4.880	203.660	4.630	203.360	0.000	203.340	0.000
Mean	203.500	1.609	203.571	2.651	203.546	2.416	203.498	1.82	203.353	0	203.277	0

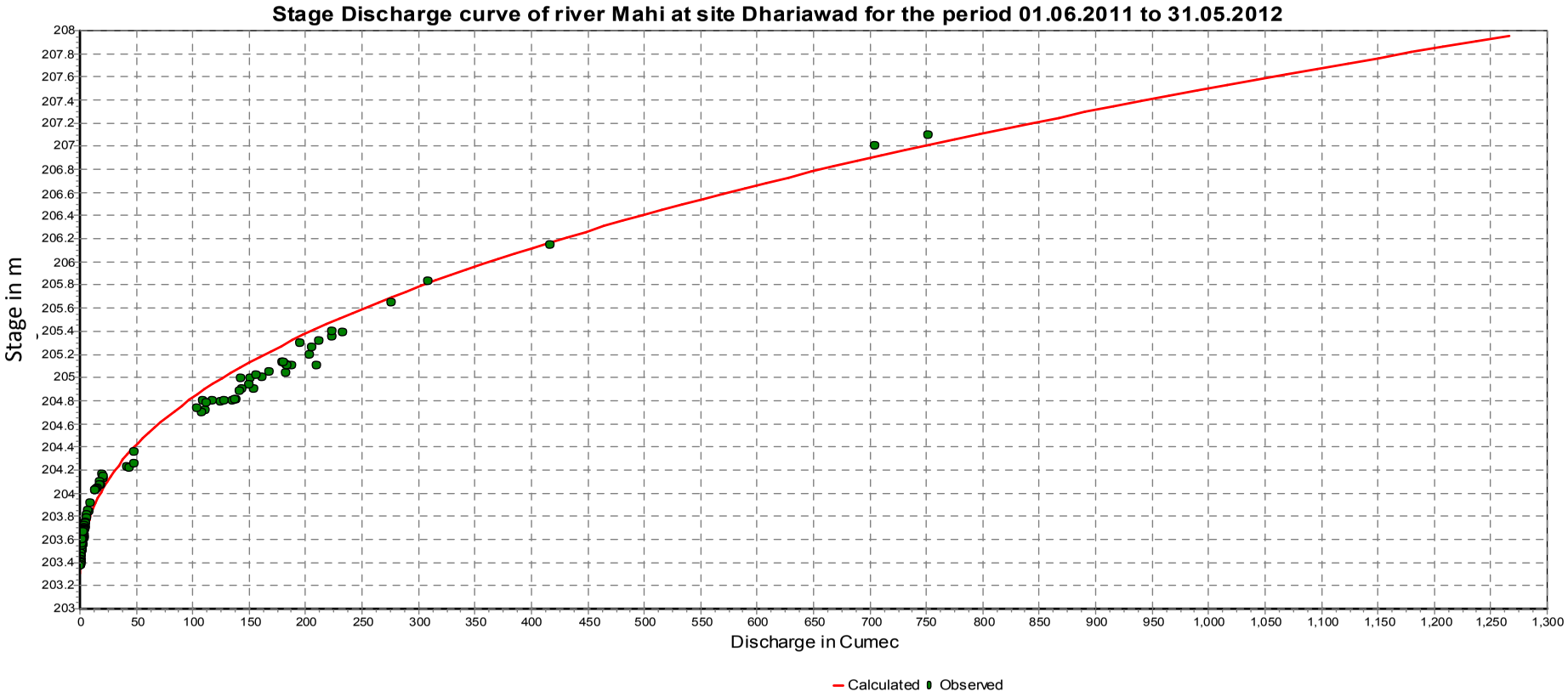
Peak Computed Discharge = 363.1 cumecs on 04/09/2011 Corres. Water Level :206 m

Lowest Computed Discharge = 0.000 cumecs on 01/06/2011 Corres. Water Level :203.2 m

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff



Procedure : Standard

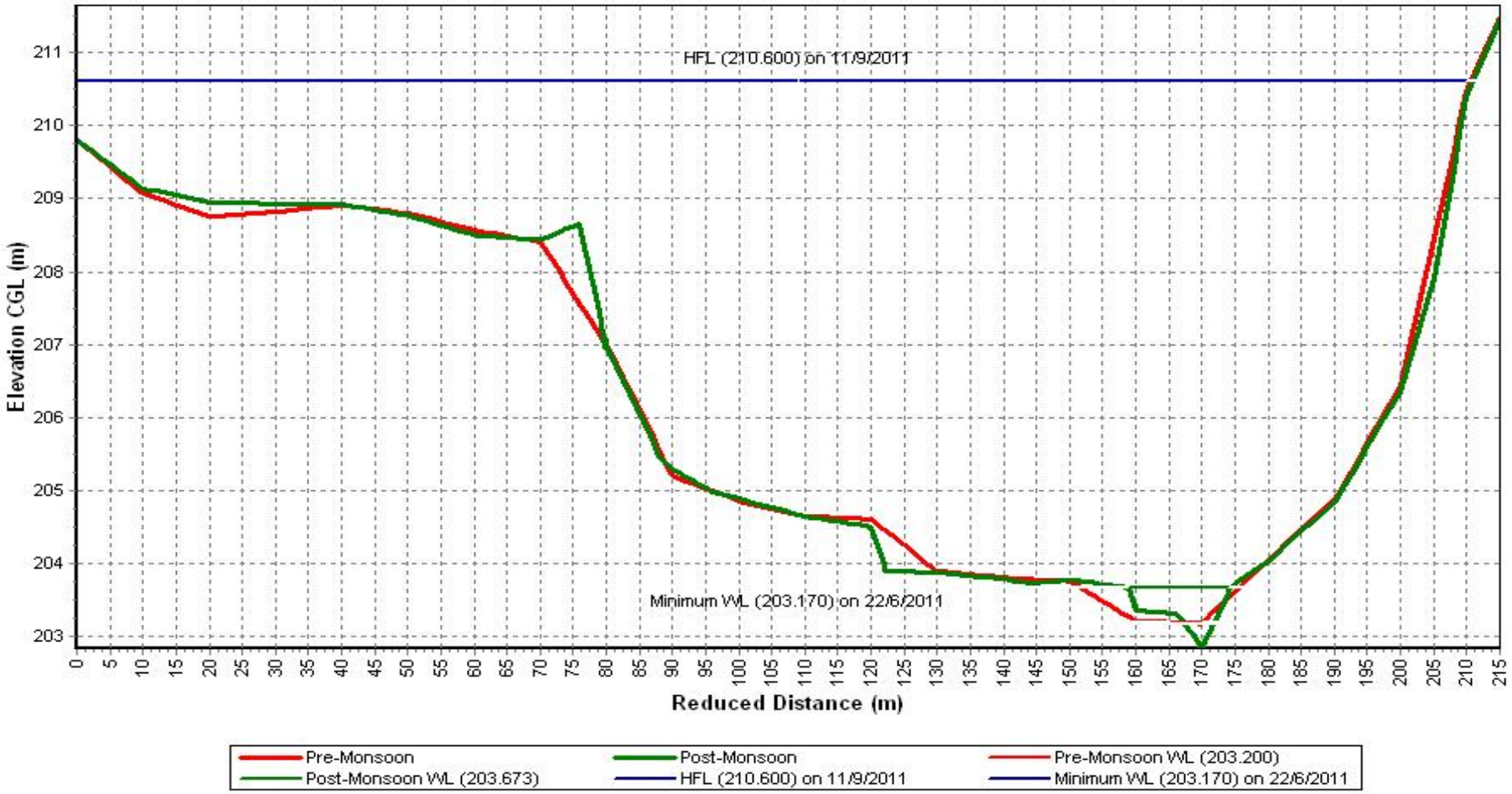
Equation type: Power

Q = c (h+a)^b, a = -203.23, b = 2.342, c = 33.401

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Jakham at Dhariawad (01 02 13 004) **Division : Mahi Division, Gandhinagar**

Local River : Jakham **Sub-Division : Mahi Sub Divn., Kadana**

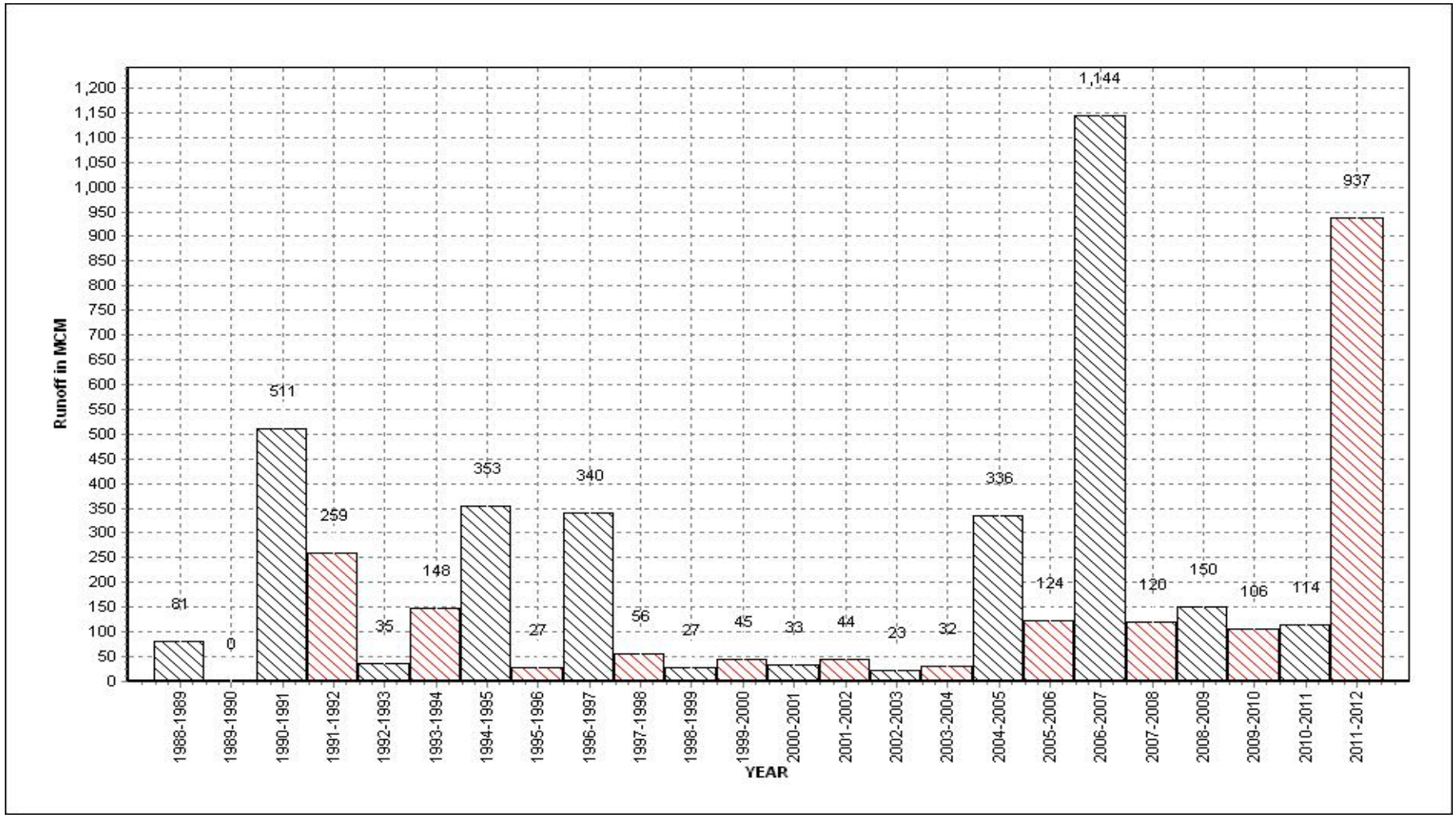


Historic Flood Level-210.100 m on 11.08.2006 at 0600 hrs

Annual Runoff Values for the period: 1988 - 2012

Station Name : Jakham at Dhariawad (01 02 13 004)
Local River : Jakham

Division : Mahi Division, Gandhinagar
Sub-Division : Mahi Sub Divn., Kadana

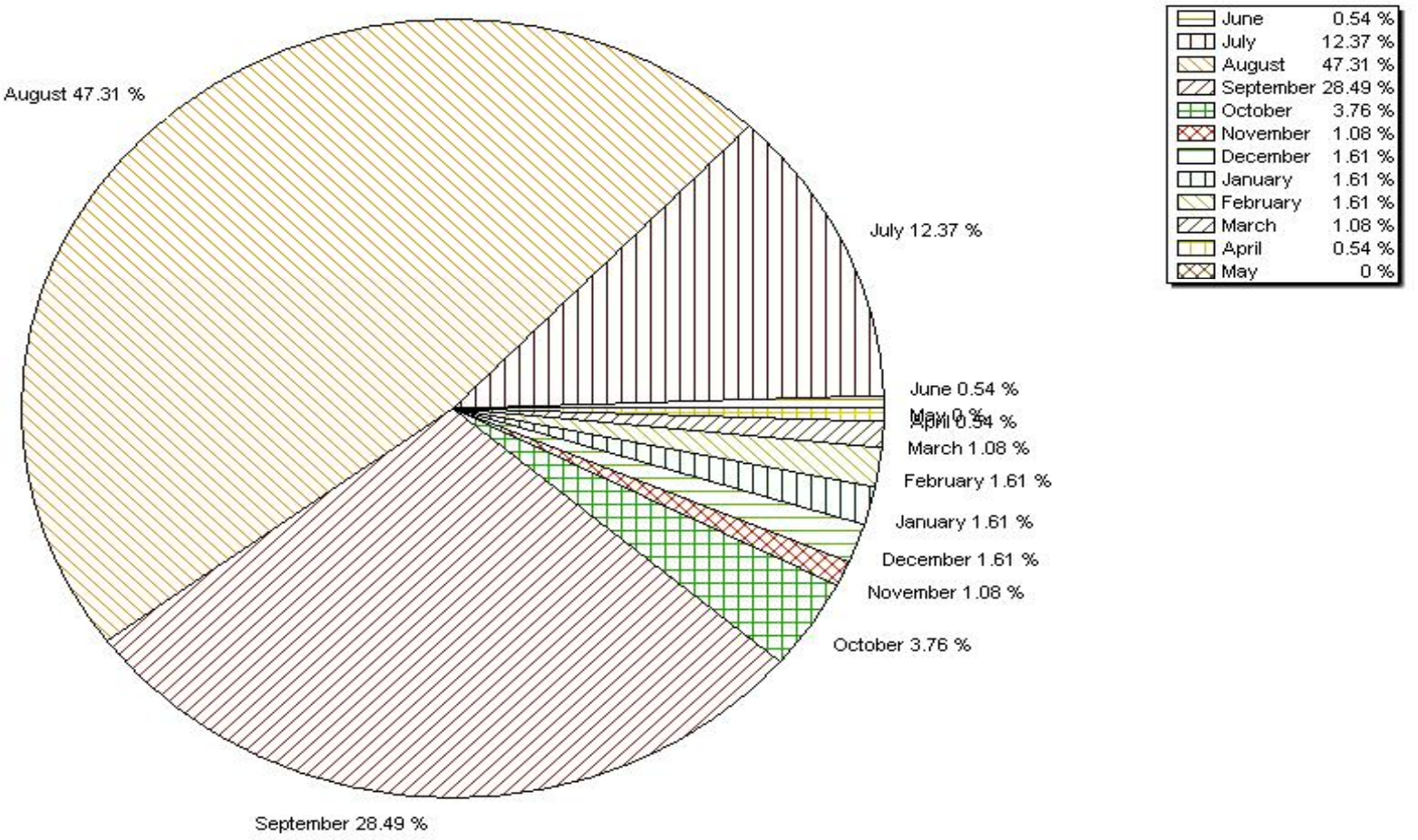


Note: Missing values have not been considered while arriving at Annual Runoff

Monthly Average Runoff based on period : 1988-2011

Station Name : Jakham at Dhariawad (01 02 13 004)
Local River : Jakham

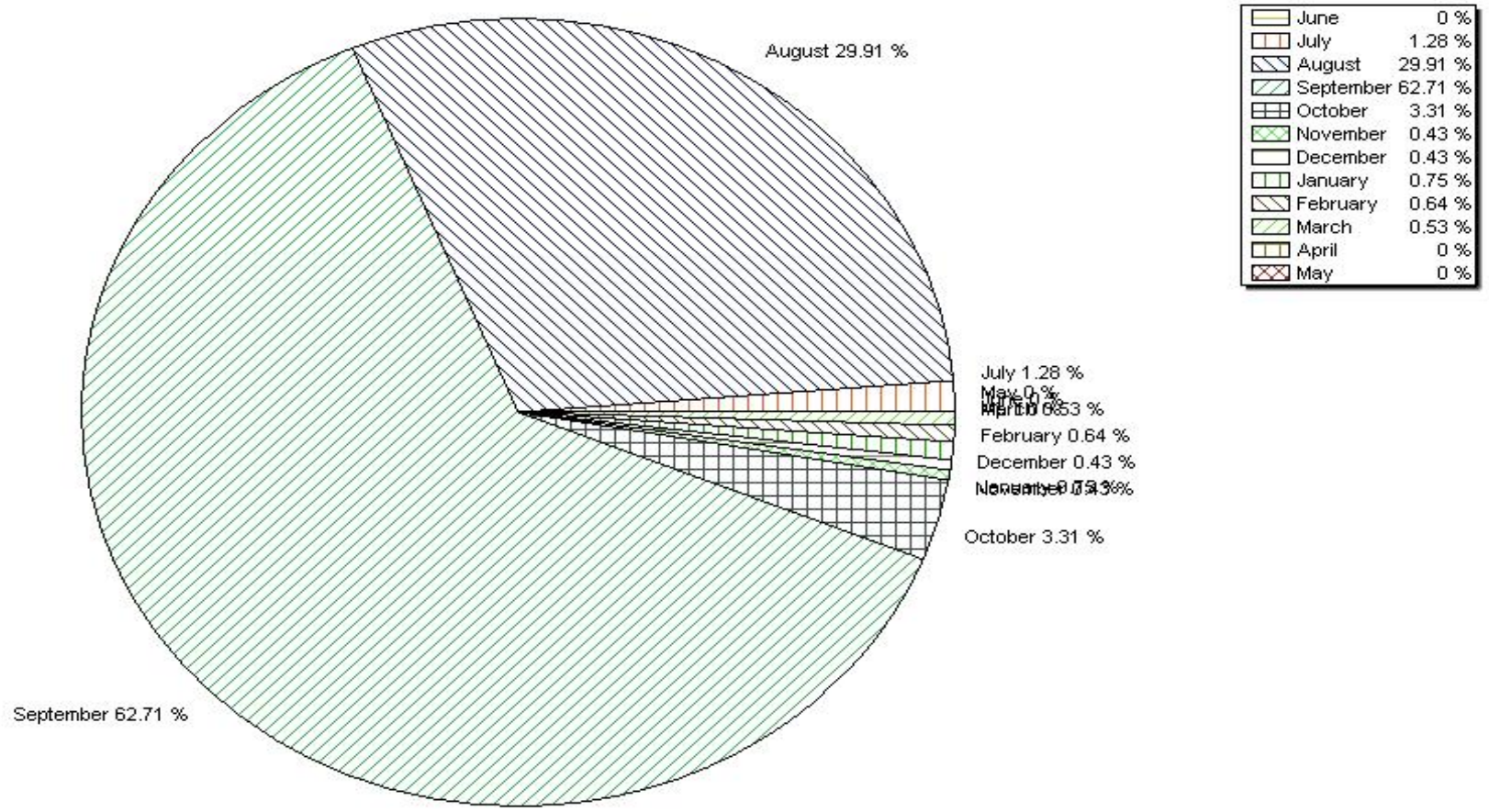
Division : Mahi Division, Gandhinagar
Sub-Division : Mahi Sub Divn., Kadana



Monthly Runoff for the Year : 2011-2012

Station Name : Jakham at Dhariawad (01 02 13 004)
Local River : Jakham

Division : Mahi Division, Gandhinagar
Sub-Division : Mahi Sub Divn., Kadana



Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Jakham at Dhariawad (01 02 13 004) **Division : Mahi Division, Gandhinagar**

Local River : Jakham **Sub-Division : Mahi Sub Divn., Kadana**

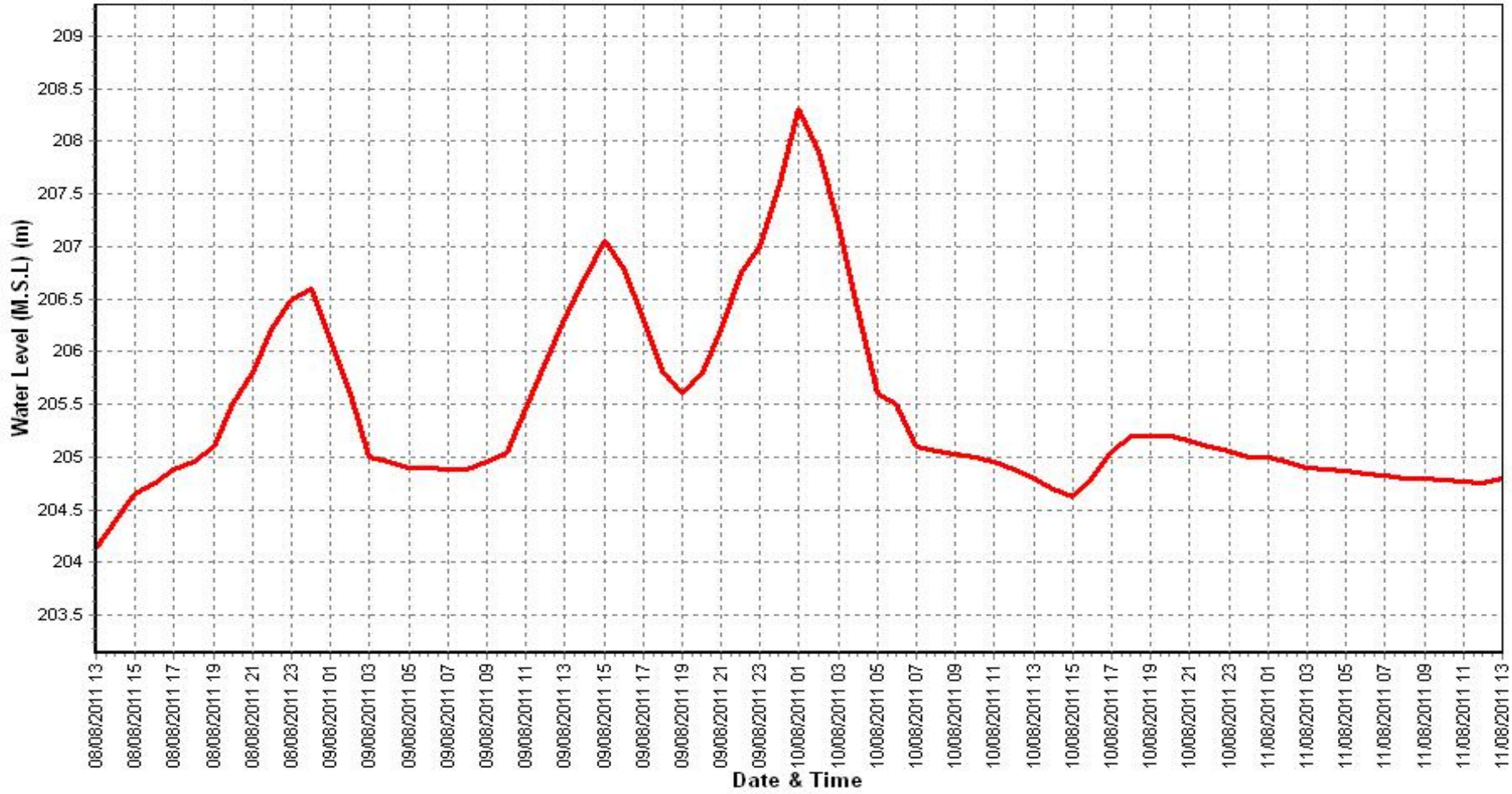


Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Jakham at Dhariawad (01 02 13 004) **Division : Mahi Division, Gandhinagar**

Local River : Jakham **Sub-Division : Mahi Sub Divn., Kadana**

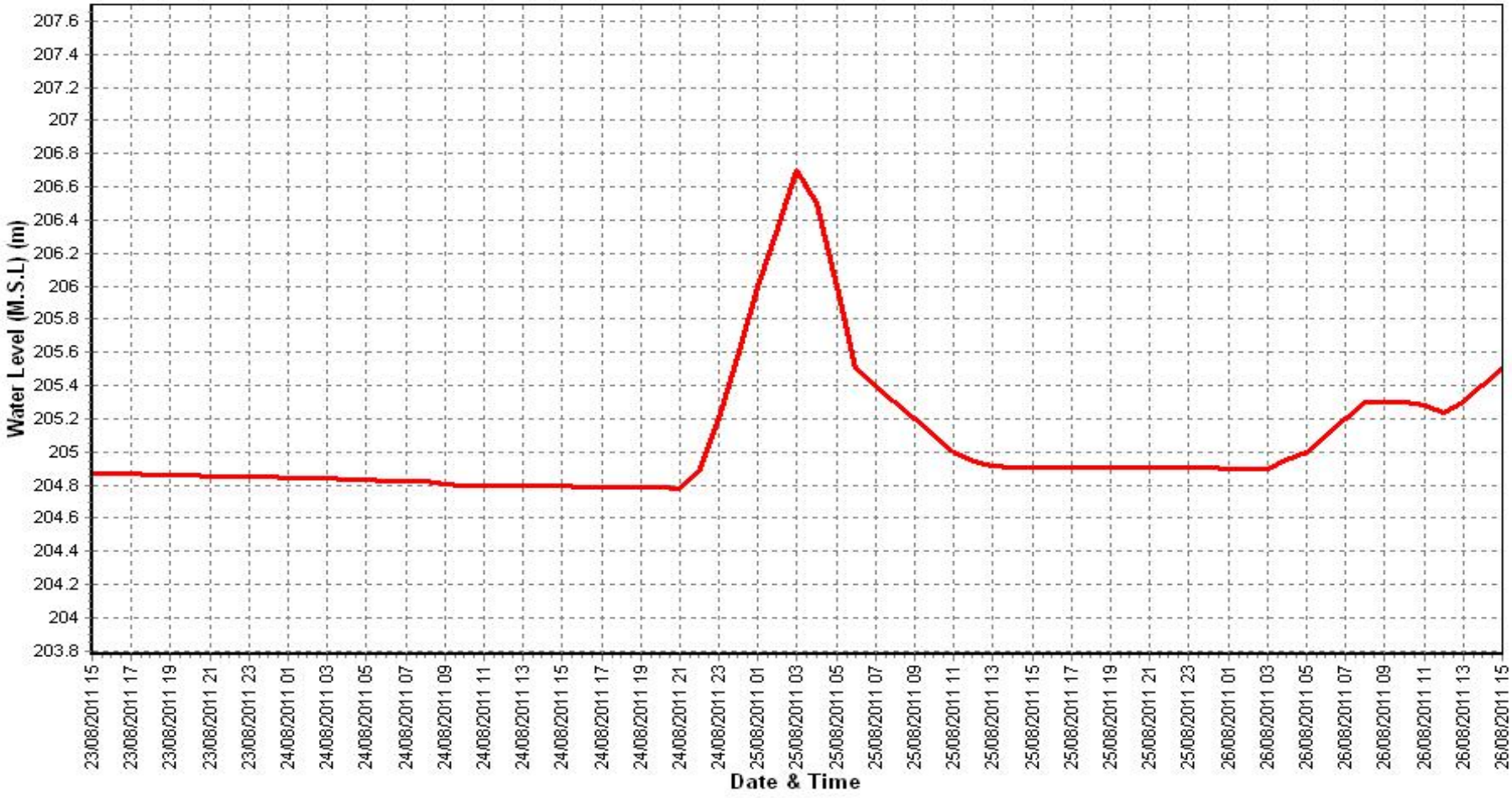


Time Span: 72 Hrs

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Jakham at Dhariawad (01 02 13 004) **Division : Mahi Division, Gandhinagar**

Local River : Jakham **Sub-Division : Mahi Sub Divn., Kadana**



Time Span: 72 Hrs

HISTORY SHEET

			Water Year	**:**	**2011-2012**
Site	**:**	**Mahi at Mataji**	**Code**	**:**	**01 02 13 001**
State	:	Madhya Pradesh	District		Ratlam
Basin	:	Mahi	Independent River	:	Mahi
Tributary	:	Mahi	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Mahi
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	Mahi Sub Divn., Kadana
Drainage Area	:	3880 Sq. Km.	Bank	:	Left
Latitude	:	23°20'57"N	Longitude	:	74°43'31" E
Zero of Gauge (m)	:	295 (m.s.l) 284 (m.s.l)	01/01/1982 01/01/2004	- -	31/12/2003
		Opening Date	Closing Date		
Gauge	:	21/07/1982			
Discharge	:	21/07/1982			
Sediment	:	21/07/1982			
Water Quality	:	21/07/1982			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1982-1983	2688	302.515	16/08/1982	0.000	297.760	07/04/1983
1983-1984	723.8	300.455	11/07/1983	0.000	296.895	28/04/1984
1984-1985	5636	303.895	11/08/1984	0.000	296.970	05/04/1985
1985-1986	165.0	298.800	04/08/1985	0.000	297.015	28/03/1986
1986-1987	6363	305.600	24/07/1986	0.000	297.145	02/03/1987
1987-1988	1080	301.200	25/08/1987	0.000	297.090	30/01/1988
1988-1989	8387	307.000	04/10/1988	0.000	297.100	30/03/1989
1989-1990	1586	297.800	02/07/1989	0.000	297.100	24/01/1990
1990-1991	3436	302.050	23/08/1990	0.000	296.990	27/04/1991
1991-1992	3154	304.800	31/07/1991	0.000	296.730	22/06/1991
1992-1993	475.7	299.800	07/09/1992	0.000	296.940	02/05/1993
1993-1994	1779	305.500	17/07/1993	0.000	296.970	09/06/1993
1994-1995	3453	306.550	02/08/1994	0.000	296.740	03/06/1994
1995-1996	1312	302.425	25/07/1995	0.000	296.990	14/04/1996
1996-1997	10257	306.300	28/07/1996	0.000	296.910	16/04/1997
1997-1998	2210	302.730	31/07/1997	0.000	296.560	01/06/1997
1998-1999	2430	302.150	16/09/1998	0.000	296.680	13/05/1999
1999-2000	284.0	299.230	26/09/1999	0.000	296.990	25/01/2000
2000-2001	134.0	299.050	13/08/2000	0.000	296.870	25/01/2001
2001-2002	166.0	299.220	17/08/2001	0.000	296.525	25/01/2002
2002-2003	414.1	299.750	04/09/2002	0.000	River Dry	13/05/2003
2003-2004	8252	306.300	28/07/2003	0.000	286.440	15/04/2004
2004-2005	1230	290.030	14/08/2004	0.000	286.080	21/05/2005
2005-2006	8075	294.480	28/07/2005	0.000	286.330	01/01/2006
2006-2007	7296	294.190	10/08/2006	0.217	286.610	19/07/2006
2007-2008	8074	294.300	09/07/2007	0.000	285.650	01/06/2007
2008-2009	202.3	288.890	12/09/2008	0.000	285.550	31/05/2009
2009-2010	6579	293.720	23/07/2009	0.000	286.500	20/11/2009
2010-2011	1017	290.460	30/08/2010	0.000	286.630	20/01/2011
2011-2012	1227.3	290.600	10/08/2011	0.000	286.610	10/02/2012

Stage-Discharge Data for the period 2011 - 2012

Station Name : Mahi at Mataji (01 02 13 001) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn., Kadana**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	284.900	0.000 *	R Dry	0.000	289.605	741.3	290.150	916.2	287.340	47.23 #	286.820	3.087
2	284.700	0.000 *	R Dry	0.000	288.170	246.4	290.200	962.8	287.300	41.96 *	286.820	3.077
3	284.300	0.000 *	R Dry	0.000	287.660	98.77 #	289.890	795.9	287.250	23.30	286.820	3.066
4	R Dry	0.000	R Dry	0.000	289.060	565.8	289.800	810.0 *	287.210	22.58	286.810	2.856
5	R Dry	0.000	R Dry	0.000	289.060	545.4	289.690	747.3	287.190	20.80	286.810	2.847
6	R Dry	0.000	R Dry	0.000	288.460	301.9	288.680	356.8	287.170	26.76 *	286.800	1.250 *
7	R Dry	0.000	R Dry	0.000	288.460	294.3 *	288.450	281.5	287.130	11.94	286.800	1.250 *
8	R Dry	0.000	R Dry	0.000	288.200	262.7	288.200	262.8	287.110	11.57	286.800	2.434
9	R Dry	0.000	R Dry	0.000	289.510	661.1	288.160	263.2	287.090	18.91 *	286.800	2.434
10	R Dry	0.000	285.410	0.000	290.600	1227	288.100	244.6	287.075	11.10	286.810	1.540 *
11	R Dry	0.000	285.340	0.000	290.045	931.0	288.080	190.1 *	287.060	9.892	286.800	2.412
12	R Dry	0.000	285.270	0.000	289.590	740.4	290.025	878.9	287.050	9.613	286.780	0.436
13	R Dry	0.000	285.220	0.000	289.020	577.0	289.510	661.1	287.000	9.471	286.780	0.750 *
14	R Dry	0.000	285.360	0.000	290.000	905.6 *	289.310	589.8	286.980	9.471	286.780	0.435
15	R Dry	0.000	285.510	0.000	289.630	732.4 *	289.060	533.2	286.950	9.293	286.780	0.438
16	R Dry	0.000	285.500	0.000	289.140	578.1	288.610	337.6	286.930	6.930 *	286.770	0.422
17	R Dry	0.000	287.550	79.21 *	290.250	1030	288.460	303.8	286.910	4.514	286.770	0.501
18	R Dry	0.000	287.590	86.11 #	289.980	926.3	288.400	276.5 *	286.910	4.456	286.770	0.539
19	R Dry	0.000	287.690	104.2 #	289.890	742.5	288.350	289.6	286.900	4.279	286.770	0.524
20	R Dry	0.000	288.160	257.5	289.830	778.7	288.310	281.3	286.900	4.275	286.770	0.540 *
21	R Dry	0.000	287.650	96.92 #	290.030	920.3 *	288.280	275.1	286.900	4.279	286.770	0.537
22	R Dry	0.000	287.660	98.77 #	290.000	905.6 *	288.100	242.6	286.890	4.103	286.770	0.522
23	R Dry	0.000	287.650	96.92 #	289.225	634.0	287.780	122.2 #	286.890	4.760 *	286.760	0.501
24	R Dry	0.000	287.740	114.2 *	288.550	326.0	287.650	96.92 #	286.880	3.725	286.760	0.398
25	R Dry	0.000	287.750	116.2 #	288.800	380.0	287.630	93.25 *	286.880	3.899	286.750	0.168
26	R Dry	0.000	287.660	98.77 #	289.970	891.6	287.600	87.87 #	286.870	3.810 *	286.730	0.000 *
27	R Dry	0.000	287.610	89.65 #	289.060	545.1	287.560	80.91 #	286.870	3.745	286.690	0.000 *
28	R Dry	0.000	287.580	84.36 #	290.100	955.1 *	287.500	70.95 #	286.860	3.769	286.660	0.000 *
29	R Dry	0.000	287.550	79.21 #	290.350	1194	287.460	64.63 #	286.860	3.555	286.620	0.000 *
30	R Dry	0.000	287.500	70.95 #	290.200	962.8	287.380	52.76 #	286.850	2.960 *	286.600	0.000 *
31	R Dry		288.750	386.8 *	289.610	723.5 *			286.840	3.387		
Ten-Daily Mean												
I Ten-Daily	284.633	0.000	285.410	0.000	288.879	494.5	289.132	564.1	287.187	23.62	286.809	2.384
II Ten-Daily		0.000	286.319	52.71	289.737	794.2	288.812	434.2	286.959	7.219	286.777	0.700
III Ten-Daily		0.000	287.736	121.1	289.627	767.1	287.694	118.7	286.872	3.817	286.711	0.213
Monthly												
Min.	284.300	0.000	285.220	0.000	287.660	98.77	287.380	52.76	286.840	2.960	286.600	0.000
Max.	284.900	0.000	288.750	386.8	290.600	1227	290.200	962.8	287.340	47.23	286.820	3.087
Mean	284.633	0	286.986	59.99	289.421	687.9	288.546	372.3	287.001	11.3	286.766	1.099

Annual Runoff in MCM = 3001 Annual Runoff in mm = 774

Peak Observed Discharge = 1227 cumecs on 10/08/2011 Corres. Water Level :290.6 m

Lowest Observed Discharge = 0.000 cumecs on 04/06/2011

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Mahi at Mataji (01 02 13 001) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn., Kadana**

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	286.600	0.000 *	286.660	0.000 *	286.640	0.000	286.580	0.000 *	286.540	0.000 *	286.490	0.000 *
2	286.600	0.000 *	286.660	0.000 *	286.630	0.000	286.580	0.000 *	286.540	0.000 *	286.490	0.000 *
3	286.600	0.000 *	286.650	0.000 *	286.630	0.000	286.580	0.000 *	286.540	0.000 *	286.490	0.000 *
4	286.600	0.000 *	286.650	0.000 *	286.620	0.000	286.580	0.000 *	286.530	0.000 *	286.490	0.000 *
5	286.600	0.000 *	286.650	0.000 *	286.620	0.000	286.570	0.000 *	286.530	0.000 *	286.490	0.000 *
6	286.600	0.000 *	286.650	0.000 *	286.610	0.000	286.570	0.000 *	286.530	0.000 *	286.490	0.000 *
7	286.600	0.000 *	286.650	0.000 *	286.610	0.000	286.570	0.000 *	286.530	0.000 *	286.480	0.000 *
8	286.600	0.000 *	286.650	0.000 *	286.610	0.000	286.570	0.000 *	286.530	0.000 *	286.480	0.000 *
9	286.600	0.000 *	286.660	0.000 *	286.610	0.000	286.570	0.000 *	286.530	0.000 *	286.470	0.000 *
10	286.610	0.000 *	286.660	0.000 *	286.610	0.000	286.560	0.000 *	286.530	0.000 *	286.470	0.000 *
11	286.610	0.000 *	286.660	0.000 *	286.610	0.000	286.560	0.000 *	286.520	0.000 *	286.470	0.000 *
12	286.610	0.000 *	286.660	0.000 *	286.610	0.000	286.560	0.000 *	286.520	0.000 *	286.460	0.000 *
13	286.620	0.000 *	286.660	0.000 *	286.610	0.000	286.560	0.000 *	286.520	0.000 *	286.460	0.000 *
14	286.630	0.000 *	286.660	0.000 *	286.610	0.000	286.560	0.000 *	286.520	0.000 *	286.460	0.000 *
15	286.650	0.000 *	286.660	0.000 *	286.600	0.000	286.560	0.000 *	286.520	0.000 *	286.450	0.000 *
16	286.670	0.000 *	286.660	0.000 *	286.600	0.000	286.560	0.000 *	286.520	0.000 *	286.450	0.000 *
17	286.710	0.000 *	286.670	0.000 *	286.600	0.000	286.560	0.000 *	286.510	0.000 *	286.450	0.000 *
18	286.720	0.000 *	286.670	0.000 *	286.600	0.000	286.560	0.000 *	286.510	0.000 *	286.450	0.000 *
19	286.730	0.000 *	286.660	0.000 *	286.600	0.000	286.550	0.000 *	286.510	0.000 *	286.440	0.000 *
20	286.730	0.000 *	286.660	0.000 *	286.600	0.000	286.550	0.000 *	286.510	0.000 *	286.440	0.000 *
21	286.730	0.000 *	286.660	0.000 *	286.600	0.000	286.550	0.000 *	286.510	0.000 *	286.440	0.000 *
22	286.720	0.000 *	286.700	0.000 *	286.600	0.000	286.550	0.000 *	286.510	0.000 *	286.450	0.000 *
23	286.700	0.000 *	286.690	0.000 *	286.590	0.000	286.550	0.000 *	286.510	0.000 *	286.450	0.000 *
24	286.690	0.000 *	286.680	0.000 *	286.590	0.000	286.550	0.000 *	286.500	0.000 *	286.450	0.000 *
25	286.690	0.000 *	286.680	0.000 *	286.590	0.000	286.550	0.000 *	286.500	0.000 *	286.450	0.000 *
26	286.680	0.000 *	286.670	0.000 *	286.590	0.000	286.550	0.000 *	286.500	0.000 *	286.440	0.000 *
27	286.680	0.000 *	286.660	0.000 *	286.590	0.000	286.550	0.000 *	286.500	0.000 *	286.440	0.000 *
28	286.680	0.000 *	286.660	0.000 *	286.580	0.000	286.540	0.000 *	286.500	0.000 *	286.440	0.000 *
29	286.680	0.000 *	286.660	0.000 *	286.580	0.000	286.540	0.000 *	286.500	0.000 *	286.440	0.000 *
30	286.670	0.000 *	286.650	0.000 *			286.540	0.000 *	286.500	0.000 *	286.430	0.000 *
31	286.670	0.000 *	286.650	0.000 *			286.540	0.000 *			286.430	0.000 *
Ten-Daily Mean												
I Ten-Daily	286.601	0.000	286.654	0.000	286.619	0.000	286.573	0.000	286.533	0.000	286.484	0.000
II Ten-Daily	286.668	0.000	286.662	0.000	286.604	0.000	286.558	0.000	286.516	0.000	286.453	0.000
III Ten-Daily	286.690	0.000	286.669	0.000	286.590	0.000	286.546	0.000	286.503	0.000	286.442	0.000
Monthly												
Min.	286.600	0.000	286.650	0.000	286.580	0.000	286.540	0.000	286.500	0.000	286.430	0.000
Max.	286.730	0.000	286.700	0.000	286.640	0.000	286.580	0.000	286.540	0.000	286.490	0.000
Mean	286.654	0	286.662	0	286.605	0	286.559	0	286.517	0	286.459	0

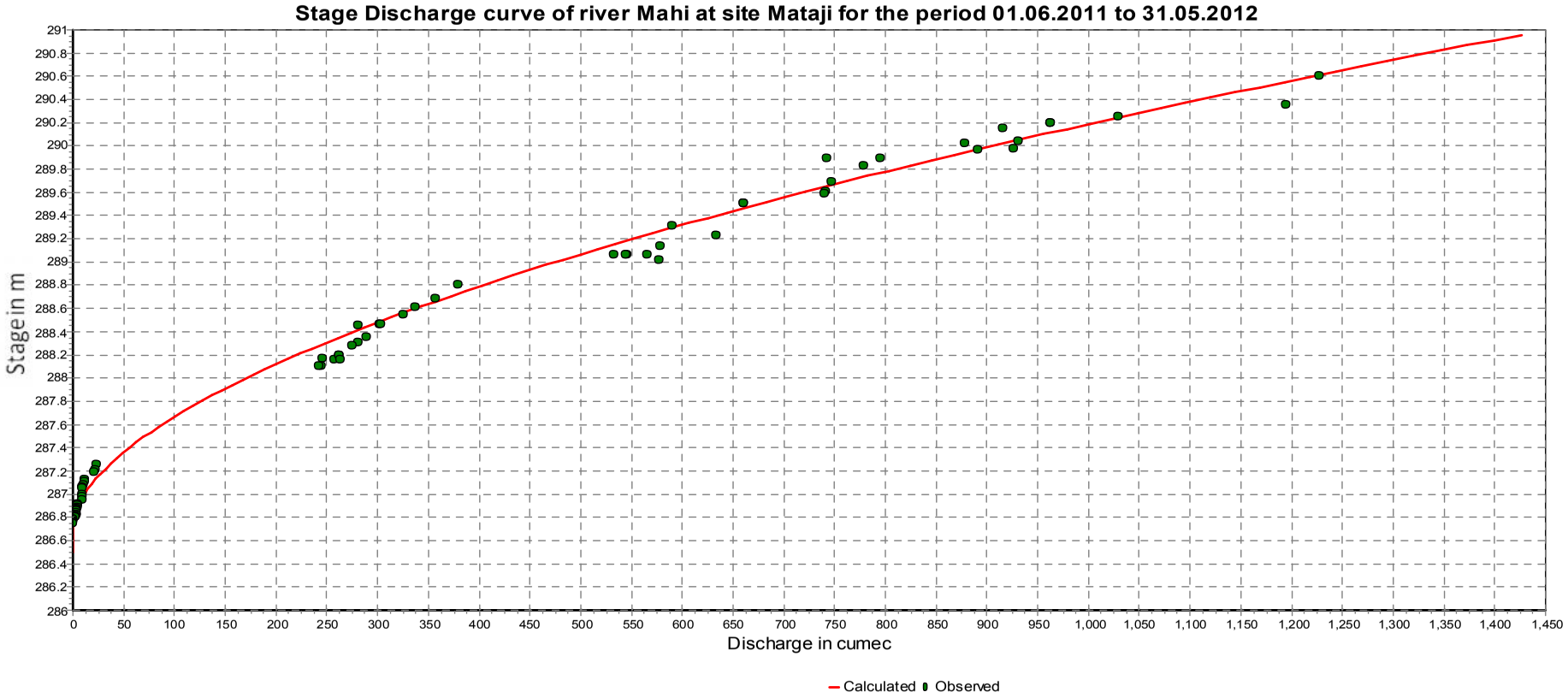
Peak Computed Discharge = 955.1 cumecs on 28/08/2011 Corres. Water Level :290.1 m

Lowest Computed Discharge = 0.000 cumecs on 01/06/2011 Corres. Water Level :284.9 m

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff



Procedure : Standard

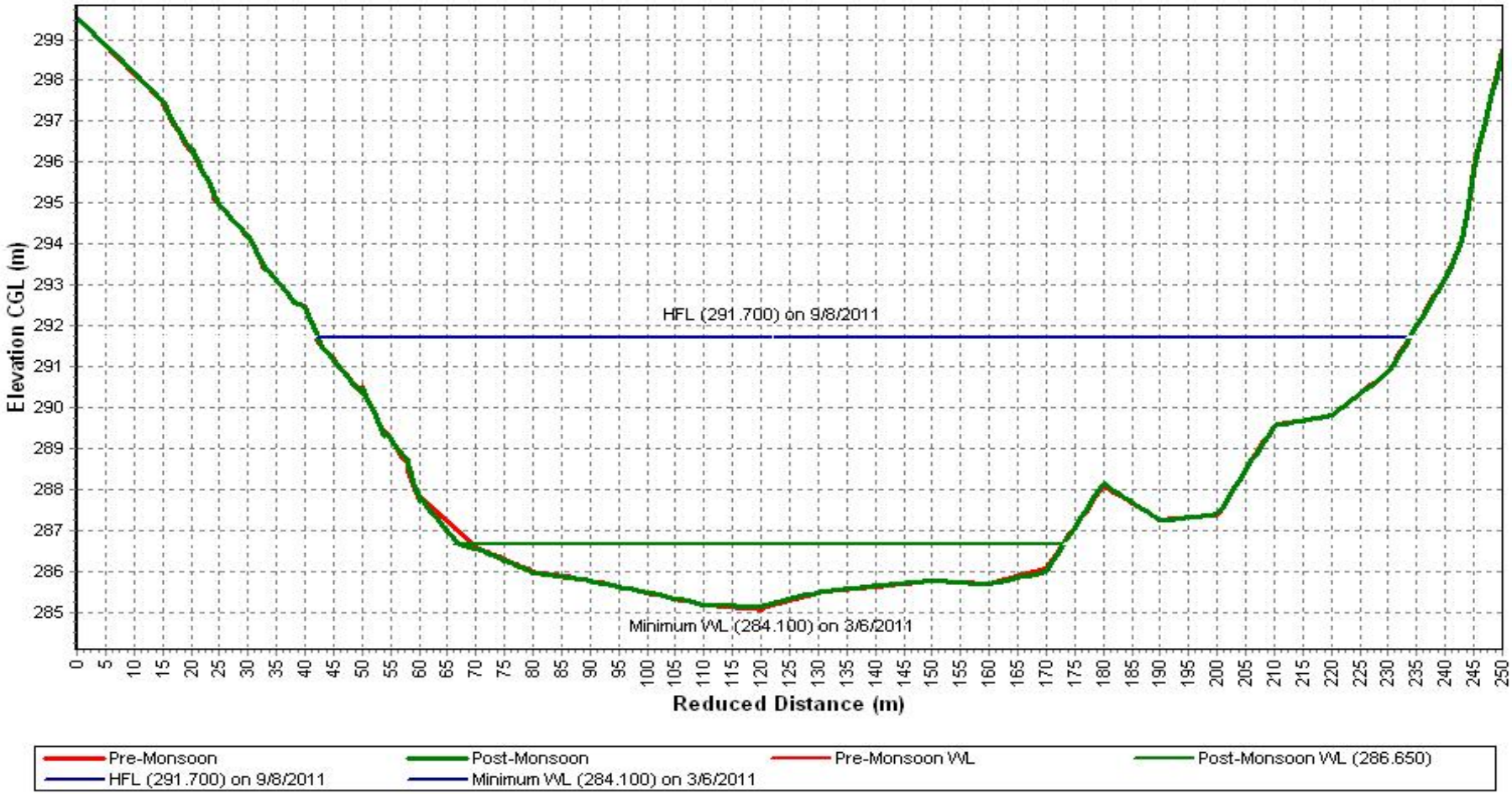
Equation type: Power

Q = c (h+a)^b, a = -286.72, b = 1.773, c = 110.22

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Mahi at Mataji (01 02 13 001) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn.. Kadana**

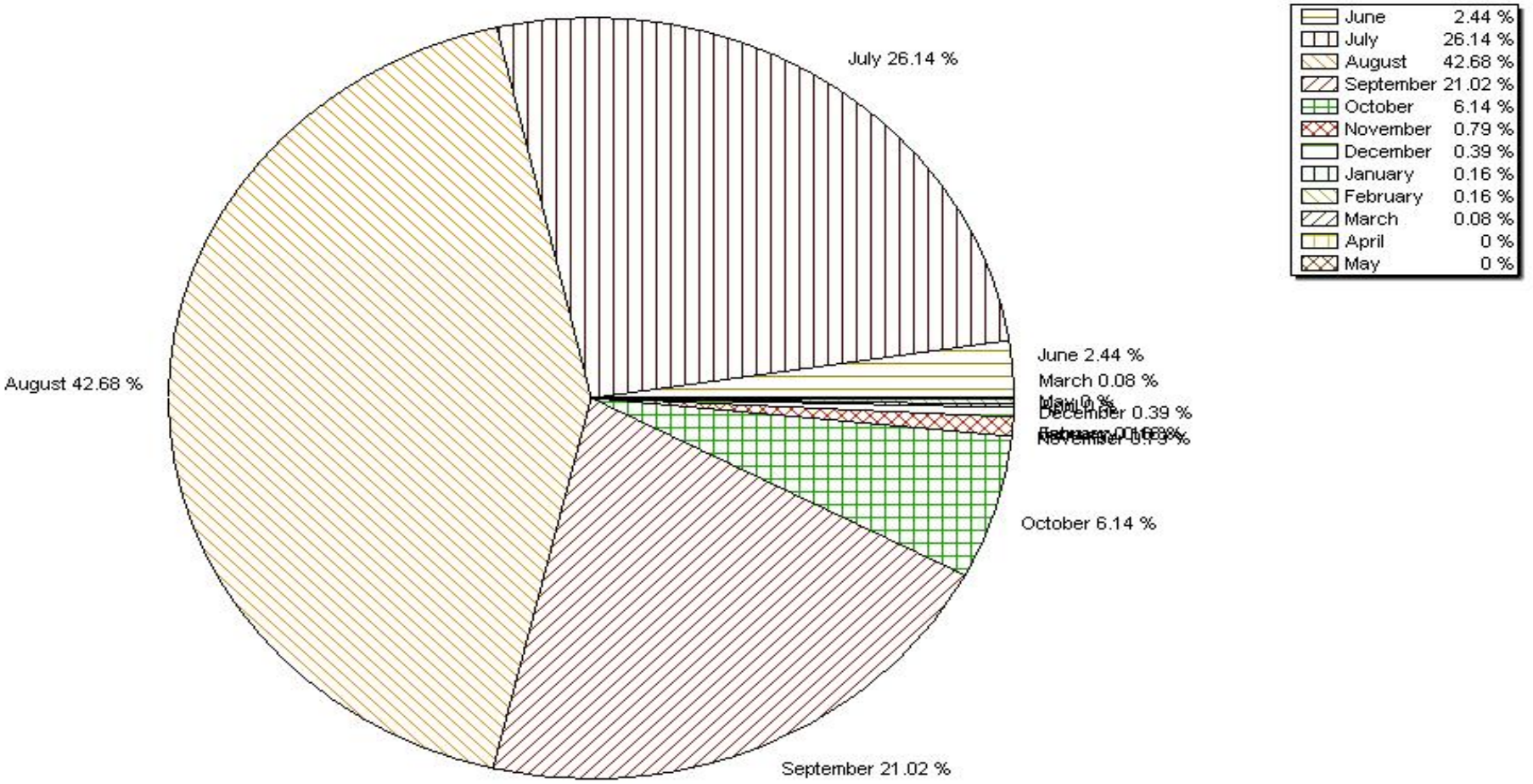


Historical flood level - 298.32 m on 06.09.2006 at 1800 hrs

Monthly Average Runoff based on period : 1982-2011

Station Name : Mahi at Mataji (01 02 13 001)
Local River : Mahi

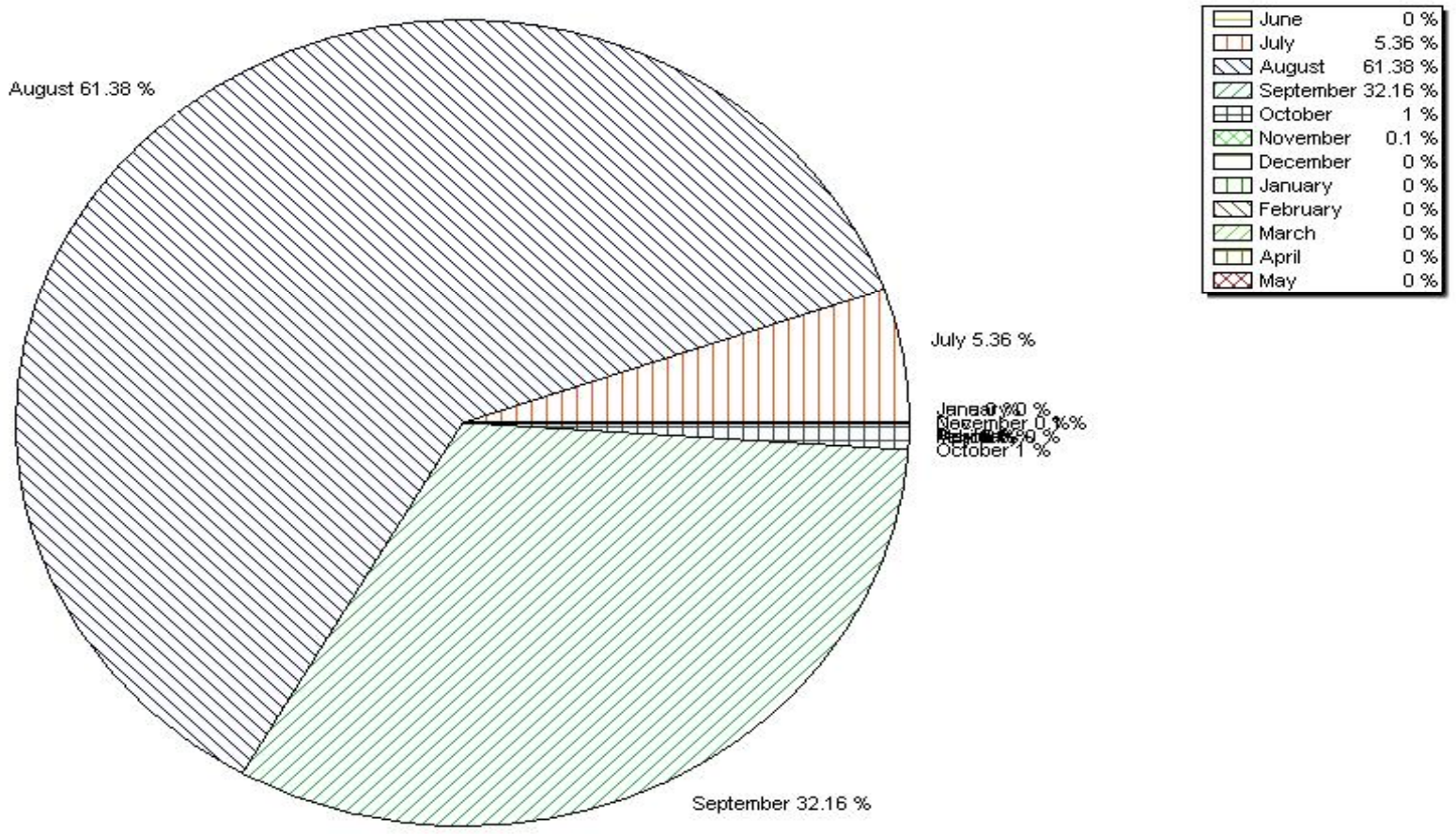
Division : Mahi Division, Gandhinagar
Sub-Division : Mahi Sub Divn., Kadana



Monthly Runoff for the Year : 2011-2012

Station Name : Mahi at Mataji (01 02 13 001)
Local River : Mahi

Division : Mahi Division, Gandhinagar
Sub-Division : Mahi Sub Divn., Kadana



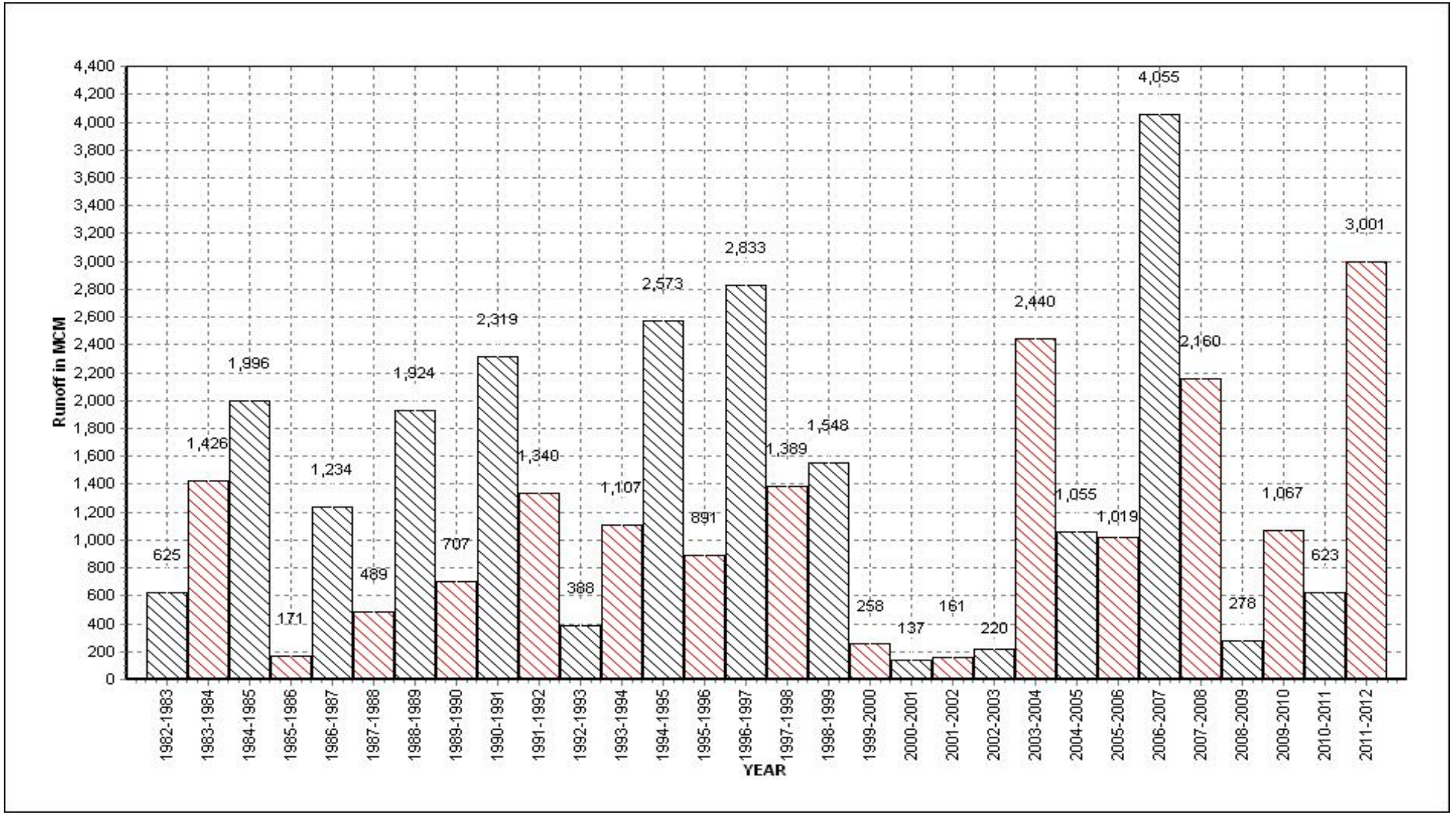
Annual Runoff Values for the period: 1982 - 2012

Station Name : Mahi at Mataji (01 02 13 001)

Division : Mahi Division, Gandhinagar

Local River : Mahi

Sub-Division : Mahi Sub Divn., Kadana

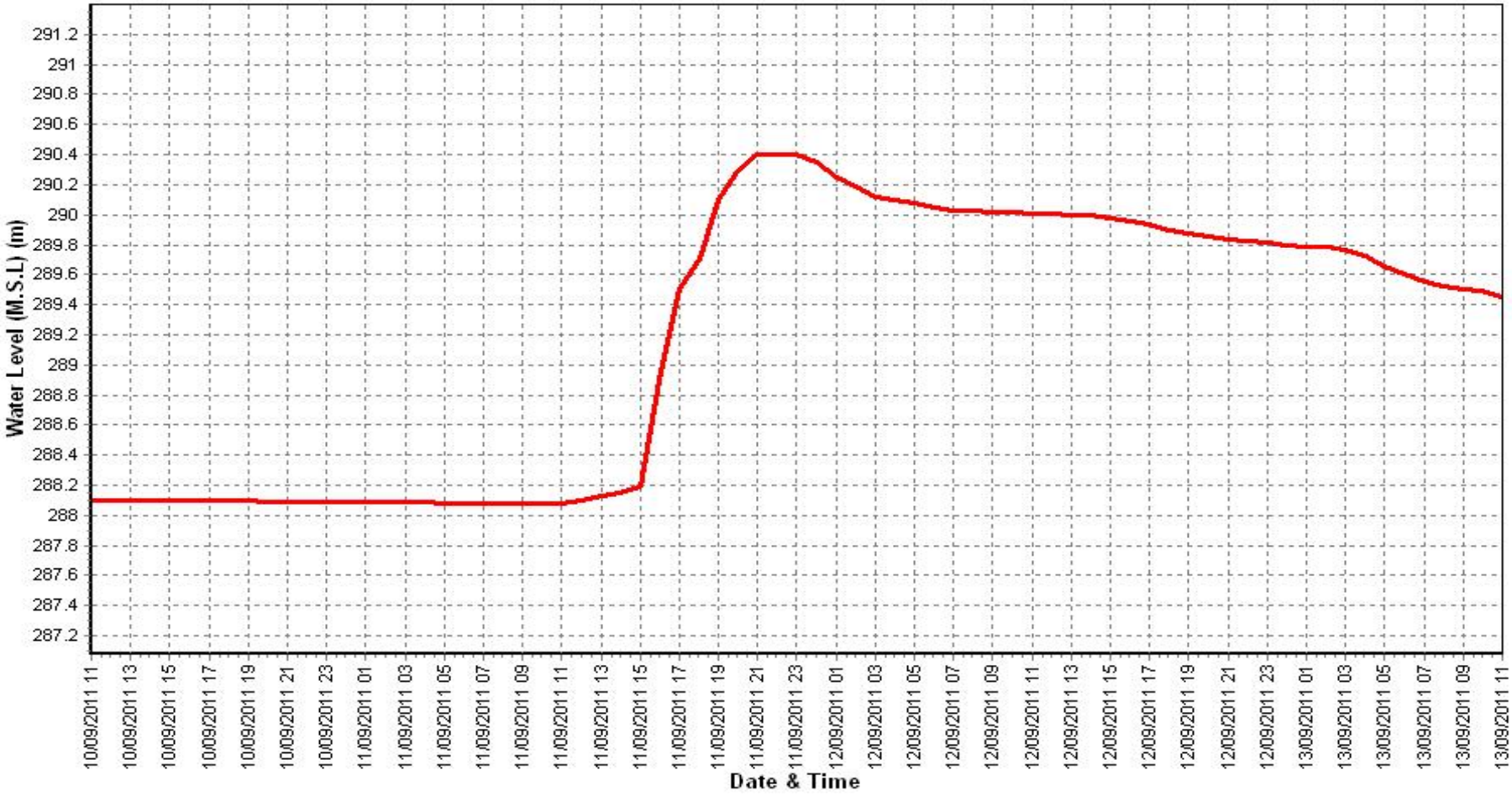


Note: Missing values have not been considered while arriving at Annual Runoff

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Mahi at Mataji (01 02 13 001) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn., Kadana**



Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Mahi at Mataji (01 02 13 001) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn., Kadana**

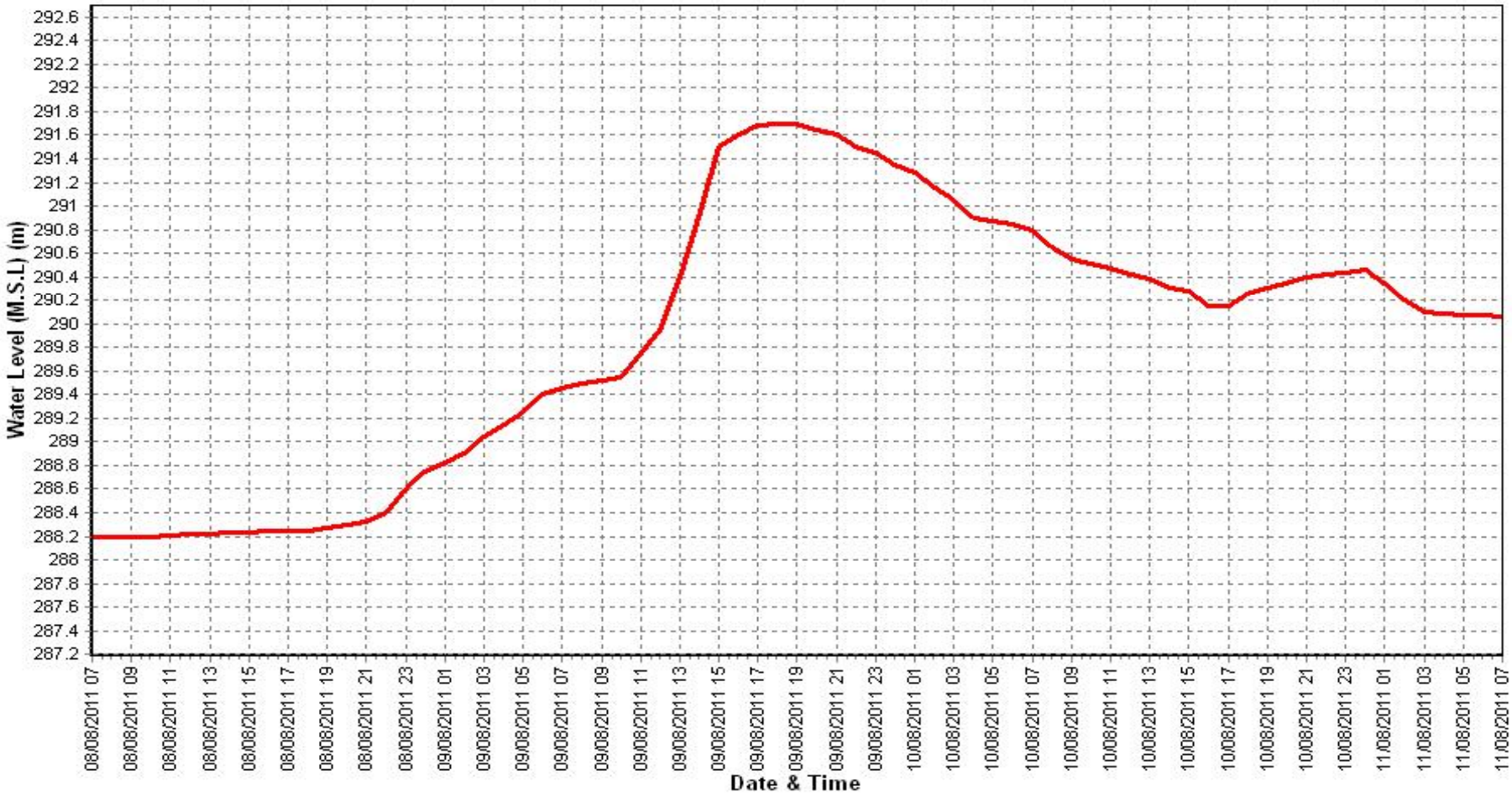


Time Span: 72 Hrs

Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Mahi at Mataji (01 02 13 001) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn.. Kadana**



Time Span: 72 Hrs

Stage Discharge data of Sabarmati basin

HISTORY SHEET

			Water Year	**:**	**2011-2012**
Site	**:**	**Sabarmati at Voutha**	**Code**	**:**	**01 02 12 013**
State	:	Gujarat	District	:	Ahmedabad
Basin	:	Sabarmati	Independent River	:	Sabarmati
Tributary	:	Sabarmati	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Sabarmati
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	Sabarmati Sub Divn., Ahmedabad
Drainage Area	:	19636 Sq. Km.	Bank	:	Left
Latitude	:	22°38'59"N	Longitude	:	72°32'08"E
Zero of Gauge (m)	:	12 (m.s.l)	01/06/1999	-	
		Opening Date	Closing Date		
Gauge	:	05/08/1999			
Discharge	:	24/06/2000			
Sediment	:	---			
Water Quality	:	01/01/2000			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
2001-2002	168.0	15.198	09/08/2001	0.000	River Dry	10/10/2001
2002-2003	145.3	15.048	06/09/2002	0.000	12.970	18/05/2003
2003-2004	2220	19.025	25/08/2003	0.000	13.100	01/06/2003
2004-2005	1205	17.810	07/08/2004	0.000	13.480	30/06/2004
2005-2006	3141	19.000	01/07/2005	3.857	13.250	07/06/2005
2006-2007	3351	19.865	09/08/2006	3.565	13.510	15/07/2006
2007-2008	4958	20.660	10./07/2007	6.546	13.800	18/06/2007
2008-2009	704.2	17.170	13/08/2008	9.093	13.880	10/07/2008
2009-2010	972.5	16.500	24/07/2009	8.605	13.650	23/11/2009
2010-2011	880.1	16.550	09/08/2010	5.275	13.760	21/07/2010
2011-2012	1744.1	18.140	13/09/2011	6.296	13.710	24/06/2011

Stage-Discharge Data for the period 2011 - 2012

Station Name : Sabarmati at Voutha (01 02 12 013) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	13.610	14.91	13.720	8.877	13.960	10.87	18.710	617.3	16.190	424.8	14.500	59.05
2	13.610	9.200 *	13.730	9.985	13.800	13.28	16.290	446.5 *	16.170	401.6 *	14.500	56.32 *
3	13.600	14.42	13.730	12.50 *	13.780	12.48	16.630	588.5	16.150	417.6	14.500	72.41
4	13.610	9.200 *	13.730	10.83	13.760	11.91	16.460	516.1 *	16.120	386.7	14.480	69.04
5	13.700	11.61 *	13.740	10.47	13.780	12.76	16.770	676.1	15.900	334.4	14.480	54.55 *
6	13.640	9.960 *	13.730	9.786	13.750	11.23	16.600	603.0	14.590	64.76 *	14.480	54.55 *
7	13.640	9.960 *	13.720	8.648	13.750	13.13 *	16.780	763.3	14.540	93.88	14.480	54.55 *
8	13.610	15.93	13.700	6.868	13.730	10.71	16.430	500.1	14.540	89.47	14.490	55.43 *
9	13.610	9.200 *	13.730	10.33	13.740	11.73	16.160	398.0 #	14.710	77.37 *	14.490	67.20
10	13.600	14.41	13.950	20.63 *	13.870	15.29	16.650	602.6 #	14.610	86.83	14.470	53.68 *
11	13.600	8.950 *	14.190	40.22	13.950	26.76	16.840	699.0 *	14.590	85.74	14.470	53.68 *
12	13.610	9.200 *	14.490	69.51	14.180	37.25	16.460	547.5	14.580	91.48	14.470	59.01
13	13.680	8.577	14.360	41.16	14.910	94.63	18.140	1744	14.570	77.85	14.470	53.68 *
14	13.700	11.61 *	13.970	27.63	14.850	94.19 *	18.270	1682	14.530	76.78	14.460	54.94
15	13.700	8.443	13.870	12.20	15.050	122.5 *	16.790	681.5	14.490	66.46	14.500	56.32 *
16	13.700	8.313	13.870	15.50	15.640	239.3	16.940	694.1	14.490	55.43 *	14.500	61.51
17	13.710	8.962	13.800	14.78 *	15.630	248.7	16.380	448.9	14.520	77.87	14.530	63.89
18	13.750	11.50	13.790	9.827	15.470	200.8 *	16.420	499.1 *	14.550	60.91 *	14.480	54.55 *
19	13.760	13.45 *	13.940	26.35	15.210	143.2	16.250	447.8	14.540	87.81	14.480	61.62
20	13.740	10.89	13.970	28.33	15.370	166.5	16.280	450.8	14.550	89.72	14.480	54.55 *
21	13.740	10.85	13.960	27.22	15.410	187.9 *	16.390	455.1	14.530	59.04 *	14.460	55.39
22	13.750	11.27	13.800	12.69	15.705	264.1	16.340	497.3	14.560	90.46	14.510	57.21 *
23	13.750	11.12	13.710	9.478	15.770	299.6	15.880	307.0	15.920	318.5 *	14.510	60.52
24	13.710	6.296	13.730	12.50 *	15.680	273.5	15.790	297.3	14.490	67.63	14.490	53.10
25	13.710	9.283	13.720	9.391	15.640	256.1	15.850	297.6 *	14.480	54.55 *	14.570	62.81 *
26	13.710	11.90 *	13.740	12.14	15.640	216.9	16.030	341.0	14.480	54.55 *	14.660	56.62
27	13.710	9.124	13.800	13.79	15.810	290.5	16.200	411.7	14.480	54.55 *	14.690	75.16 *
28	13.710	8.555	13.740	11.89	15.910	315.4 *	16.160	411.2	14.480	54.55 *	14.710	77.37 *
29	13.720	9.033	13.740	11.67	15.780	281.5	16.150	408.0	14.480	67.29	14.730	79.63 *
30	13.720	8.778	13.820	14.54	16.160	439.5	16.220	478.7	14.480	54.55 *	14.730	79.63 *
31			13.720	12.20 *	16.070	377.6			14.480	65.50		
Ten-Daily Mean												
I Ten-Daily	13.623	11.88	13.748	10.89	13.792	12.34	16.748	571.1	15.352	237.7	14.487	59.68
II Ten-Daily	13.695	9.989	14.025	28.55	15.026	137.4	16.877	789.5	14.541	77.01	14.484	57.37
III Ten-Daily	13.723	9.622	13.771	13.41	15.780	291.1	16.101	390.5	14.624	85.56	14.606	65.74
Monthly												
Min.	13.600	6.296	13.700	6.868	13.730	10.71	15.790	297.3	14.480	54.55	14.460	53.10
Max.	13.760	15.93	14.490	69.51	16.160	439.5	18.710	1744	16.190	424.8	14.730	79.63
Mean	13.680	10.5	13.845	17.48	14.895	151.6	16.575	583.7	14.832	131.9	14.526	60.93

Annual Runoff in MCM = 3078 Annual Runoff in mm = 157

Peak Observed Discharge = 1744 cumecs on 13/09/2011 Corres. Water Level :18.14 m

Lowest Observed Discharge = 6.296 cumecs on 24/06/2011 Corres. Water Level :13.71 m

Stage-Discharge Data for the period 2011 - 2012

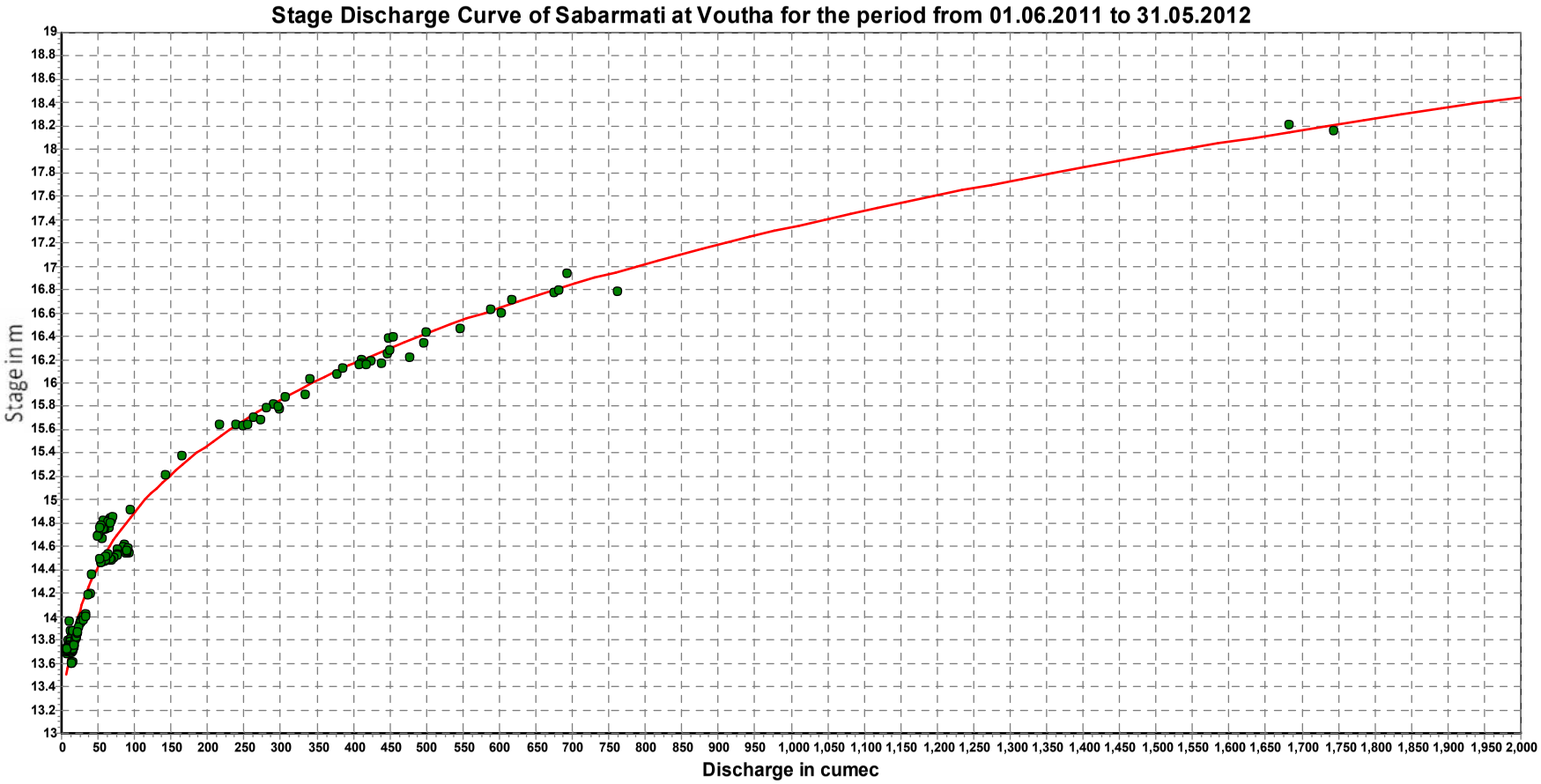
Station Name : Sabarmati at Voutha (01 02 12 013) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	14.750	61.18	14.850	94.19 *	13.720	16.57	13.690	13.95	13.710	11.90 *	13.770	13.77 *
2	14.750	81.94 *	14.810	64.31	13.720	12.20 *	13.690	11.32 *	13.720	7.458	13.770	13.77 *
3	14.750	60.38	14.810	89.14 *	13.800	14.78 *	13.700	14.49	13.710	11.90 *	13.760	13.45 *
4	14.760	60.93	14.760	66.29	13.810	21.17	13.710	11.90 *	13.730	12.50 *	13.760	13.45 *
5	14.820	69.05	14.750	56.01	13.830	15.84 *	13.720	15.66	13.730	12.50 *	13.770	13.77 *
6	14.790	86.69 *	14.740	80.78 *	14.000	30.08	13.720	12.20 *	13.730	12.50 *	13.760	13.45 *
7	14.840	68.05	14.750	58.85	13.850	16.58 *	13.850	22.18	13.720	12.20 *	13.770	13.77 *
8	14.840	92.91 *	14.740	80.78 *	13.820	21.15	13.850	16.58 *	13.720	12.20 *	13.770	13.77 *
9	14.810	89.14 *	14.740	55.98	14.020	33.42	13.850	16.58 *	13.760	13.45 *	13.850	16.58 *
10	14.810	89.14 *	14.730	79.63 *	14.100	27.96 *	13.860	22.35	13.720	12.20 *	13.960	21.07 *
11	14.820	90.38 *	14.850	70.95	13.900	23.86	13.860	16.96 *	13.710	7.491	14.290	39.69 *
12	14.820	63.72	14.750	58.14	13.750	13.13 *	13.710	16.74	13.720	7.851	14.340	43.28 *
13	14.820	90.38 *	14.850	94.19 *	13.750	17.88	13.700	11.61 *	13.720	12.20 *	14.300	40.39 *
14	14.840	92.91 *	14.800	87.91 *	13.720	12.20 *	13.970	30.15	13.720	12.20 *	14.100	27.96 *
15	14.820	58.68	14.730	79.63 *	13.700	14.01	13.740	17.94	13.720	12.20 *	14.050	25.34 *
16	14.820	90.38 *	14.700	51.68	13.700	14.18	13.770	13.77 *	13.710	11.90 *	14.040	24.84 *
17	14.830	91.64 *	14.680	74.07 *	13.700	11.61 *	14.000	33.09	13.760	13.45 *	14.000	22.90 *
18	14.890	99.43 *	14.680	50.63	13.720	16.46	13.950	20.63 *	13.750	13.13 *	13.950	20.63 *
19	14.890	99.43 *	14.780	55.39	13.720	12.20 *	14.050	25.34 *	13.750	18.16	13.950	20.63 *
20	14.890	99.43 *	14.780	85.49 *	13.740	12.81 *	13.850	16.58 *	13.760	13.45 *	13.930	19.77 *
21	14.900	100.8 *	14.760	53.37	13.740	12.81 *	13.740	16.76	13.790	14.44 *	13.930	19.77 *
22	14.900	100.8 *	14.800	87.91 *	13.730	17.04	13.730	8.693	13.790	14.44 *	13.950	20.63 *
23	14.890	99.43 *	14.800	67.06	13.720	15.82	13.740	12.81 *	13.770	13.77 *	13.910	18.93 *
24	14.870	96.78 *	14.760	83.11 *	13.720	12.20 *	13.720	15.70	13.750	13.13 *	13.950	20.63 *
25	14.870	96.78 *	14.760	83.11 *	13.750	18.12	13.720	12.20 *	13.850	16.58 *	13.950	20.63 *
26	14.920	103.5 *	13.800	19.75	13.750	13.13 *	13.720	12.20 *	13.850	16.58 *	13.930	19.77 *
27	14.930	104.9 *	13.740	17.29	13.750	18.19	13.710	11.90 *	13.790	14.44 *	13.930	19.77 *
28	14.900	100.8 *	13.790	19.85	13.710	11.90 *	13.720	8.414	13.770	13.77 *	13.900	18.53 *
29	14.870	96.78 *	13.720	16.53	13.690	15.14	13.710	7.536	13.770	13.77 *	13.880	17.73 *
30	14.860	95.48 *	13.700	15.88			13.710	11.90 *	13.790	14.44 *	13.880	17.73 *
31	14.860	95.48 *	13.710	11.90 *			13.710	7.492			13.860	16.96 *
Ten-Daily Mean												
I Ten-Daily	14.792	75.94	14.768	72.60	13.867	20.97	13.764	15.72	13.725	11.88	13.794	14.69
II Ten-Daily	14.844	87.64	14.760	70.81	13.740	14.83	13.860	20.28	13.732	12.20	14.095	28.54
III Ten-Daily	14.888	99.22	14.213	43.25	13.729	14.93	13.721	11.42	13.792	14.54	13.915	19.19
Monthly												
Min.	14.750	58.68	13.700	11.90	13.690	11.61	13.690	7.492	13.710	7.458	13.760	13.45
Max.	14.930	104.9	14.850	94.19	14.100	33.42	14.050	33.09	13.850	18.16	14.340	43.28
Mean	14.843	87.97	14.568	61.61	13.780	16.98	13.780	15.67	13.750	12.87	13.934	20.75

Peak Computed Discharge = 699.0 cumecs on 11/09/2011 Corres. Water Level :16.84 m

Lowest Computed Discharge = 8.950 cumecs on 11/06/2011 Corres. Water Level :13.6 m



Procedure : Standard

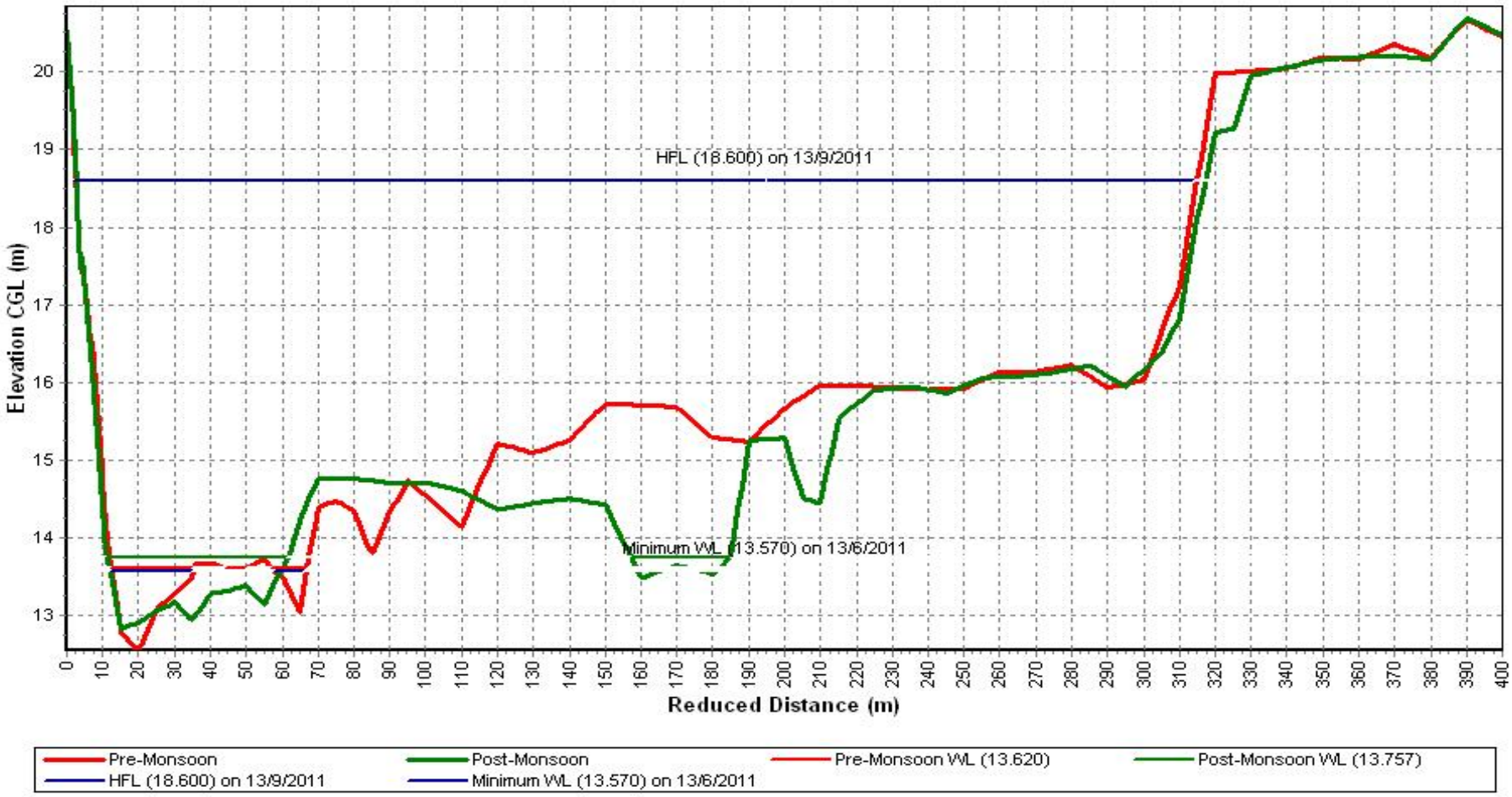
Equation type: Power

Q = c (h+a)^b, a = -12.32, b = 3.454, c = 3.816

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Sabarmati at Voutha (01 02 12 013) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

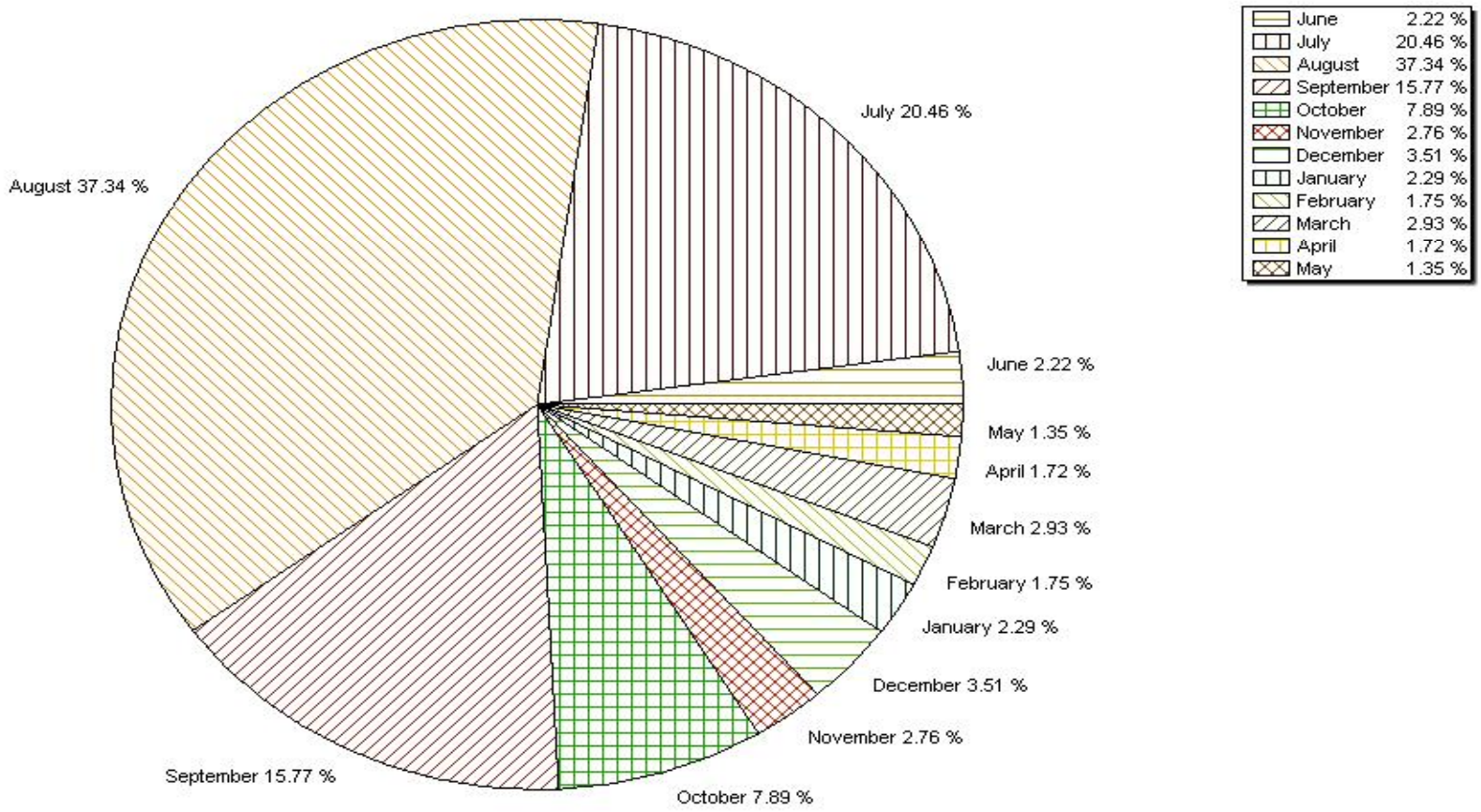


Historic Flood Level-21.090m on 20.08.2006 at 1700 hrs

Monthly Average Runoff based on period : 2001-2011

Station Name : Sabarmati at Voutha (01 02 12 013)
Local River : Sabarmati

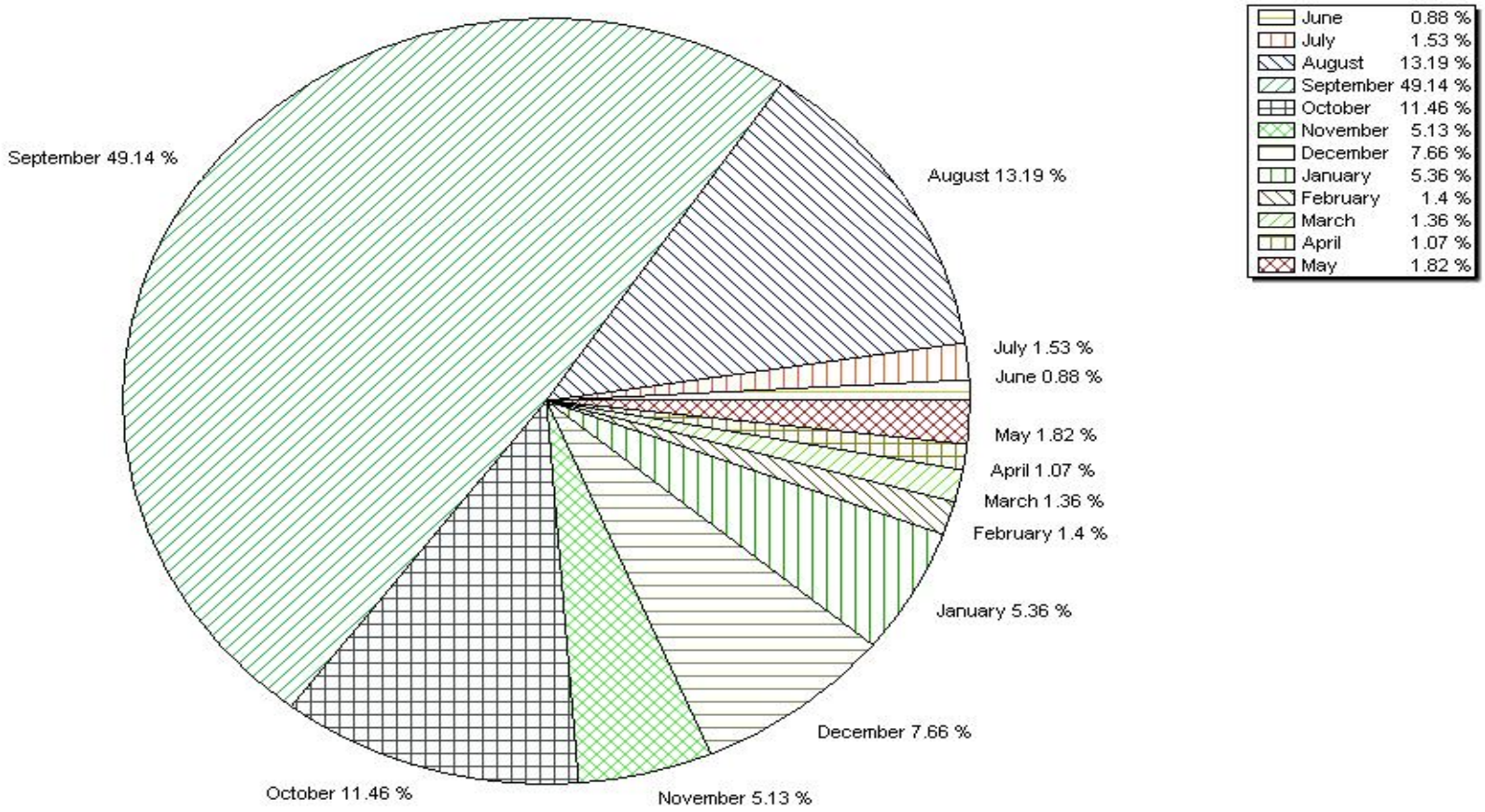
Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad



Monthly Runoff for the Year : 2011-2012

Station Name : Sabarmati at Voutha (01 02 12 013)
Local River : Sabarmati

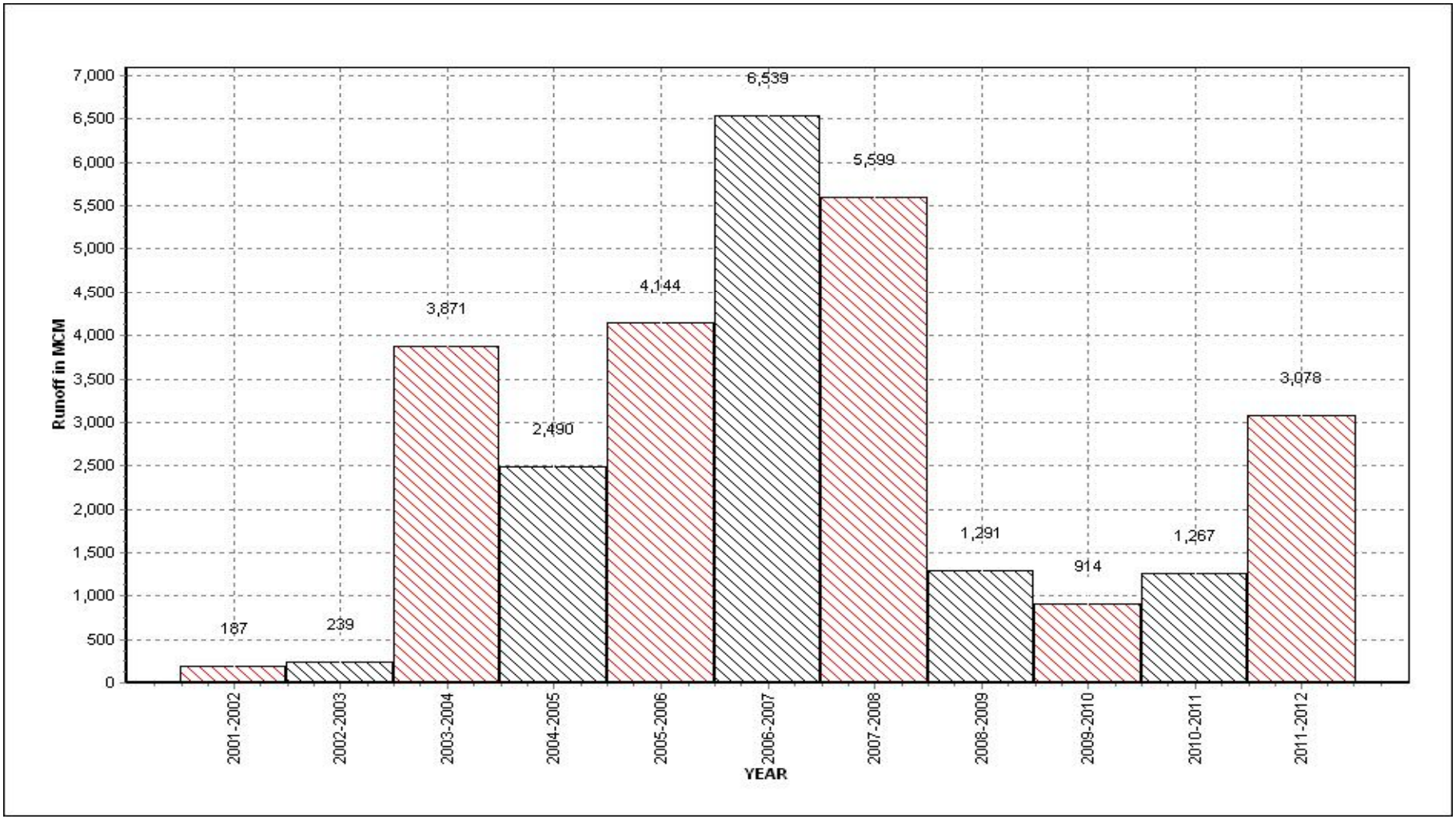
Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad



Annual Runoff Values for the period: 2001 - 2012

Station Name : Sabarmati at Voutha (01 02 12 013)
Local River : Sabarmati

Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad

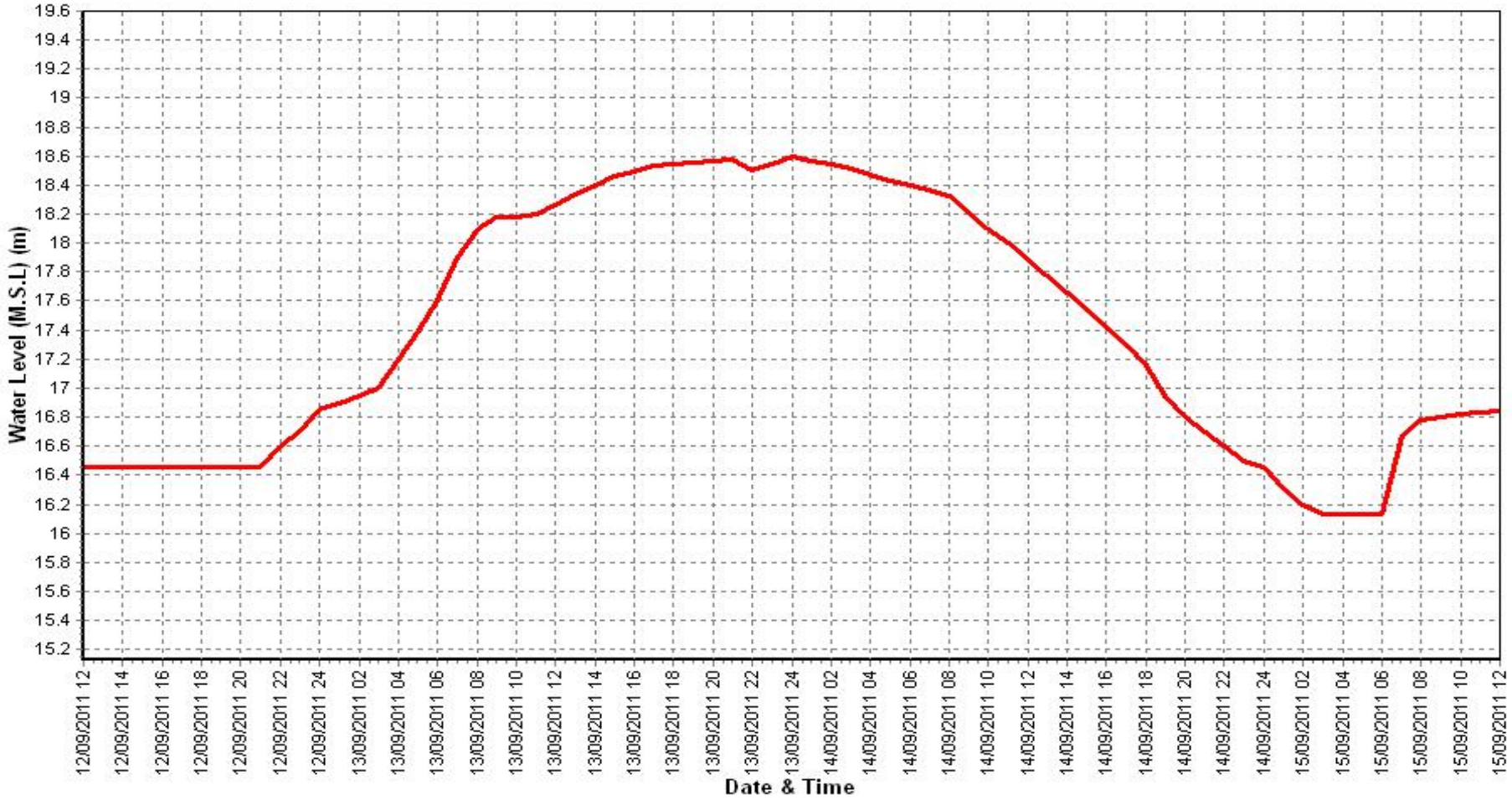


Note: Missing values have not been considered while arriving at Annual Runoff

Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Sabarmati at Voutha (01 02 12 013) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

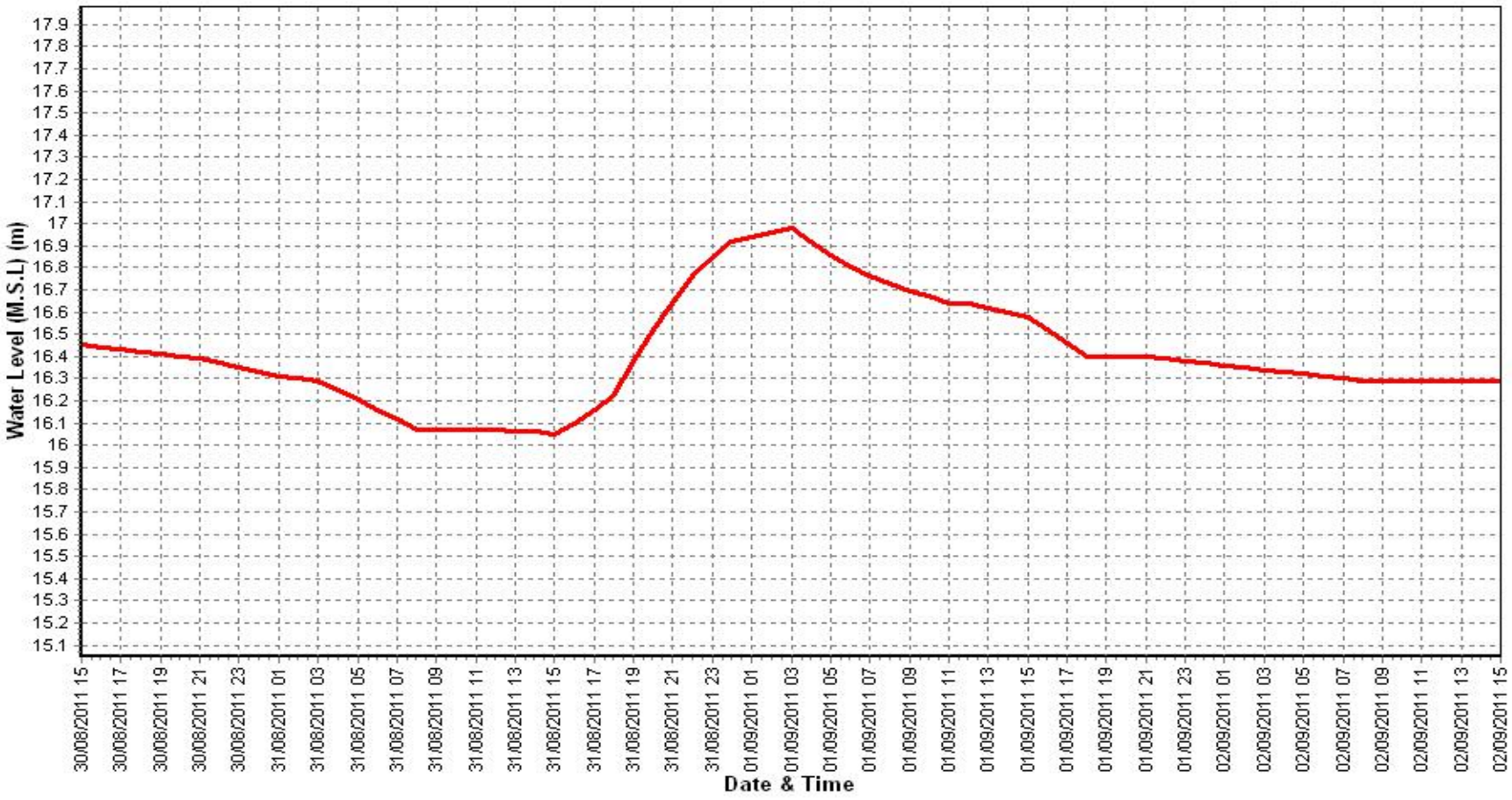


Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Sabarmati at Voutha (01 02 12 013) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

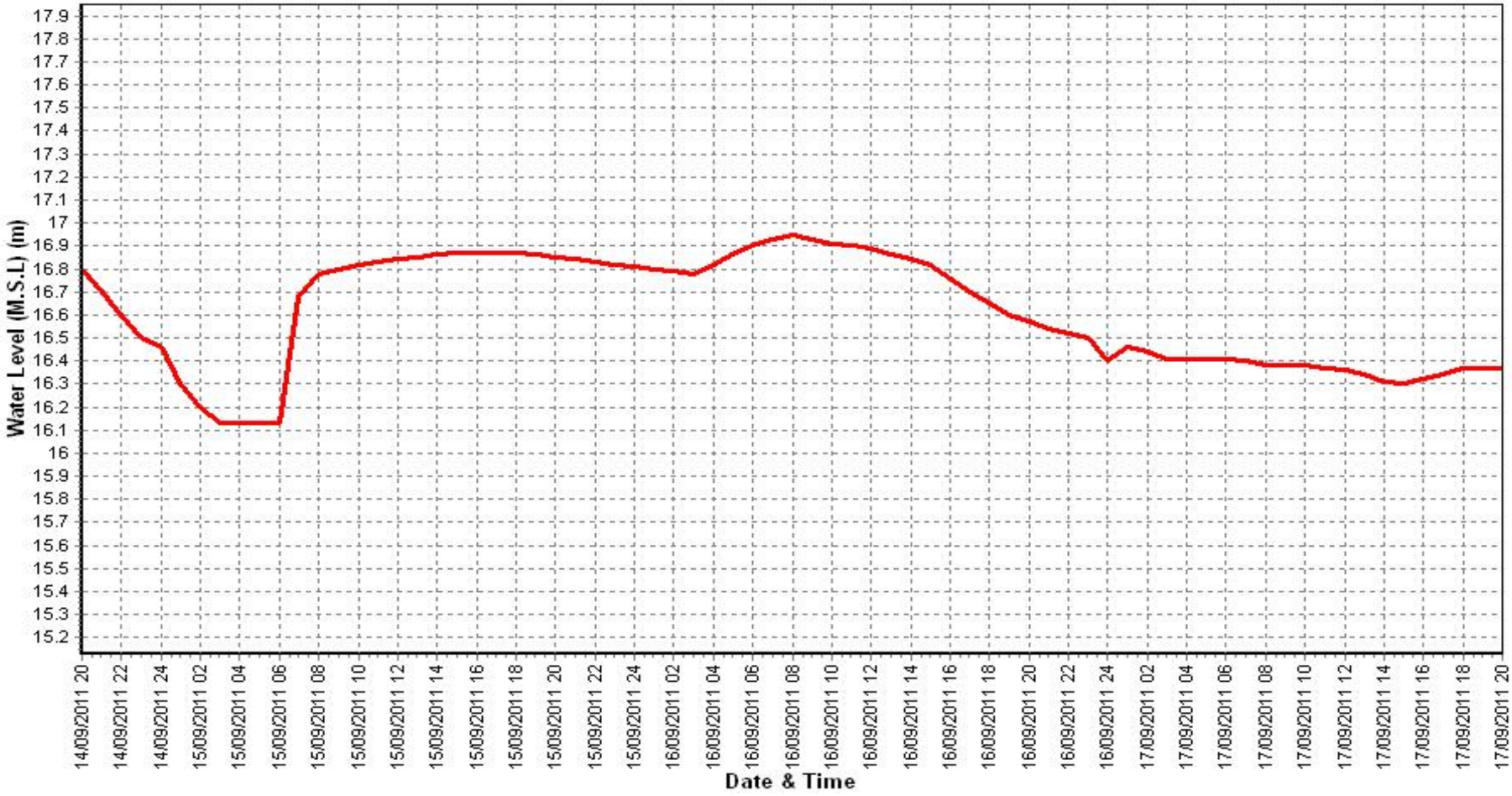


Time Span: 72 Hrs

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Sabarmati at Voutha (01 02 12 013) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : Sabarmati Sub Divn., Ahmedabad**



Time Span: 72 Hrs

HISTORY SHEET

			Water Year	**:**	**2011-2012**
Site	**:**	**Watrak at Kheda**	**Code**	**:**	**01 02 12 012**
State	:	Gujarat	District		Kheda
Basin	:	Sabarmati	Independent River	:	Sabarmati
Tributary	:	Watrak	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Watrak
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	Sabarmati Sub Divn., Ahmedabad
Drainage Area	:	7550 Sq. Km.	Bank	:	Right
Latitude	:	22°44'45"N	Longitude	:	72°40'49"E
Zero of Gauge (m)	:	19.5 (m.s.l) 19.75 (m.s.l) 19 (m.s.l)	29/03/1985 01/06/1989 01/06/1994	- - -	31/05/1989 31/05/1994
		Opening Date	Closing Date		
Gauge	:	29/03/1985			
Discharge	:	10/07/1989			
Sediment	:	---			
Water Quality	:	---			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1989-1990	239.7	22.450	21/08/1989	0.000	River Dry	25/01/1990
1990-1991	1626	28.200	25/08/1990	0.000	River Dry	26/01/1991
1991-1992	707.9	23.475	01/08/1991	0.000	River Dry	26/01/1992
1992-1993	57.09	20.830	08/09/1992	0.000	River Dry	25/01/1993
1993-1994	845.5	24.000	18/07/1993	0.000	River Dry	08/11/1993
1994-1995	1617	25.015	09/09/1994	0.000	River Dry	25/01/1995
1995-1996	31.50	20.100	31/07/1995	0.000	River Dry	27/01/1996
1996-1997	310.3	22.175	29/07/1996	0.000	River Dry	25/01/1997
1997-1998	2380	25.950	28/07/1997	0.000	River Dry	25/01/1998
1998-1999	1677	24.100	18/09/1998	0.000	River Dry	12/03/1999
1999-2000	154.2	21.480	21/07/1999	0.000	River Dry	27/01/2000
2000-2001	100.2	21.195	15/07/2000	0.000	River Dry	04/12/2000
2001-2002	0.000	19.230	04/10/2001	0.000	River Dry	25/01/2002
2002-2003	0.000	19.460	21/09/2002	0.000	River Dry	25/01/2003
2003-2004	324.6	22.985	25/08/2003	0.000	River Dry	26/01/2004
2004-2005	182.2	22.220	07/08/2004	0.000	River Dry	29/03/2005
2005-2006	872.0	26.825	07/07/2005	0.000	River Dry	01/06/2005
2006-2007	4508	25.326	12/08/2006	0.000	River Dry	01/06/2006
2007-2008	1682	26.000	10/07/2007	0.000	River Dry	01/06/2007
2008-2009	278.6	22.370	13/08/2008	0.000	19.000	01/11/2008
2009-2010	270.1	21.700	23/07/2009	0.000	19.010	01/12/2009
2010-2011	163.7	21.070	09/08/2010	0.000	19.650	01/06/2010
2011-2012	232.7	21.110	13/09/2011	9.412	19.570	05/10/2011

Stage-Discharge Data for the period 2011 - 2012

Station Name : Watrak at Kheda (01 02 12 012) **Division : Mahi Division, Gandhinagar**

Local River : Watrak **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	18.780	0.000 *	19.000	0.100 *	19.000	0.100 *	20.595	110.4	20.075	40.68	19.070	0.371 *
2	18.780	0.000 *	19.000	0.100 *	19.000	0.100 *	20.645	98.13	20.040	41.03 *	19.070	0.371 *
3	18.790	0.000 *	19.000	0.100 *	19.000	0.100 *	20.930	141.9	19.815	10.95	19.070	0.371 *
4	18.790	0.000 *	19.000	0.100 *	19.000	0.100 *	20.380	78.25 *	19.570	9.456	19.060	0.319 *
5	18.800	0.000 *	19.000	0.100 *	19.000	0.100 *	20.685	138.9	19.570	9.412	19.100	0.554 *
6	18.800	0.000 *	19.000	0.100 *	19.000	0.100 *	20.575	98.69	19.370	4.587 *	19.110	0.626 *
7	18.810	0.000 *	19.000	0.100 *	19.000	0.100 *	20.650	98.04	19.340	15.73	19.080	0.427 *
8	18.810	0.000 *	19.000	0.100 *	19.000	0.100 *	20.430	83.62	19.290	10.47	19.050	0.272 *
9	18.820	0.000 *	19.000	0.100 *	19.000	0.100 *	20.695	128.0	19.250	2.213 *	19.080	0.626 *
10	18.820	0.000 *	19.000	0.100 *	19.100	0.554 *	20.450	81.16	19.210	1.639 *	19.040	0.230 *
11	18.830	0.000 *	19.070	0.370 *	19.020	0.157 *	20.560	103.9 *	19.190	1.390 *	19.060	0.319 *
12	18.850	0.000 *	19.030	0.191 *	19.800	41.47	20.460	92.10	19.170	1.165 *	19.050	0.272 *
13	18.860	0.000 *	19.010	0.550 *	19.935	46.55	21.110	232.7	19.150	0.963 *	19.050	0.272 *
14	18.870	0.000 *	19.000	0.100 *	19.660	15.05 *	20.955	141.5	19.120	0.702 *	19.050	0.272 *
15	18.880	0.000 *	19.000	0.100 *	20.000	37.57 *	20.650	106.8	19.100	0.554 *	19.040	0.230 *
16	18.890	0.000 *	19.000	0.100 *	20.385	69.16	20.440	88.83	19.110	0.626 *	19.030	0.191 *
17	18.900	0.000 *	19.000	0.100 *	20.245	54.91	20.390	82.04	19.140	0.870 *	19.030	0.191 *
18	18.910	0.000 *	19.000	0.100 *	19.995	45.41	20.400	80.89 *	19.150	0.783 *	19.010	0.126 *
19	18.920	0.000 *	19.040	0.230 *	20.200	41.51	20.290	62.73	19.150	0.783 *	19.010	0.126 *
20	18.950	0.018 *	19.020	0.157 *	20.035	42.26	20.350	71.51	19.140	0.870 *	19.010	0.126 *
21	18.960	0.028 *	19.000	0.100 *	19.890	20.95 *	20.315	57.82	19.130	0.783 *	19.000	0.100 *
22	18.970	0.041 *	19.000	0.100 *	19.930	31.93 *	20.295	56.59	19.130	0.783 *	19.000	0.100 *
23	18.980	0.058 *	19.000	0.100 *	20.260	90.42	20.200	54.38	19.150	0.963 *	19.000	0.100 *
24	18.990	0.077 *	19.000	0.100 *	20.320	101.7	20.235	55.77	19.210	1.639 *	19.000	0.100 *
25	18.990	0.077 *	19.000	0.100 *	20.140	69.13	20.200	56.78 *	19.250	2.213 *	19.000	0.100 *
26	18.990	0.077 *	19.000	0.100 *	20.195	76.02	20.190	53.31	19.260	2.372 *	19.000	0.100 *
27	18.990	0.077 *	19.000	0.100 *	20.270	80.27	20.200	55.39	19.250	2.213 *	18.980	0.000 *
28	18.990	0.077 *	19.000	0.100 *	20.200	56.78 *	20.190	52.40	19.240	2.060 *	18.930	0.000 *
29	18.990	0.077 *	19.000	0.100 *	20.125	57.85	20.240	55.35	19.220	1.773 *	18.900	0.000 *
30	19.000	0.100 *	19.000	0.100 *	21.010	219.9	20.120	42.49	19.150	0.963 *	18.900	0.000 *
31			19.000	0.100 *	20.420	83.58 *			19.100	0.554 *		
Ten-Daily Mean												
I Ten-Daily	18.800	0.000	19.000	0.100	19.010	0.145	20.603	105.7	19.553	14.62	19.073	0.417
II Ten-Daily	18.886	0.002	19.017	0.200	19.927	39.40	20.561	106.3	19.142	0.871	19.034	0.213
III Ten-Daily	18.985	0.069	19.000	0.100	20.251	80.78	20.219	54.03	19.190	1.483	18.971	0.060
Monthly												
Min.	18.780	0.000	19.000	0.100	19.000	0.100	20.120	42.49	19.100	0.554	18.900	0.000
Max.	19.000	0.100	19.070	0.550	21.010	219.9	21.110	232.7	20.075	41.03	19.110	0.626
Mean	18.890	0.024	19.005	0.132	19.746	41.42	20.461	88.68	19.292	5.522	19.026	0.23

Annual Runoff in MCM = 357 Annual Runoff in mm = 47

Peak Observed Discharge = 232.7 cumecs on 13/09/2011 Corres. Water Level :21.11 m

Lowest Observed Discharge = 9.412 cumecs on 05/10/2011 Corres. Water Level :19.57 m

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Watrak at Kheda (01 02 12 012) **Division : Mahi Division, Gandhinagar**

Local River : Watrak **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

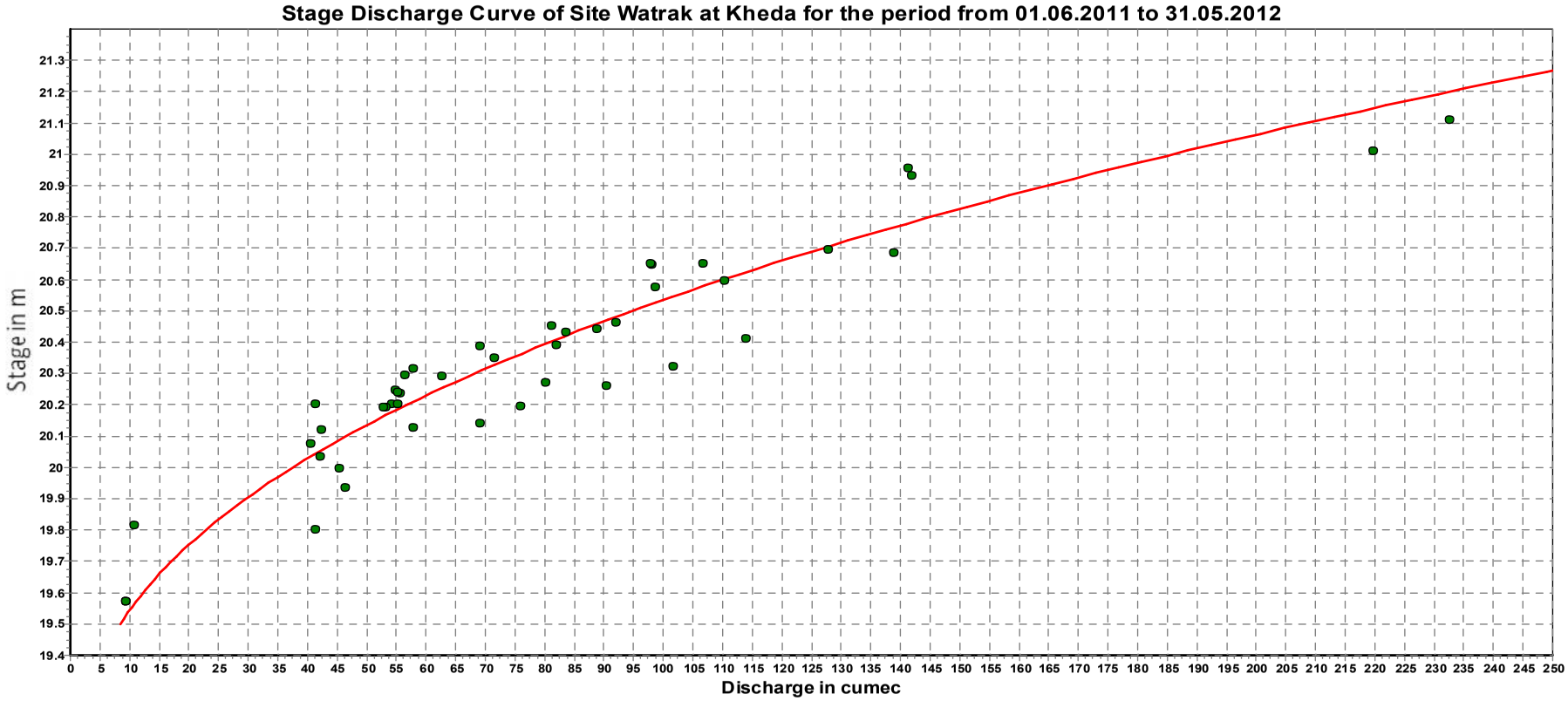
Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	18.890	0.000 *	18.890	0.000 *	18.900	0.000 *	18.810	0.000 *	18.830	0.000 *	18.840	0.000 *
2	18.890	0.000 *	18.900	0.000 *	18.870	0.000 *	18.810	0.000 *	18.840	0.000 *	18.840	0.000 *
3	18.890	0.000 *	18.900	0.000 *	18.850	0.000 *	18.810	0.000 *	18.840	0.000 *	18.840	0.000 *
4	18.890	0.000 *	18.900	0.000 *	18.850	0.000 *	18.810	0.000 *	18.840	0.000 *	18.840	0.000 *
5	18.880	0.000 *	18.900	0.000 *	18.850	0.000 *	18.810	0.000 *	18.840	0.000 *	18.840	0.000 *
6	18.880	0.000 *	18.900	0.000 *	18.840	0.000 *	18.810	0.000 *	18.840	0.000 *	18.840	0.000 *
7	18.880	0.000 *	18.900	0.000 *	18.840	0.000 *	18.800	0.000 *	18.840	0.000 *	18.840	0.000 *
8	18.870	0.000 *	18.900	0.000 *	18.840	0.000 *	18.800	0.000 *	18.850	0.000 *	18.840	0.000 *
9	18.870	0.000 *	18.900	0.000 *	18.830	0.000 *	18.800	0.000 *	18.850	0.000 *	18.840	0.000 *
10	18.870	0.000 *	18.900	0.000 *	18.830	0.000 *	18.800	0.000 *	18.850	0.000 *	18.850	0.000 *
11	18.870	0.000 *	18.900	0.000 *	18.830	0.000 *	18.800	0.000 *	18.850	0.000 *	18.850	0.000 *
12	18.860	0.000 *	18.900	0.000 *	18.830	0.000 *	18.800	0.000 *	18.850	0.000 *	18.850	0.000 *
13	18.860	0.000 *	18.910	0.000 *	18.830	0.000 *	18.800	0.000 *	18.850	0.000 *	18.850	0.000 *
14	18.860	0.000 *	18.910	0.000 *	18.830	0.000 *	18.800	0.000 *	18.850	0.000 *	18.850	0.000 *
15	18.860	0.000 *	18.910	0.000 *	18.820	0.000 *	18.810	0.000 *	18.850	0.000 *	18.850	0.000 *
16	18.860	0.000 *	18.910	0.000 *	18.820	0.000 *	18.810	0.000 *	18.850	0.000 *	18.850	0.000 *
17	18.860	0.000 *	18.910	0.000 *	18.820	0.000 *	18.810	0.000 *	18.850	0.000 *	18.860	0.000 *
18	18.870	0.000 *	18.910	0.000 *	18.810	0.000 *	18.810	0.000 *	18.850	0.000 *	18.860	0.000 *
19	18.870	0.000 *	19.150	0.963 *	18.810	0.000 *	18.810	0.000 *	18.850	0.000 *	18.860	0.000 *
20	18.870	0.000 *	19.160	1.061 *	18.810	0.000 *	18.810	0.000 *	18.850	0.000 *	18.860	0.000 *
21	18.870	0.000 *	19.100	0.554 *	18.800	0.000 *	18.810	0.000 *	18.850	0.000 *	18.860	0.000 *
22	18.870	0.000 *	18.910	0.000 *	18.800	0.000 *	18.810	0.000 *	18.850	0.000 *	18.860	0.000 *
23	18.870	0.000 *	18.920	0.000 *	18.800	0.000 *	18.810	0.000 *	18.850	0.000 *	18.860	0.000 *
24	18.870	0.000 *	18.920	0.000 *	18.800	0.000 *	18.810	0.000 *	18.840	0.000 *	18.850	0.000 *
25	18.880	0.000 *	18.900	0.000 *	18.800	0.000 *	18.820	0.000 *	18.840	0.000 *	18.850	0.000 *
26	18.880	0.000 *	18.910	0.000 *	18.800	0.000 *	18.820	0.000 *	18.840	0.000 *	18.850	0.000 *
27	18.880	0.000 *	18.920	0.000 *	18.800	0.000 *	18.820	0.000 *	18.840	0.000 *	18.850	0.000 *
28	18.890	0.000 *	18.970	0.000 *	18.800	0.000 *	18.830	0.000 *	18.840	0.000 *	18.850	0.000 *
29	18.890	0.000 *	19.000	0.000 *	18.800	0.000 *	18.830	0.000 *	18.840	0.000 *	18.840	0.000 *
30	18.890	0.000 *	19.000	0.000 *			18.830	0.000 *	18.840	0.000 *	18.840	0.000 *
31	18.890	0.000 *	18.950	0.000 *			18.830	0.000 *			18.840	0.000 *
Ten-Daily Mean												
I Ten-Daily	18.881	0.000	18.899	0.000	18.850	0.000	18.806	0.000	18.842	0.000	18.841	0.000
II Ten-Daily	18.864	0.000	18.957	0.202	18.821	0.000	18.806	0.000	18.850	0.000	18.854	0.000
III Ten-Daily	18.880	0.000	18.955	0.050	18.800	0.000	18.820	0.000	18.843	0.000	18.850	0.000
Monthly												
Min.	18.860	0.000	18.890	0.000	18.800	0.000	18.800	0.000	18.830	0.000	18.840	0.000
Max.	18.890	0.000	19.160	1.061	18.900	0.000	18.830	0.000	18.850	0.000	18.860	0.000
Mean	18.875	0	18.937	0.083	18.824	0	18.811	0	18.845	0	18.848	0

Peak Computed Discharge = 103.9 cumecs on 11/09/2011 **Corres. Water Level :20.56 m**

Lowest Computed Discharge = 0.000 cumecs on 01/06/2011 **Corres. Water Level :18.78 m**

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

Note:Missing values ignored while arriving at Annual Runoff



Procedure : Standard

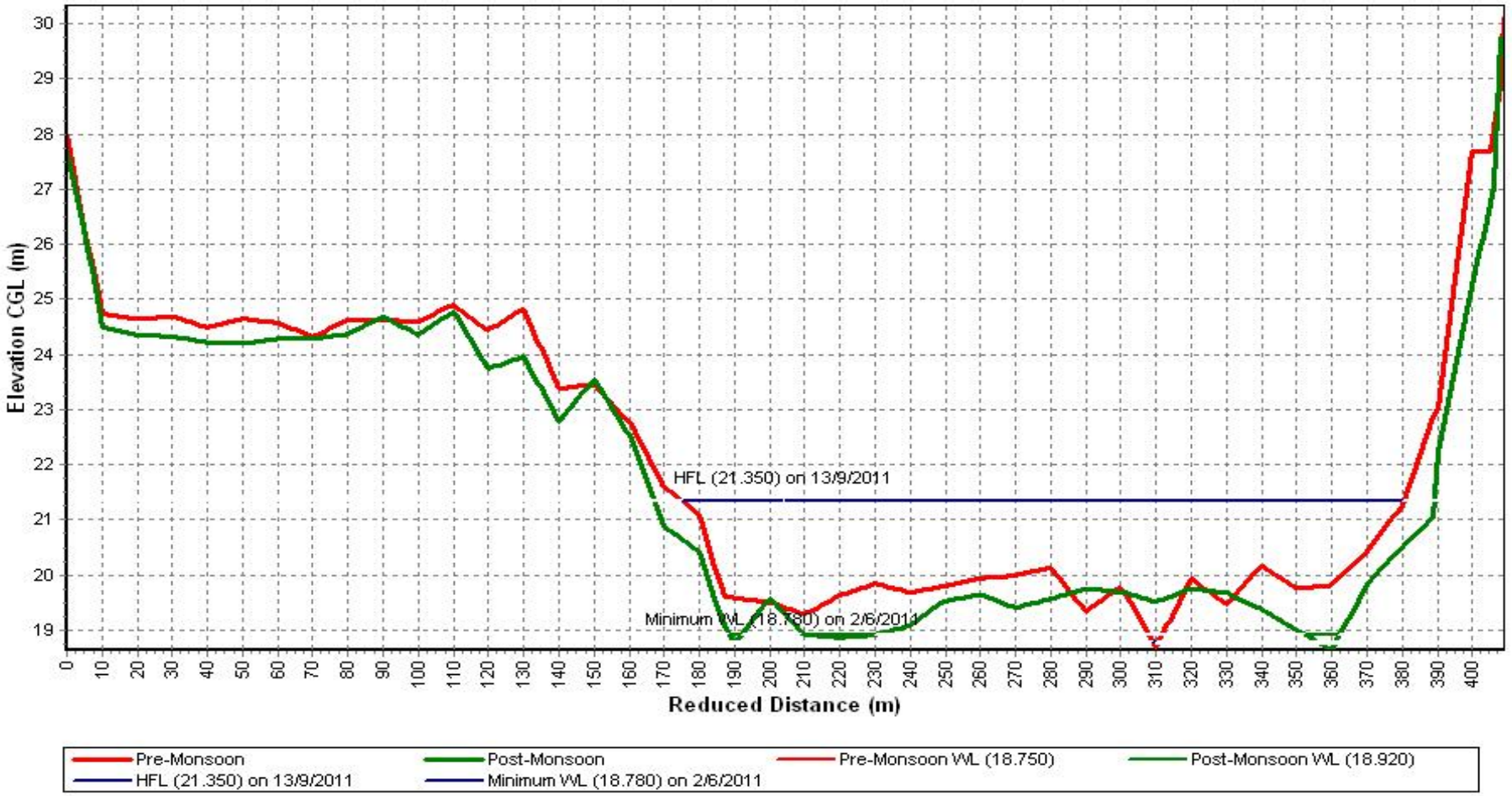
Equation type: Power

Q = c (h+a)^b, a = -18.9, b = 2.473, c = 29.677

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Watrak at Kheda (01 02 12 012) **Division : Mahi Division, Gandhinagar**

Local River : Watrak **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

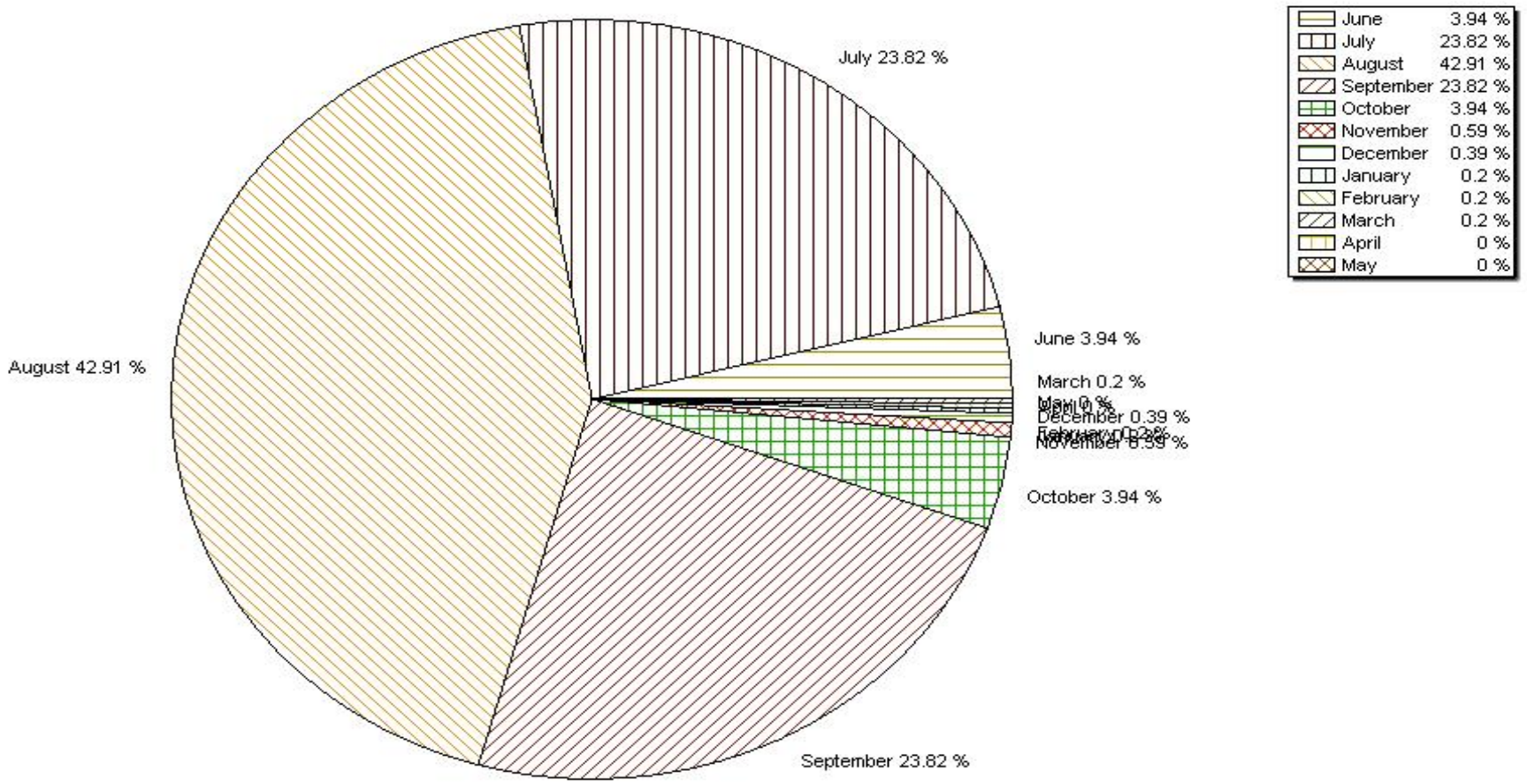


Historic Flood Level-28.2m on 25.08.1990 at 0800hrs

Monthly Average Runoff based on period : 1989-2011

Station Name : Watrak at Kheda (01 02 12 012)
Local River : Watrak

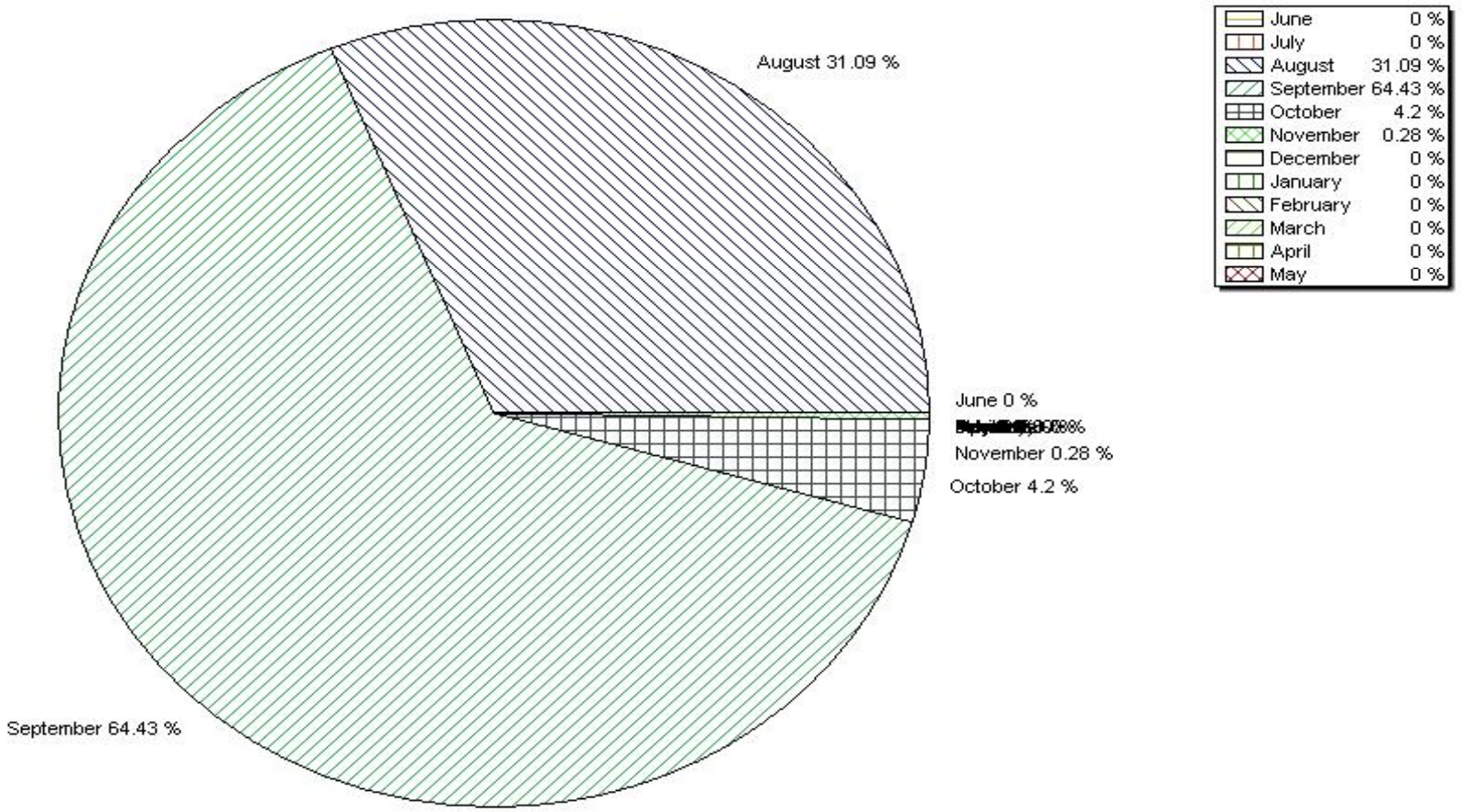
Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad



Monthly Runoff for the Year : 2011-2012

Station Name : Watrak at Kheda (01 02 12 012)
Local River : Watrak

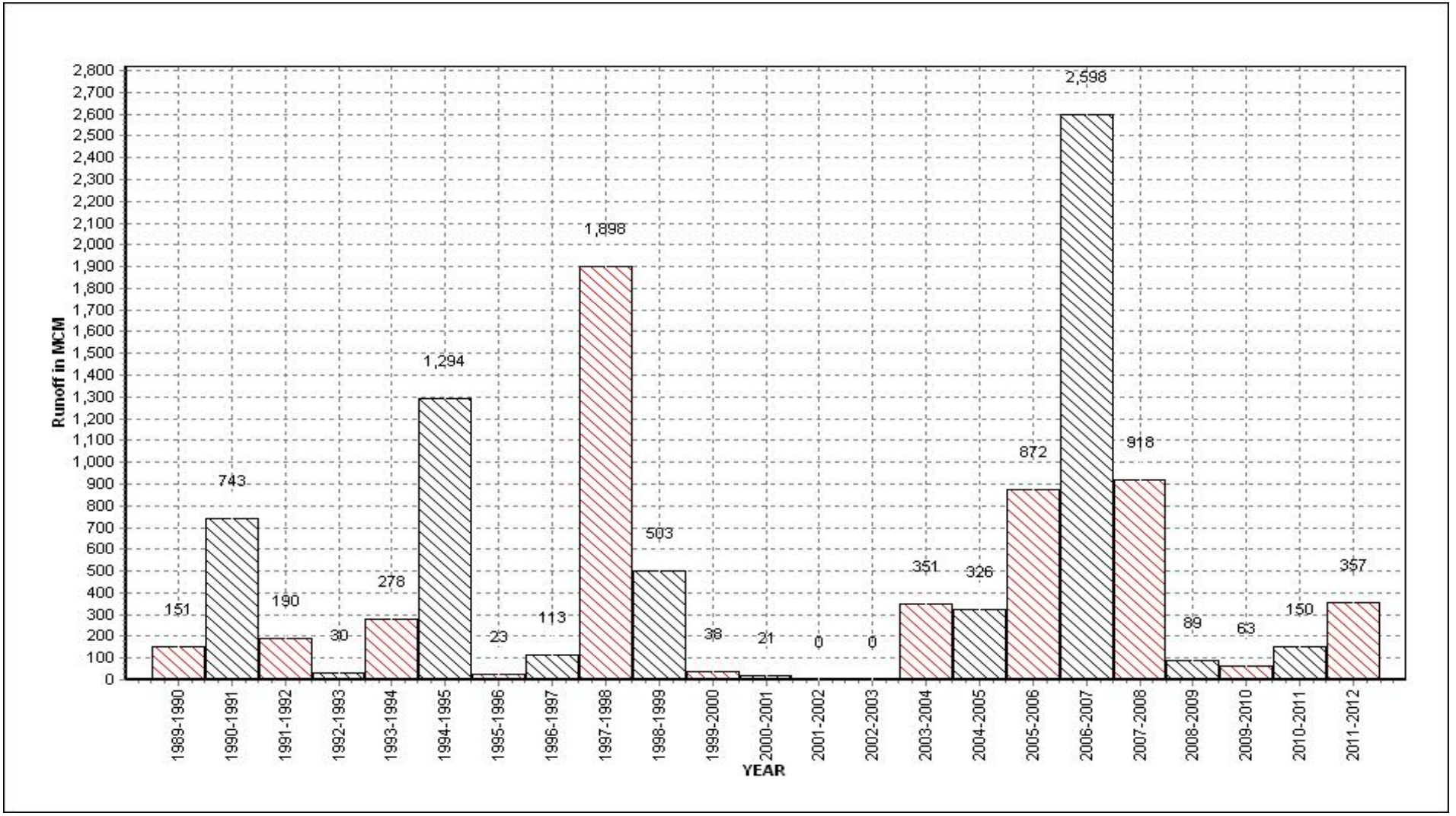
Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad



Annual Runoff Values for the period: 1989 - 2012

Station Name : Watrak at Kheda (01 02 12 012)
Local River : Watrak

Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad



Note: Missing values have not been considered while arriving at Annual Runoff

Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Watrak at Kheda (01 02 12 012) **Division : Mahi Division, Gandhinagar**

Local River : Watrak **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

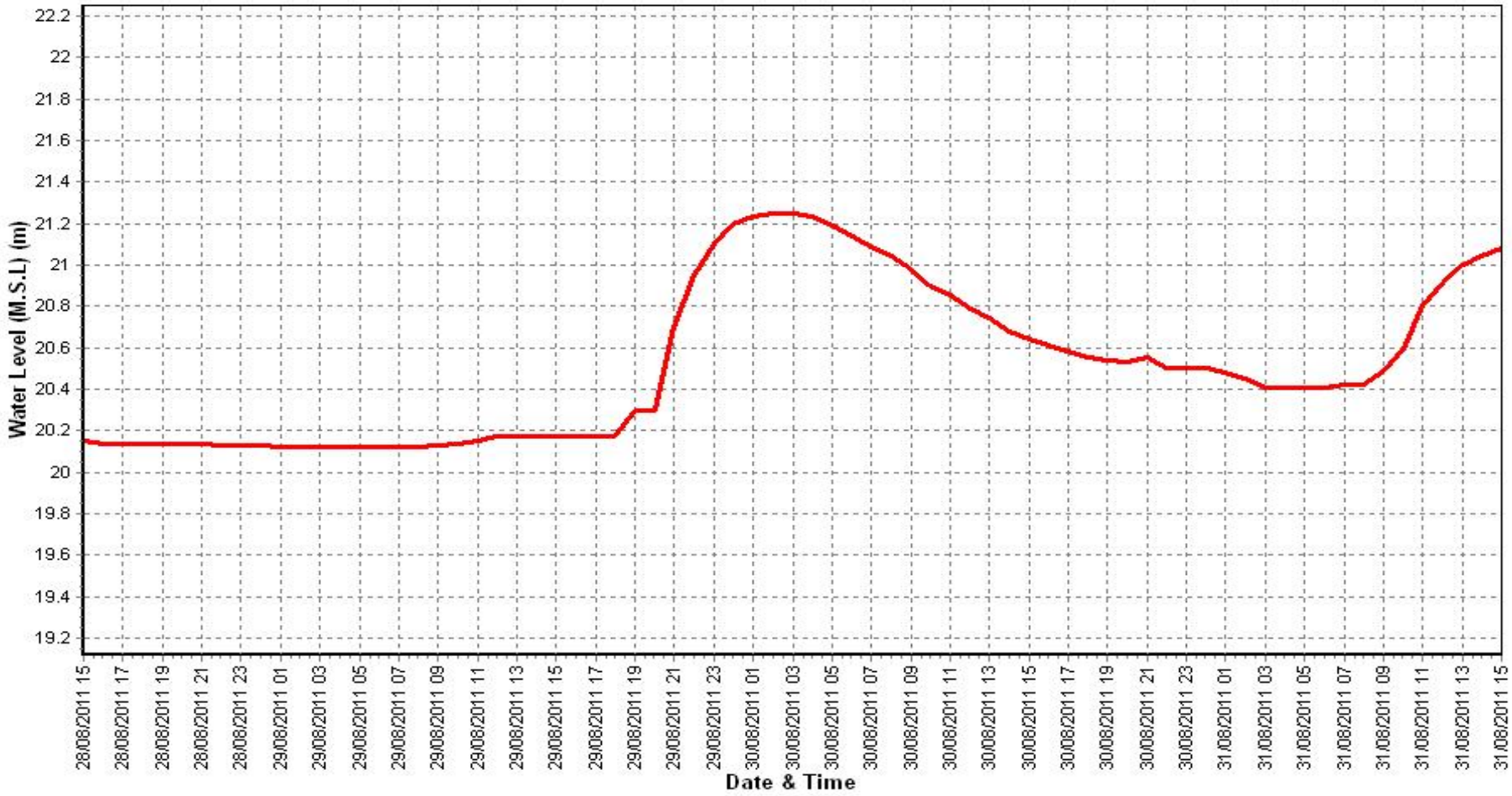


Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Watrak at Kheda (01 02 12 012) **Division : Mahi Division, Gandhinagar**

Local River : Watrak **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

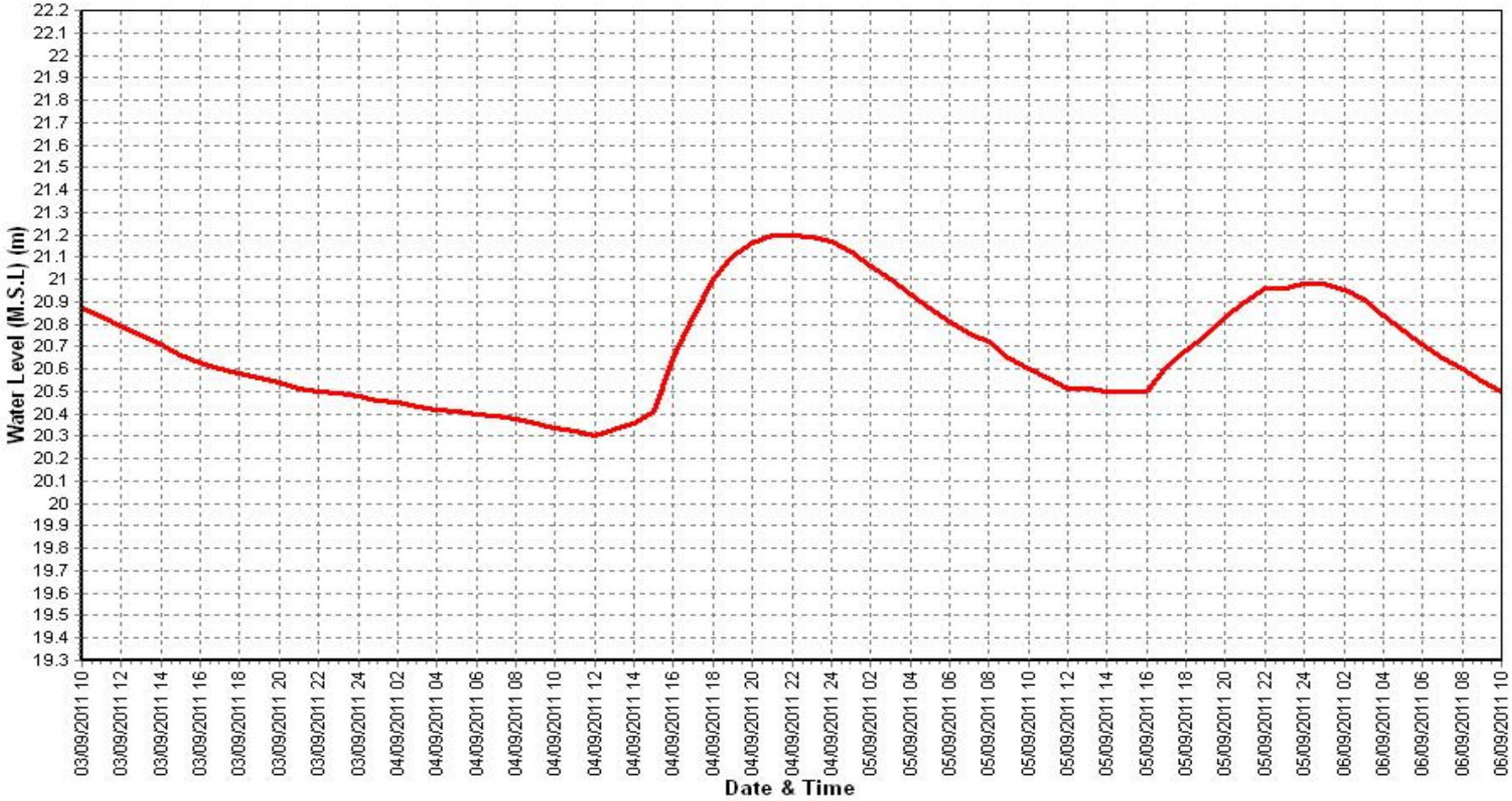


Time Span: 72 Hrs

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Watrak at Kheda (01 02 12 012) **Division : Mahi Division, Gandhinagar**

Local River : Watrak **Sub-Division : Sabarmati Sub Divn., Ahmedabad**



Time Span: 72 Hrs

HISTORY SHEET

			Water Year	**:**	**2011-2012**
Site	**:**	**Watrak at Gadvel (Ratanpur)**	**Code**	**:**	**01 02 12 010**
State	:	Gujarat	District		Kheda
Basin	:	Sabarmati	Independent River	:	Sabarmati
Tributary	:	Watrak	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Watrak
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	Sabarmati Sub Divn., Ahmedabad
Drainage Area	:	2916 Sq. Km.	Bank	:	Left
Latitude	:	22°58'31"N	Longitude	:	72°53'02"E
Zero of Gauge (m)	:	39.1 (m.s.l) 37 (m.s.l)	30/03/1985 16/06/1990	- -	15/06/1990
		Opening Date	Closing Date		
Gauge	:	30/03/1985			
Discharge	:	11/07/1989			
Sediment	:	---			
Water Quality	:	---			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1991-1992	467.8	41.000	01/08/1991	0.000	River Dry	05/03/1992
1992-1993	56.13	39.150	08/09/1992	0.000	River Dry	09/05/1993
1993-1994	672.0	41.400	18/07/1993	0.000	River Dry	13/09/1993
1994-1995	735.8	42.185	08/09/1994	0.000	River Dry	09/03/1995
1995-1996	39.38	38.500	20/07/1995	0.000	River Dry	30/01/1996
1996-1997	213.4	39.100	29/07/1996	0.000	River Dry	16/03/1997
1997-1998	1978	44.750	01/08/1997	0.000	River Dry	27/01/1998
1998-1999	365.0	40.725	18/09/1998	0.000	River Dry	10/02/1999
1999-2000	77.92	38.365	21/07/1999	0.000	River Dry	14/02/2000
2000-2001	150.0	38.815	14/07/2000	0.000	River Dry	25/01/2001
2001-2002	17.30	37.890	12/08/2001	0.000	River Dry	25/01/2002
2002-2003	60.50	38.250	05/09/2002	0.000	River Dry	12/01/2003
2003-2004	159.0	39.040	24/08/2003	0.000	River Dry	12/07/2003
2004-2005	253.0	39.400	02/08/2004	0.000	River Dry	18/05/2005
2005-2006	340.6	40.400	01/07/2005	0.000	River Dry	01/06/2005
2006-2007	3732	44.980	12/08/2006	0.000	River Dry	01/06/2006
2007-2008	1526	43.950	10/07/2007	0.000	River Dry	01/06/2007
2008-2009	98.714	40.043	13/08/2010	0.000	River Dry	01/06/2008
2009-2010	101	39.230	24/07/2009	0.000	River Dry	01/06/2009
2010-2011	102.2	39.150	19/09/2010	0.000	River Dry	19/06/2010
2011-2012	134.8	39.000	05/09/2011	0.000	River Dry	09/04/2012

Stage-Discharge Data for the period 2011 - 2012

Station Name : Watrak at Gadvel (Ratanpur) (01 02 12 010) **Division : Mahi Division, Gandhinagar**

Local River : Watrak **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	R Dry	0.000	R Dry	0.000	R Dry	0.000	38.800	70.20	38.550	57.42	37.300	0.000
2	R Dry	0.000	R Dry	0.000	R Dry	0.000	38.900	81.44	38.070	26.63 *	37.300	0.000
3	R Dry	0.000	R Dry	0.000	R Dry	0.000	39.050	122.8 #	37.620	6.031	37.300	0.000
4	R Dry	0.000	R Dry	0.000	R Dry	0.000	39.300	110.6 *	37.700	5.931	37.280	0.000
5	R Dry	0.000	R Dry	0.000	R Dry	0.000	39.000	134.8 #	37.570	4.845	37.280	0.000
6	R Dry	0.000	R Dry	0.000	R Dry	0.000	38.780	44.96	37.560	5.270 *	37.280	0.000
7	R Dry	0.000	R Dry	0.000	R Dry	0.000	39.250	81.17	37.560	3.893	37.270	0.000
8	R Dry	0.000	R Dry	0.000	R Dry	0.000	38.800	51.92	37.550	3.449	37.270	0.000
9	R Dry	0.000	37.200	0.000 *	R Dry	0.000	39.200	84.51	37.550	4.970 *	37.270	0.000
10	R Dry	0.000	37.050	0.000 *	38.760	77.82	38.900	76.18	37.540	3.251	37.270	0.000
11	R Dry	0.000	37.040	0.000 *	38.500	45.35	38.800	72.02 *	37.500	2.559	37.270	0.000
12	R Dry	0.000	37.000	0.000 *	37.950	39.38 #	39.200	111.8	37.490	2.486	37.270	0.000
13	R Dry	0.000	R Dry	0.000	37.800	30.15 #	39.500	96.58 #	37.480	2.172	37.270	0.000
14	R Dry	0.000	R Dry	0.000	37.950	20.68 *	38.800	92.14	37.470	2.013	37.270	0.000
15	R Dry	0.000	R Dry	0.000	38.500	65.16	38.900	92.37	37.460	1.996	37.270	0.000
16	R Dry	0.000	R Dry	0.000	38.800	80.10	38.800	78.85	37.450	2.320 *	37.270	0.000
17	R Dry	0.000	R Dry	0.000	38.380	45.54	38.600	40.45	37.430	1.670	37.260	0.000
18	R Dry	0.000	R Dry	0.000	38.600	72.33	38.160	31.40 *	37.400	1.627	37.260	0.000
19	R Dry	0.000	37.000	0.000 *	38.450	68.60	38.950	93.81	37.380	1.621	37.260	0.000
20	R Dry	0.000	R Dry	0.000	38.200	43.90	38.780	92.49	37.370	1.478	37.260	0.000
21	37.450	0.000 *	R Dry	0.000	38.160	31.40 *	38.610	55.65	37.360	0.982	37.250	0.000
22	37.000	0.000 *	R Dry	0.000	38.700	87.36	38.560	46.36	37.350	0.852	37.250	0.000
23	37.000	0.000 *	R Dry	0.000	38.775	68.84	38.520	54.70	37.350	0.000	37.250	0.000
24	37.000	0.000 *	R Dry	0.000	38.650	72.23	38.540	40.86	37.340	0.000	37.250	0.000
25	37.000	0.000 *	R Dry	0.000	38.850	94.87	38.510	52.27 *	37.320	0.000	37.250	0.000
26	37.000	0.000 *	R Dry	0.000	38.800	85.63	38.500	39.91	37.310	0.000	37.240	0.000
27	37.000	0.000 *	R Dry	0.000	38.950	79.65	38.550	60.91	37.310	0.000	37.240	0.000
28	37.000	0.000 *	R Dry	0.000	38.600	58.17 *	38.570	60.07	37.300	0.000	37.240	0.000
29	R Dry	0.000	37.100	0.000 *	38.515	77.22	38.490	61.35	37.300	0.000	37.240	0.000
30	R Dry	0.000	37.050	0.000 *	38.900	124.6 #	38.200	36.65	37.300	0.000	37.230	0.000
31			37.040	0.000 *	39.480	129.5			37.500	0.000		
Ten-Daily Mean												
I Ten-Daily			37.125	0.000	38.760	77.82	38.998	85.86	37.727	12.17	37.282	0.000
II Ten-Daily			37.013	0.000	38.313	51.12	38.849	80.19	37.443	1.994	37.266	0.000
III Ten-Daily	37.056	0.000	37.063	0.000	38.762	82.68	38.505	50.87	37.340	0.167	37.244	0.000
Monthly												
Min.	37.000	0.000	37.000	0.000	37.800	20.68	38.160	31.40	37.300	0.000	37.230	0.000
Max.	37.450	0.000	37.200	0.000	39.480	129.5	39.500	134.8	38.550	57.42	37.300	0.000
Mean	37.056	0	37.060	0	38.558	68.11	38.784	72.31	37.498	4.628	37.264	0

Annual Runoff in MCM = 329 Annual Runoff in mm = 113

Peak Observed Discharge = 134.8 cumecs on 05/09/2011 Corres. Water Level :39 m

Lowest Observed Discharge = 0.000 cumecs on 23/10/2011 Corres. Water Level :37.35 m

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Watrak at Gadvel (Ratanpur) (01 02 12 010) **Division : Mahi Division, Gandhinagar**

Local River : Watrak **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	37.230	0.000	37.090	0.000	37.000	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
2	37.220	0.000	37.080	0.000	37.000	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
3	37.220	0.000	37.080	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
4	37.210	0.000	37.080	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
5	37.200	0.000	37.070	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
6	37.200	0.000	37.070	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
7	37.190	0.000	37.070	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
8	37.190	0.000	37.060	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
9	37.180	0.000	37.060	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
10	37.180	0.000	37.060	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
11	37.170	0.000	37.060	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
12	37.170	0.000	37.050	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
13	37.170	0.000	37.050	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
14	37.160	0.000	37.050	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
15	37.160	0.000	37.040	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
16	37.160	0.000	37.040	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
17	37.160	0.000	37.040	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
18	37.150	0.000	37.030	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
19	37.150	0.000	37.030	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
20	37.140	0.000	37.030	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
21	37.140	0.000	37.030	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
22	37.130	0.000	37.030	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
23	37.120	0.000	37.020	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
24	37.120	0.000	37.020	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
25	37.120	0.000	37.020	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
26	37.120	0.000	37.020	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
27	37.110	0.000	37.020	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
28	37.110	0.000	37.020	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
29	37.110	0.000	37.020	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
30	37.100	0.000	37.010	0.000			R Dry	0.000	R Dry	0.000	R Dry	0.000
31	37.090	0.000	37.010	0.000			R Dry	0.000			R Dry	0.000
Ten-Daily Mean												
I Ten-Daily	37.202	0.000	37.072	0.000	37.000	0.000		0.000		0.000		0.000
II Ten-Daily	37.159	0.000	37.042	0.000		0.000		0.000		0.000		0.000
III Ten-Daily	37.115	0.000	37.020	0.000		0.000		0.000		0.000		0.000
Monthly												
Min.	37.090	0.000	37.010	0.000	37.000	0.000		0.000		0.000		0.000
Max.	37.230	0.000	37.090	0.000	37.000	0.000		0.000		0.000		0.000
Mean	37.157	0	37.044	0	37.000	0		0		0		0

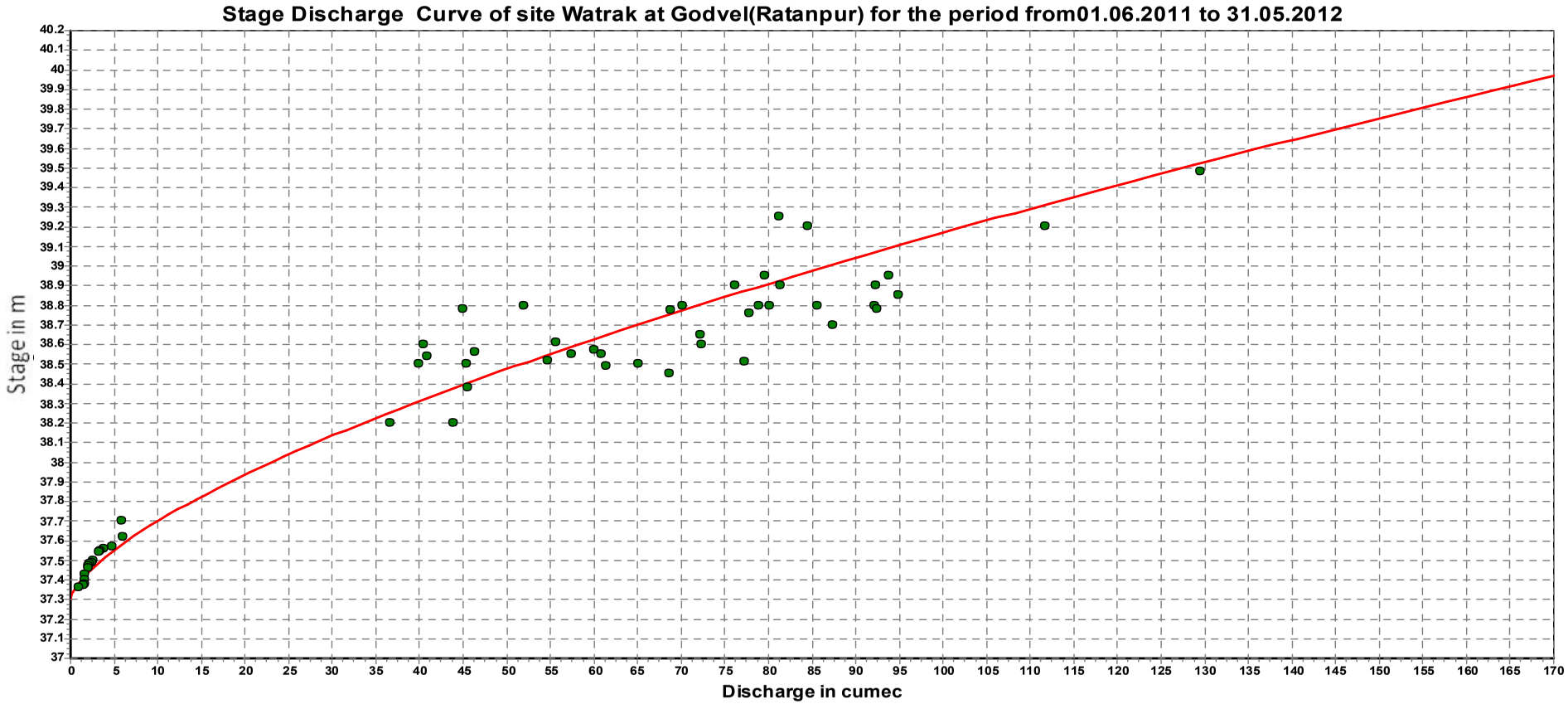
Peak Computed Discharge = 110.6 cumecs on 04/09/2011 **Corres. Water Level :39.3 m**

Lowest Computed Discharge = 0.000 cumecs on 21/06/2011 **Corres. Water Level :37.45 m**

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff



Procedure : Standard

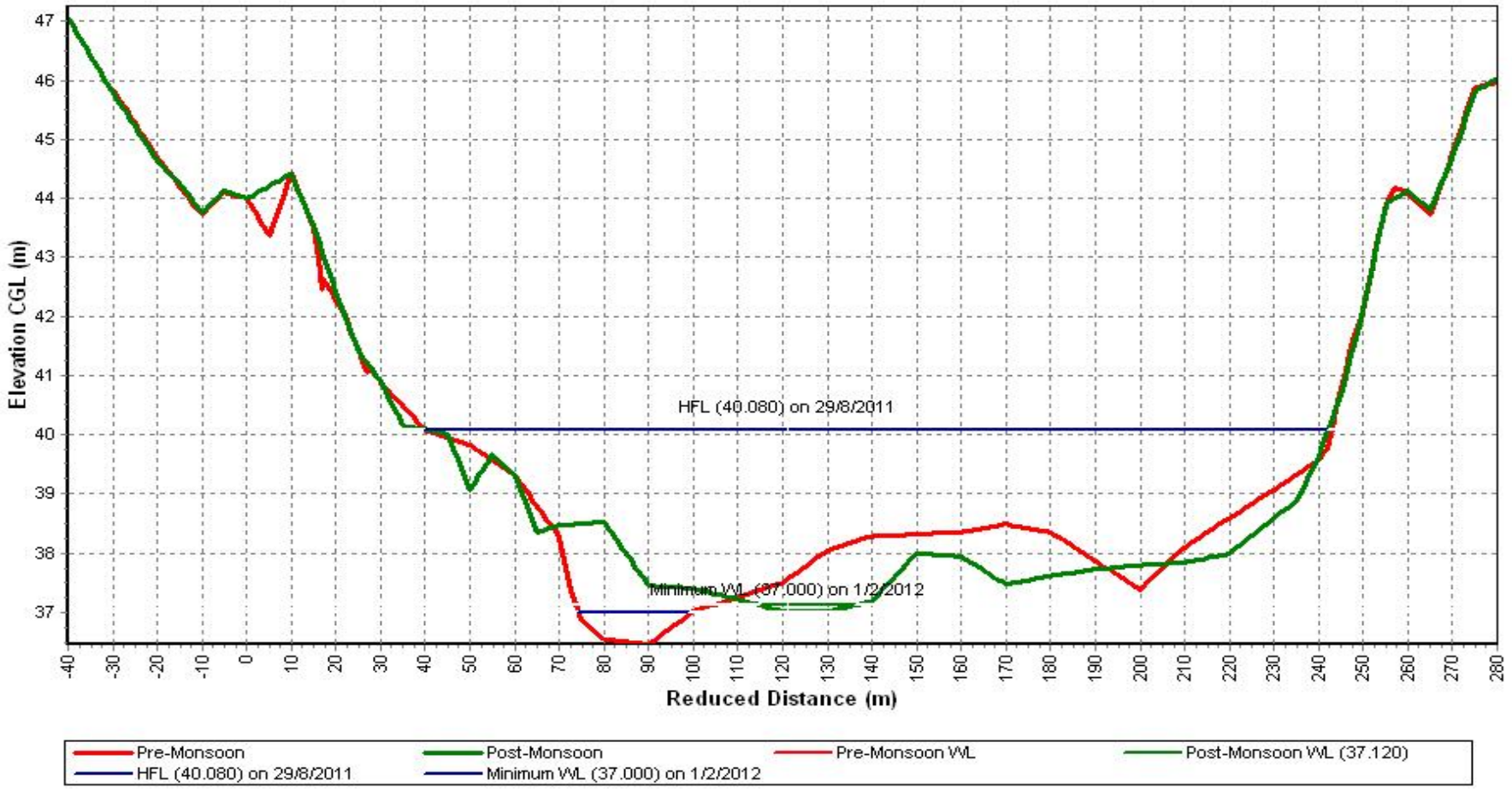
Equation type: Power

Q = c (h+a)^b, a = -37.3, b = 1.492, c = 39.33

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Watrak at Gadvel (Ratanpur) (01 02 12 010) **Division : Mahi Division, Gandhinagar**

Local River : Watrak **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

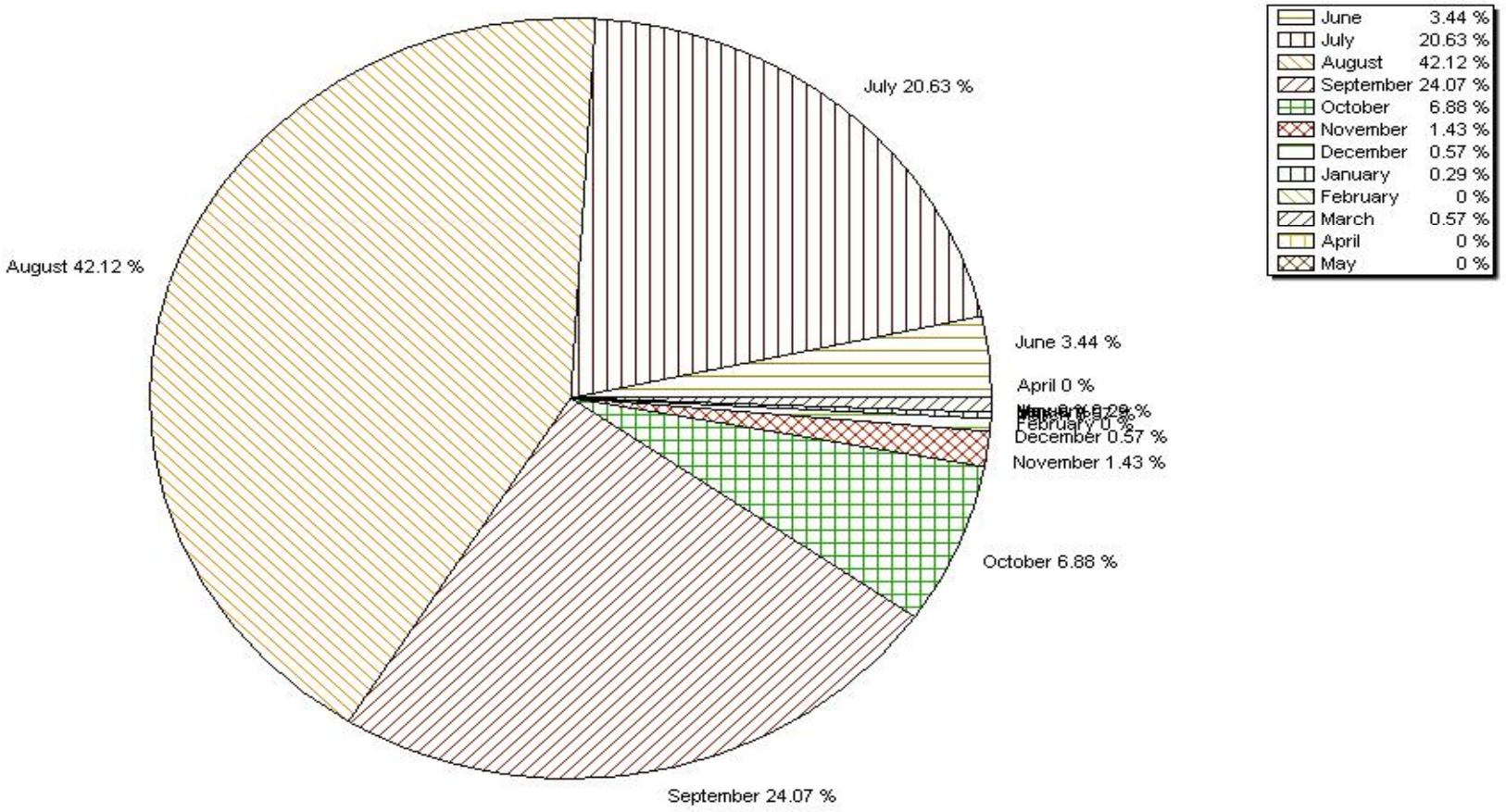


Historical Flood Level -48.200 m on 28.07.1997 at 0200 hrs

Monthly Average Runoff based on period : 1991-2011

Station Name : Watrak at Gadvel (Ratanpur) (01 02 12 010)
Local River : Watrak

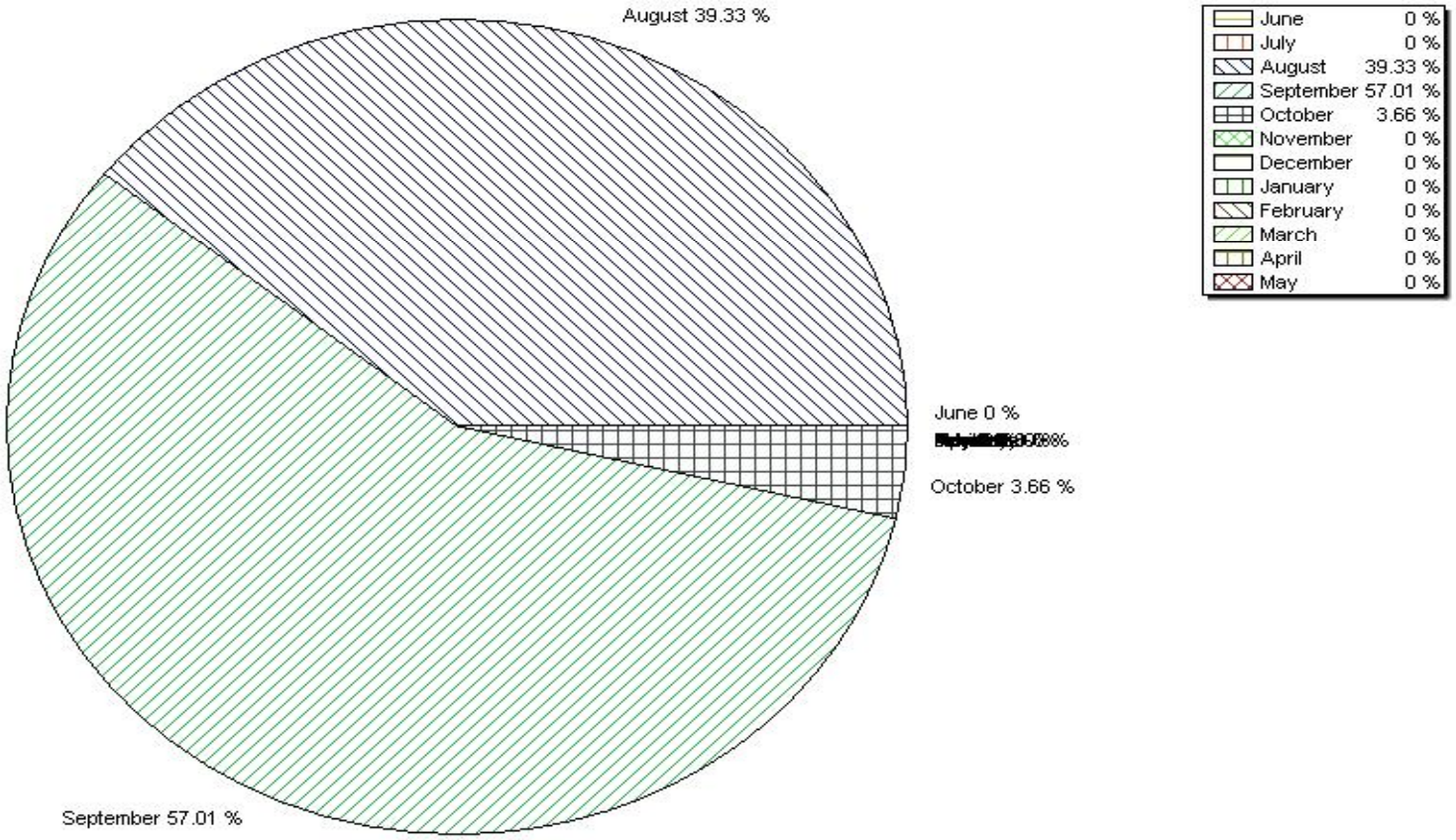
Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad



Monthly Runoff for the Year : 2011-2012

Station Name : Watrak at Gadvel (Ratanpur) (01 02 12 010)
Local River : Watrak

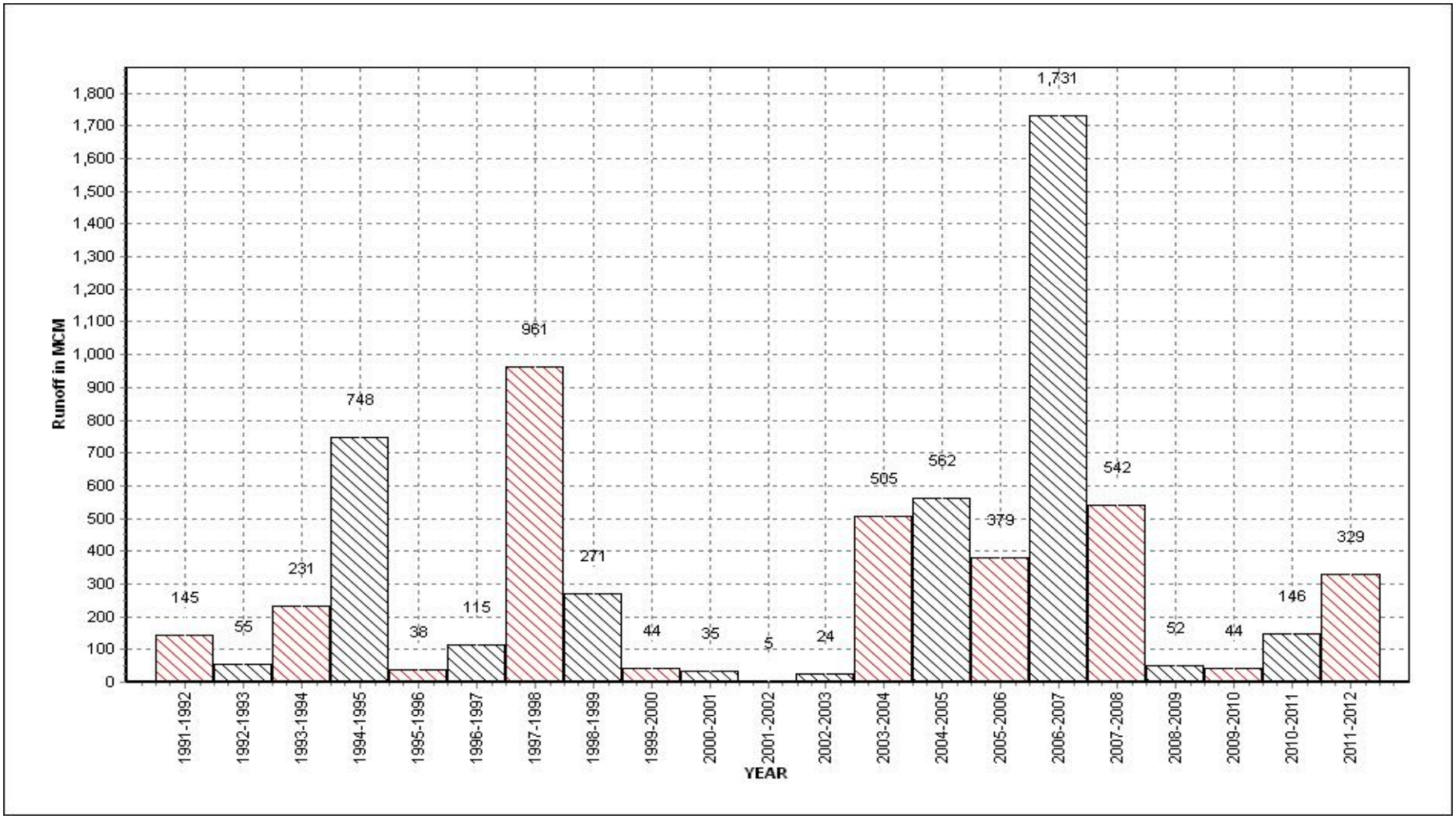
Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad



Annual Runoff Values for the period: 1991 - 2012

Station Name : Watrak at Gadvel (Ratanpur) (01 02 12 010)
Local River : Watrak

Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad

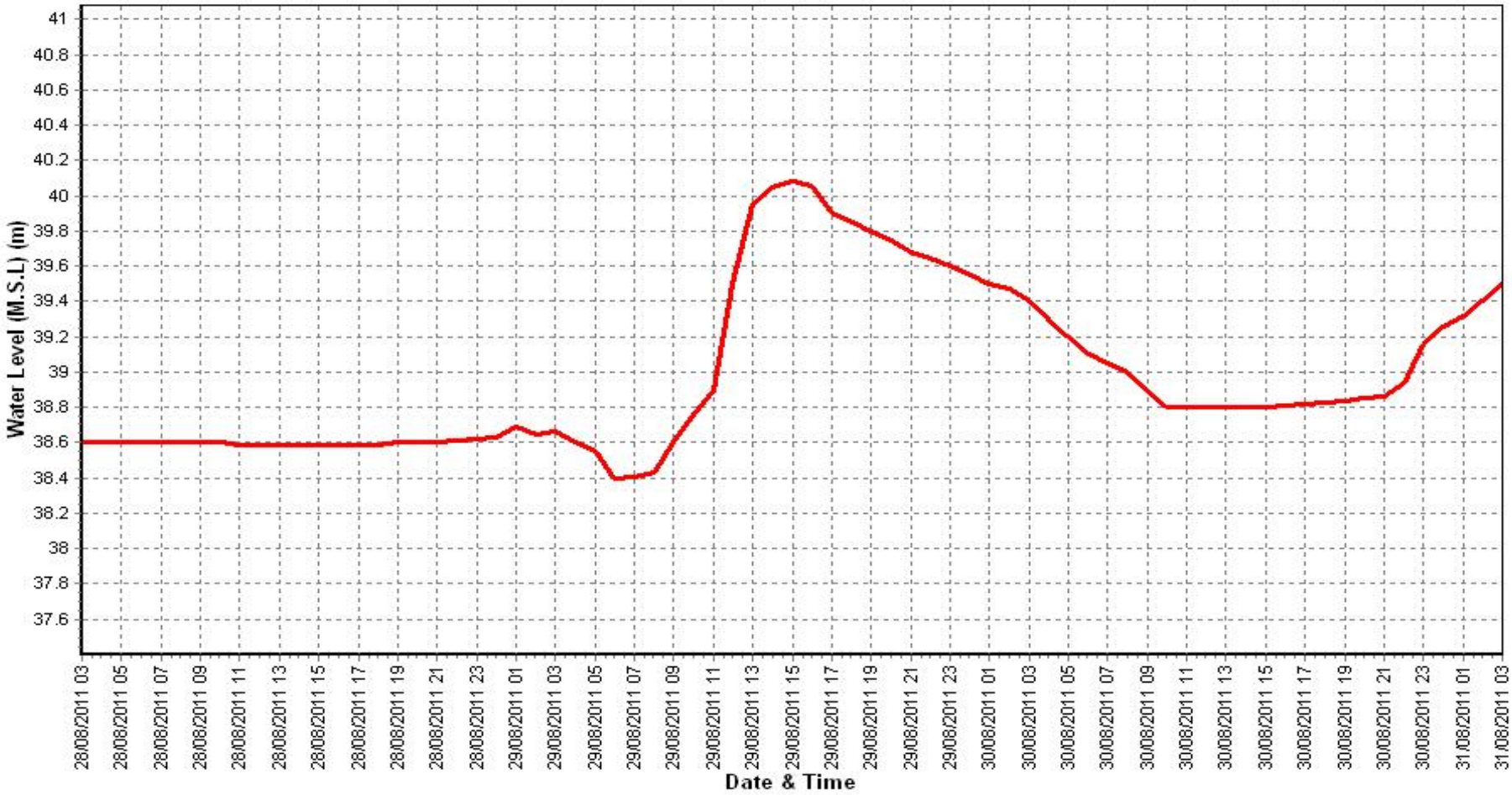


Note: Missing values have not been considered while arriving at Annual Runoff

Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Watrak at Gadvel (Ratanpur) (01 02 12 010) **Division : Mahi Division, Gandhinagar**

Local River : Watrak **Sub-Division : Sabarmati Sub Divn., Ahmedabad**



Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Watrak at Gadvel (Ratanpur) (01 02 12 010)

Local River : Watrak

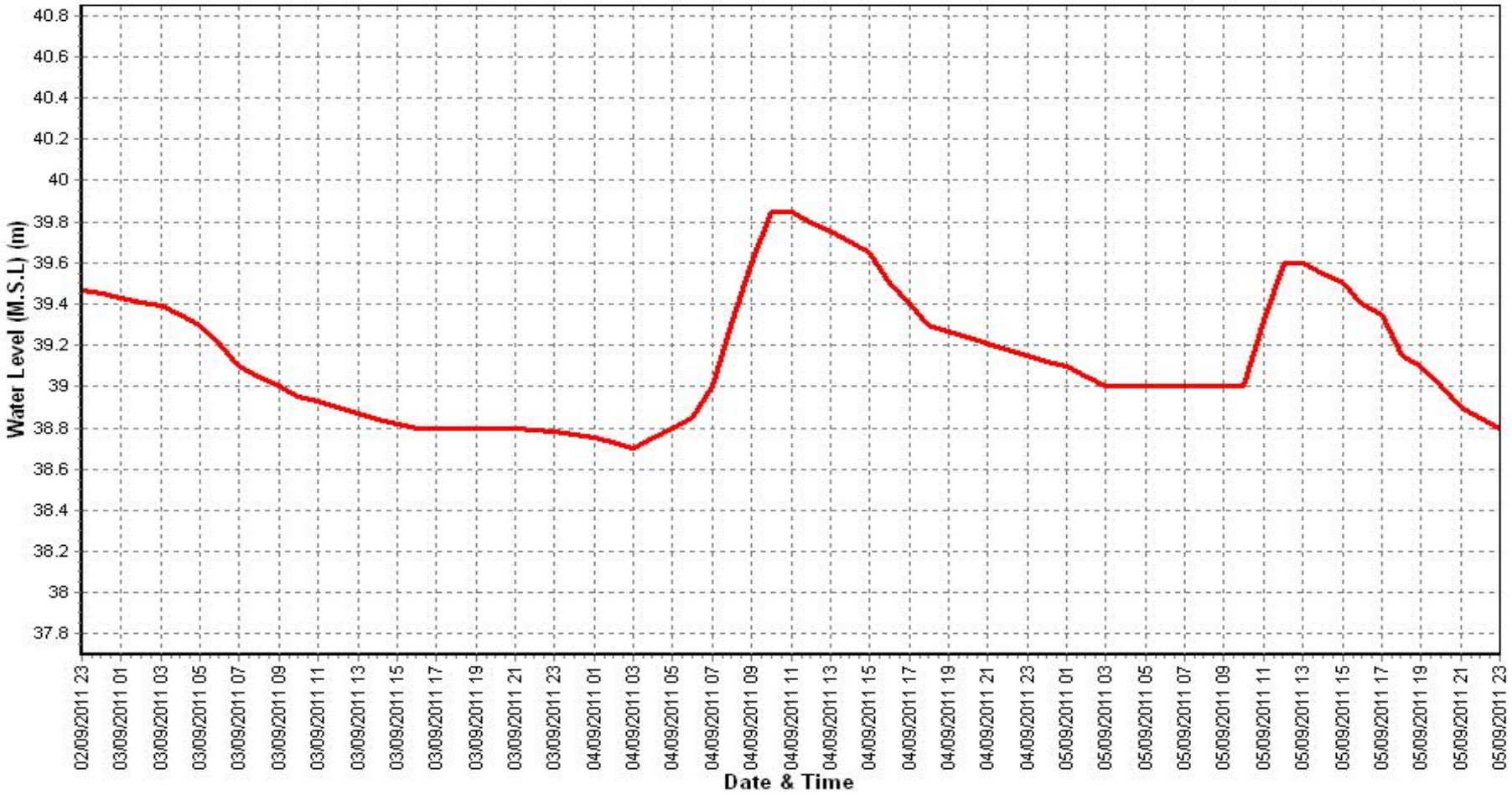


Time Span: 72 Hrs

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Watrak at Gadvel (Ratanpur) (01 02 12 010)

Local River : Watrak



Time Span: 72 Hrs

HISTORY SHEET

			Water Year	**:**	**2011-2012**
Site	**:**	**Sabarmati at Derol Bridge**	**Code**	**:**	**01 02 12 006**
State	:	Gujarat	District		Sabarkantha
Basin	:	Sabarmati	Independent River	:	Sabarmati
Tributary	:	Sabarmati	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Sabarmati
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	N.W.R.Sub Div., Himatnagar
Drainage Area	:	6724 Sq. Km.	Bank	:	Left
Latitude	:	23°34'24"N	Longitude	:	72°48'25"E
Zero of Gauge (m)	:	89 (m.s.l) 87 (m.s.l)	19/08/1980 01/06/2005	-	31/05/2005 -
		Opening Date	Closing Date		
Gauge	:	19/08/1980			
Discharge	:	01/06/1991			
Sediment	:	25/09/1992			
Water Quality	:	15/07/1992			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1992-1993	1964	94.130	08/09/1992	1.894	89.840	21/08/1992
1993-1994	1611	93.634	18/07/1993	5.400	89.980	10/11/1993
1994-1995	3050	94.730	20/08/1994	6.360	89.880	24/12/1994
1995-1996	55.80	90.550	22/07/1995	1.891	89.680	08/08/1995
1996-1997	34.00	91.000	30/08/1996	0.301	89.500	29/09/1996
1997-1998	1290	93.230	26/06/1997	0.840	89.600	10/06/1997
1998-1999	25.40	91.300	18/09/1998	0.041	89.780	06/10/1998
1999-2000	29.00	91.205	22/06/1999	0.000	River Dry	26/01/2000
2000-2001	River Dry					
2001-2002	19.10	90.890	12/07/2001	0.000	River Dry	17/01/2002
2002-2003	20.40	90.950	29/06/2002	0.000	River Dry	25/01/2003
2003-2004	73.85	91.070	28/08/2003	0.000	River Dry	26/01/2004
2004-2005	55.50	90.750	06/08/2004	0.000	River Dry	09/05/2005
2005-2006	224.7	92.300	03/10/2005	0.000	River Dry	01/06/2005
2006-2007	3079*	94.700	16/08/2006	0.000	River Dry	01/06/2006
2007-2008	842.2	92.075	09/08/2007	0.000	River Dry	01/06/2007
2008-2009	66.49	89.575	27/08/2008	0.000	River Dry	01/06/2008
2009-2010	72.99	89.650	30/08/2009	0.000	River Dry	01/06/2009
2010-2011	205.5	90.200	25/07/2010	0.000	River Dry	01/06/2010
2011-2012	386.5	90.400	12/09/2011	5.085	87.700	13/10/2011

Stage-Discharge Data for the period 2011 - 2012

Station Name : Sabarmati at Derol Bridge (01 02 12 006) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : N.W.R.Sub Div., Himatnagar**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	R Dry	0.000	R Dry	0.000	R Dry	0.000	88.700	30.62	87.950	11.41	87.400	0.000 *
2	R Dry	0.000	R Dry	0.000	R Dry	0.000	88.900	52.37	87.950	11.35	87.390	0.000 *
3	R Dry	0.000	R Dry	0.000	R Dry	0.000	88.800	62.89 #	87.950	11.18	87.380	0.000 *
4	R Dry	0.000	R Dry	0.000	R Dry	0.000	88.700	54.22 #	87.900	9.351	87.370	0.000 *
5	R Dry	0.000	R Dry	0.000	R Dry	0.000	88.800	38.40	87.900	9.714	87.360	0.000 *
6	R Dry	0.000	R Dry	0.000	R Dry	0.000	89.400	138.0 #	87.950	11.67	87.350	0.000 *
7	R Dry	0.000	R Dry	0.000	R Dry	0.000	88.700	54.22 #	87.950	11.38	87.340	0.000 *
8	R Dry	0.000	R Dry	0.000	R Dry	0.000	89.200	169.3	87.900	9.860	87.330	0.000 *
9	R Dry	0.000	88.500	39.55 #	R Dry	0.000	89.500	150.2	87.800	15.41	87.330	0.000 *
10	R Dry	0.000	88.100	19.21 *	89.400	138.0 #	89.200	163.1	87.800	15.45	87.320	0.000 *
11	R Dry	0.000	88.100	19.21 *	88.350	30.65 *	88.900	49.54	87.800	14.83	87.320	0.000 *
12	R Dry	0.000	88.050	17.37 *	88.150	21.19 *	90.400	386.5 #	87.780	14.12	87.320	0.000 *
13	R Dry	0.000	R Dry	0.000	88.100	19.21 *	89.400	138.0 #	87.700	5.085	87.320	0.000 *
14	R Dry	0.000	R Dry	0.000	88.080	18.46 *	89.200	157.9	87.700	5.087	87.310	0.000 *
15	R Dry	0.000	R Dry	0.000	88.080	18.46 *	89.200	161.3	87.650	6.920 *	87.310	0.000 *
16	R Dry	0.000	R Dry	0.000	88.500	39.55 #	89.000	211.8 #	87.650	6.920 *	87.310	0.000 *
17	R Dry	0.000	R Dry	0.000	88.250	25.60 *	89.000	83.24 #	87.650	6.920 *	87.300	0.000 *
18	R Dry	0.000	R Dry	0.000	88.130	20.38 *	88.800	49.29	87.620	6.400 *	87.300	0.000 *
19	R Dry	0.000	R Dry	0.000	88.120	19.99 *	89.000	83.24 #	87.610	6.230 *	87.300	0.000 *
20	R Dry	0.000	R Dry	0.000	88.100	19.21 *	88.800	62.89 #	87.600	6.070 *	87.300	0.000 *
21	R Dry	0.000	R Dry	0.000	88.100	19.21 *	88.700	34.16	87.600	6.070 *	87.300	0.000 *
22	R Dry	0.000	R Dry	0.000	88.090	18.83 *	88.200	34.22	87.520	4.860 *	87.290	0.000 *
23	R Dry	0.000	R Dry	0.000	88.090	18.83 *	88.100	26.98	87.500	4.590 *	87.290	0.000 *
24	R Dry	0.000	R Dry	0.000	88.080	18.46 *	88.400	48.65	87.480	4.330 *	87.290	0.000 *
25	R Dry	0.000	R Dry	0.000	88.080	18.46 *	88.400	39.13	87.470	4.200 *	87.290	0.000 *
26	R Dry	0.000	R Dry	0.000	88.100	19.21 *	88.100	23.75	87.460	4.080 *	87.280	0.000 *
27	R Dry	0.000	R Dry	0.000	88.300	29.08	88.100	21.09	87.450	3.960 *	87.280	0.000 *
28	R Dry	0.000	R Dry	0.000	88.400	68.47	88.100	19.46	87.440	3.840 *	87.280	0.000 *
29	R Dry	0.000	R Dry	0.000	88.400	33.43 #	88.000	14.66	87.430	3.720 *	87.280	0.000 *
30	R Dry	0.000	R Dry	0.000	89.900	221.7	87.950	11.94	87.420	3.610 *	87.280	0.000 *
31			R Dry	0.000	88.700	33.12			87.410	3.500 *		
Ten-Daily Mean												
I Ten-Daily			88.300	29.38	89.400	138.0	88.990	91.33	87.905	11.68	87.357	0.000
II Ten-Daily			88.075	18.29	88.186	23.27	89.170	138.4	87.676	7.858	87.309	0.000
III Ten-Daily					88.385	45.35	88.205	27.40	87.471	4.251	87.286	0.000
Monthly												
Min.			88.050	17.37	88.080	18.46	87.950	11.94	87.410	3.500	87.280	0.000
Max.			88.500	39.55	89.900	221.7	90.400	386.5	87.950	15.45	87.400	0.000
Mean			88.188	23.84	88.341	39.52	88.788	85.71	87.677	7.81	87.317	0

Annual Runoff in MCM = 326 Annual Runoff in mm = 49

Peak Observed Discharge = 386.5 cumecs on 12/09/2011 Corres. Water Level :90.4 m

Lowest Observed Discharge = 5.085 cumecs on 13/10/2011 Corres. Water Level :87.7 m

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Sabarmati at Derol Bridge (01 02 12 006) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : N.W.R.Sub Div., Himatnagar**

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	87.280	0.000 *	87.240	0.000 *	87.190	0.000 *	87.150	0.000 *	87.110	0.000 *	R Dry	0.000
2	87.280	0.000 *	87.240	0.000 *	87.190	0.000 *	87.150	0.000 *	87.110	0.000 *	R Dry	0.000
3	87.270	0.000 *	87.230	0.000 *	87.180	0.000 *	87.150	0.000 *	87.100	0.000 *	R Dry	0.000
4	87.270	0.000 *	87.230	0.000 *	87.180	0.000 *	87.150	0.000 *	87.100	0.000 *	R Dry	0.000
5	87.270	0.000 *	87.230	0.000 *	87.180	0.000 *	87.150	0.000 *	87.100	0.000 *	R Dry	0.000
6	87.270	0.000 *	87.230	0.000 *	87.180	0.000 *	87.140	0.000 *	87.100	0.000 *	87.150	0.000 *
7	87.260	0.000 *	87.230	0.000 *	87.180	0.000 *	87.140	0.000 *	87.100	0.000 *	87.150	0.000 *
8	87.260	0.000 *	87.230	0.000 *	87.170	0.000 *	87.140	0.000 *	87.100	0.000 *	87.150	0.000 *
9	87.260	0.000 *	87.230	0.000 *	87.170	0.000 *	87.140	0.000 *	87.100	0.000 *	87.150	0.000 *
10	87.260	0.000 *	87.230	0.000 *	87.170	0.000 *	87.140	0.000 *	87.100	0.000 *	87.150	0.000 *
11	87.260	0.000 *	87.230	0.000 *	87.170	0.000 *	87.140	0.000 *	87.100	0.000 *	87.140	0.000 *
12	87.250	0.000 *	87.230	0.000 *	87.170	0.000 *	87.140	0.000 *	87.100	0.000 *	87.130	0.000 *
13	87.250	0.000 *	87.220	0.000 *	87.160	0.000 *	87.140	0.000 *	87.100	0.000 *	87.130	0.000 *
14	87.250	0.000 *	87.220	0.000 *	87.160	0.000 *	87.130	0.000 *	87.100	0.000 *	87.120	0.000 *
15	87.250	0.000 *	87.220	0.000 *	87.160	0.000 *	87.130	0.000 *	87.100	0.000 *	R Dry	0.000
16	87.250	0.000 *	87.220	0.000 *	87.160	0.000 *	87.130	0.000 *	87.100	0.000 *	R Dry	0.000
17	87.250	0.000 *	87.220	0.000 *	87.160	0.000 *	87.130	0.000 *	87.100	0.000 *	R Dry	0.000
18	87.250	0.000 *	87.220	0.000 *	87.160	0.000 *	87.130	0.000 *	87.100	0.000 *	R Dry	0.000
19	87.240	0.000 *	87.210	0.000 *	87.160	0.000 *	87.120	0.000 *	87.100	0.000 *	R Dry	0.000
20	87.240	0.000 *	87.210	0.000 *	87.160	0.000 *	87.120	0.000 *	R Dry	0.000	R Dry	0.000
21	87.240	0.000 *	87.210	0.000 *	87.160	0.000 *	87.120	0.000 *	R Dry	0.000	R Dry	0.000
22	87.240	0.000 *	87.210	0.000 *	87.160	0.000 *	87.120	0.000 *	R Dry	0.000	R Dry	0.000
23	87.240	0.000 *	87.200	0.000 *	87.160	0.000 *	87.120	0.000 *	R Dry	0.000	R Dry	0.000
24	87.240	0.000 *	87.200	0.000 *	87.160	0.000 *	87.120	0.000 *	R Dry	0.000	R Dry	0.000
25	87.240	0.000 *	87.200	0.000 *	87.160	0.000 *	87.120	0.000 *	R Dry	0.000	R Dry	0.000
26	87.240	0.000 *	87.200	0.000 *	87.160	0.000 *	87.120	0.000 *	R Dry	0.000	R Dry	0.000
27	87.240	0.000 *	87.200	0.000 *	87.150	0.000 *	87.110	0.000 *	R Dry	0.000	R Dry	0.000
28	87.240	0.000 *	87.190	0.000 *	87.150	0.000 *	87.110	0.000 *	R Dry	0.000	R Dry	0.000
29	87.240	0.000 *	87.190	0.000 *	87.150	0.000 *	87.110	0.000 *	R Dry	0.000	R Dry	0.000
30	87.240	0.000 *	87.190	0.000 *			87.110	0.000 *	R Dry	0.000	R Dry	0.000
31	87.240	0.000 *	87.190	0.000 *			87.110	0.000 *			R Dry	0.000
Ten-Daily Mean												
I Ten-Daily	87.268	0.000	87.232	0.000	87.179	0.000	87.145	0.000	87.102	0.000	87.150	0.000
II Ten-Daily	87.249	0.000	87.220	0.000	87.162	0.000	87.131	0.000	87.100	0.000	87.130	0.000
III Ten-Daily	87.240	0.000	87.198	0.000	87.157	0.000	87.115	0.000				
Monthly												
Min.	87.240	0.000	87.190	0.000	87.150	0.000	87.110	0.000	87.100	0.000	87.120	0.000
Max.	87.280	0.000	87.240	0.000	87.190	0.000	87.150	0.000	87.110	0.000	87.150	0.000
Mean	87.252	0	87.216	0	87.166	0	87.130	0	87.101	0	87.141	0

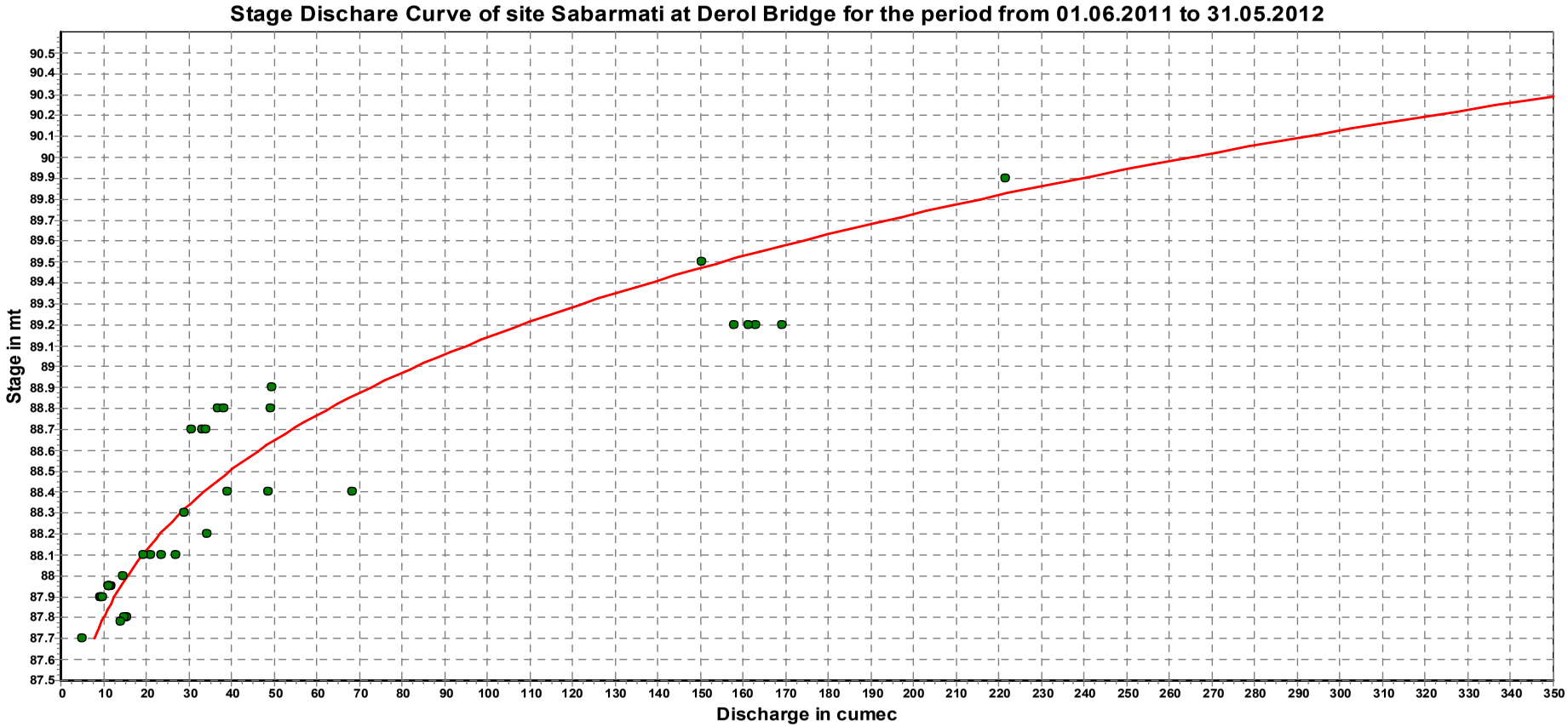
Peak Computed Discharge = 30.65 cumecs on 11/08/2011 **Corres. Water Level :88.35 m**

Lowest Computed Discharge = 0.000 cumecs on 01/11/2011 **Corres. Water Level :87.4 m**

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff



Procedure : Standard

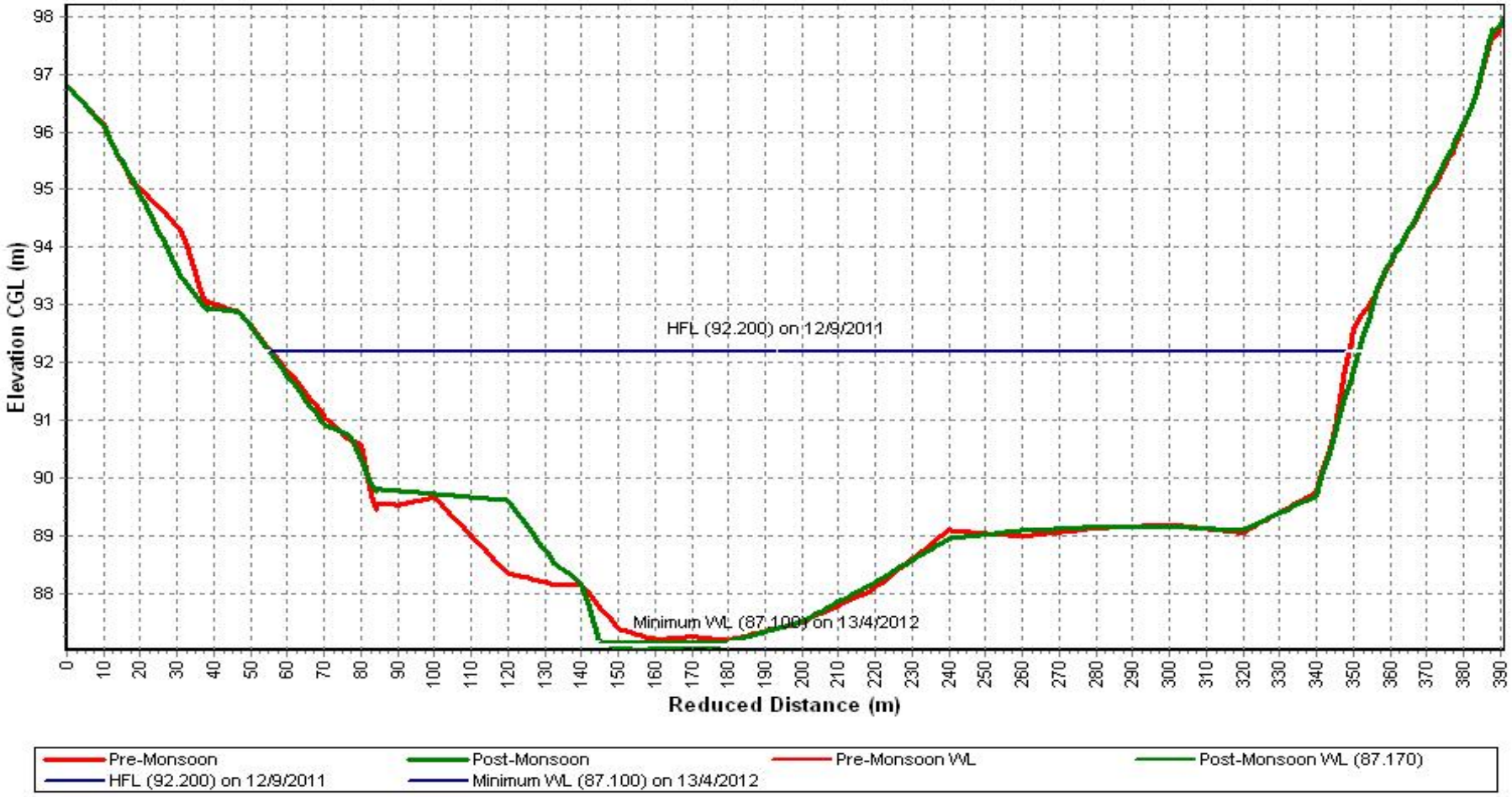
Equation type: Power

Q = c (h+a)^b, a = -86.19, b = 3.798, c = 1.645

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Sabarmati at Derol Bridge (01 02 12 006) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : N.W.R.Sub Div., Himatnagar**

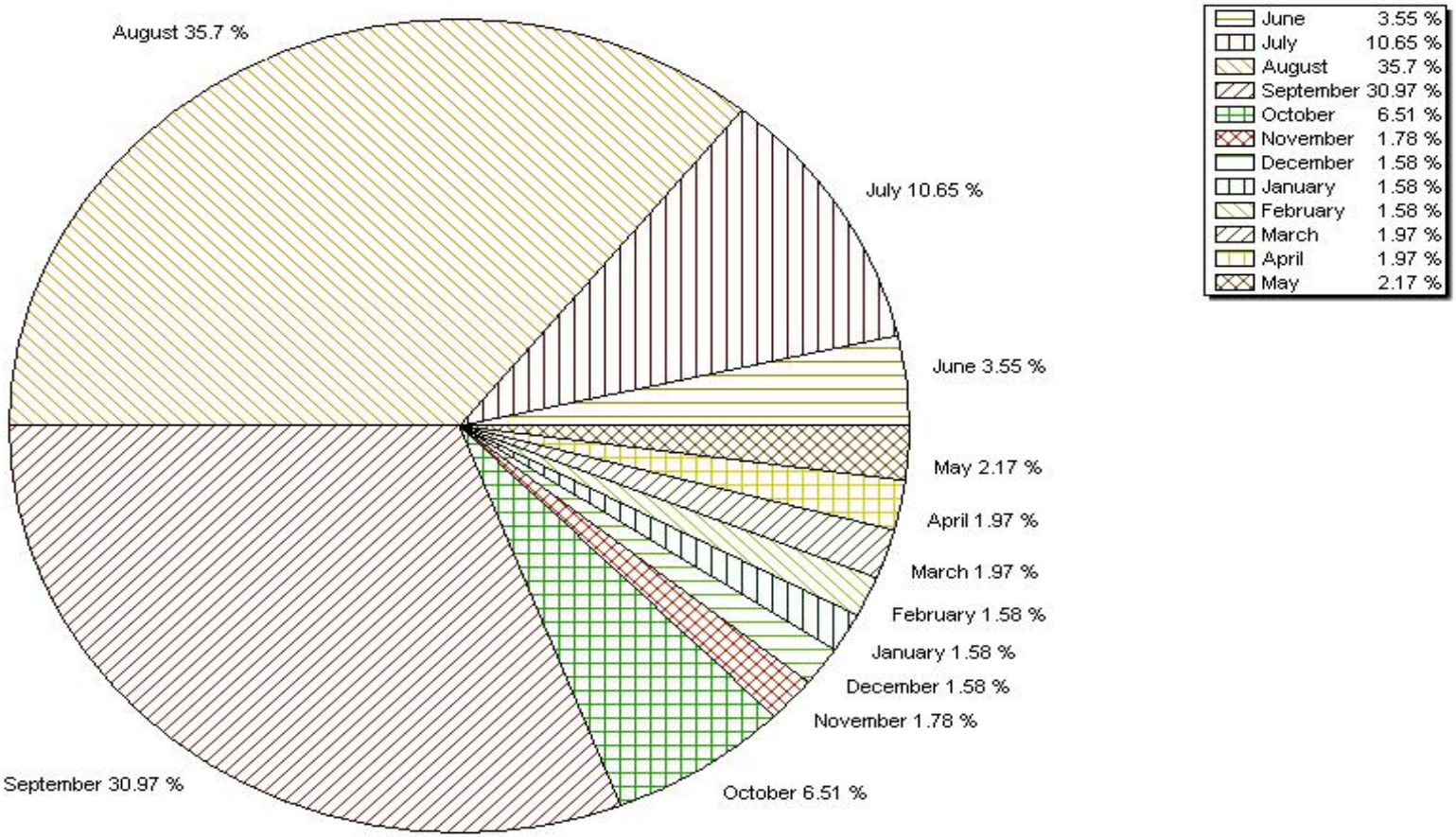


Historic Flood Level - 95.83 m on 17.07.1993 at 1800 hrs

Monthly Average Runoff based on period : 1992-2011

Station Name : Sabarmati at Derol Bridge (01 02 12 006) **Division : Mahi Division, Gandhinagar**

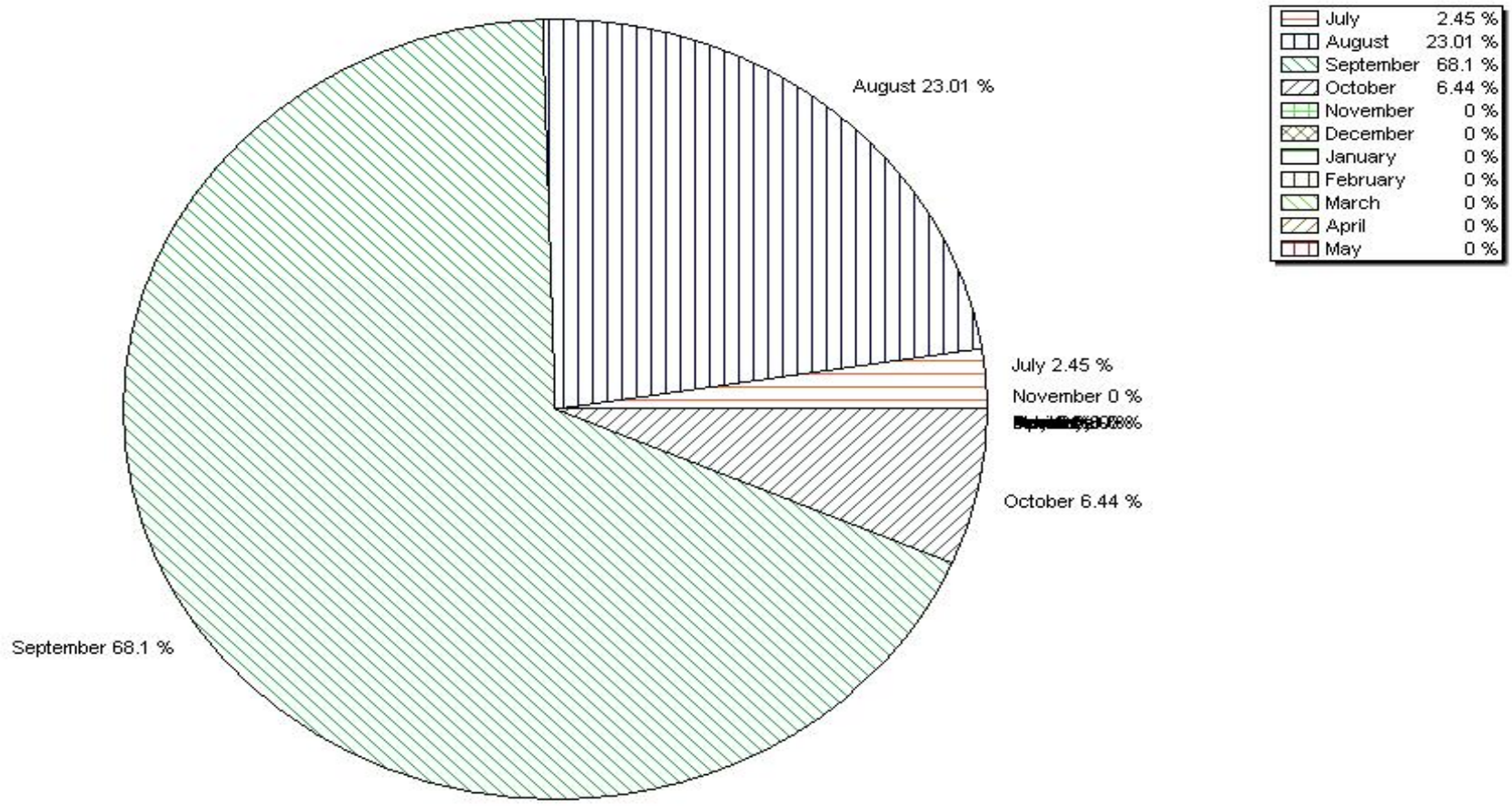
Local River : Sabarmati **Sub-Division : N.W.R.Sub Div., Himatnagar**



Monthly Runoff for the Year : 2011-2012

Station Name : Sabarmati at Derol Bridge (01 02 12 006)
Local River : Sabarmati

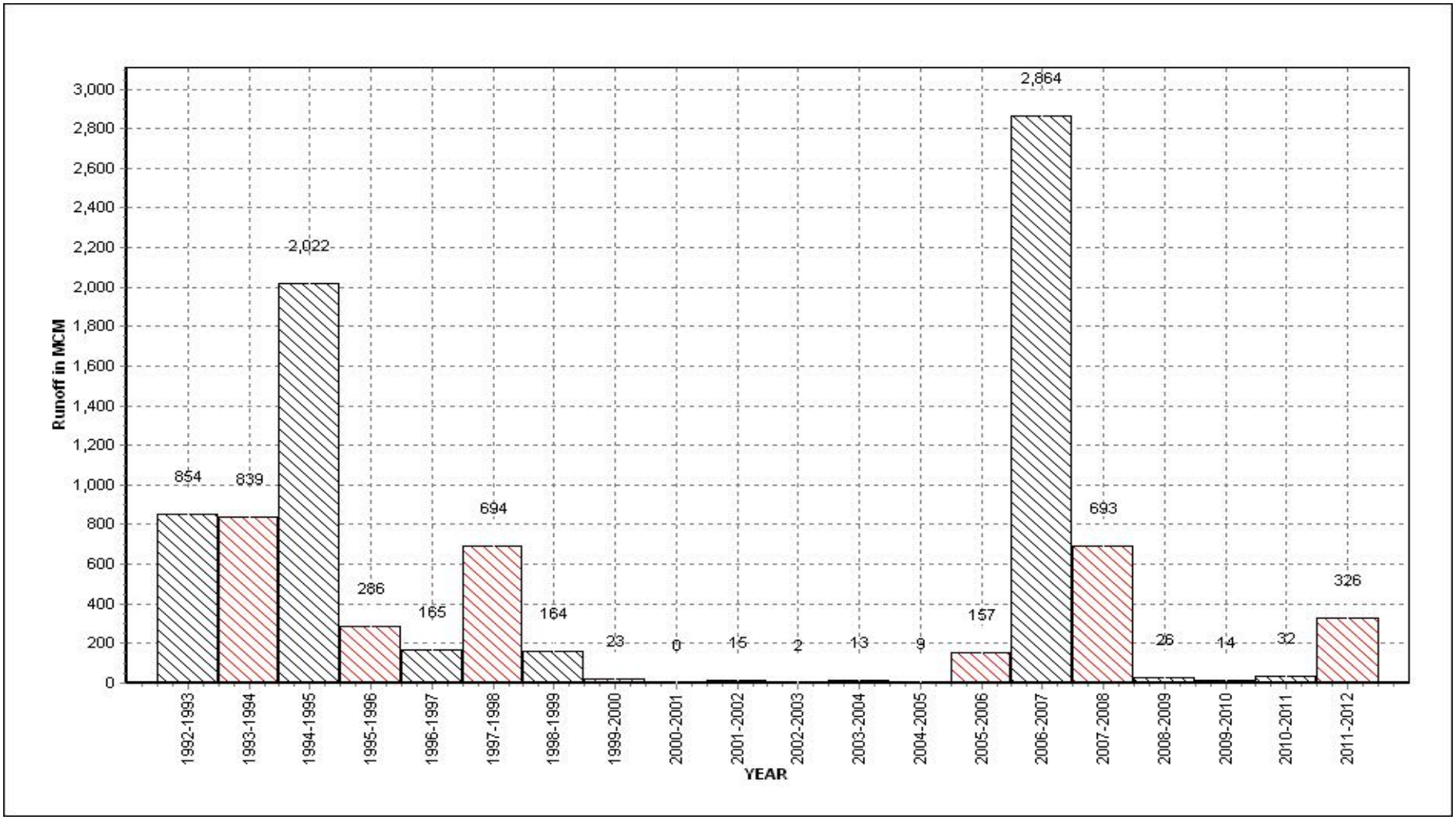
Division : Mahi Division, Gandhinagar
Sub-Division : N.W.R.Sub Div., Himatnagar



Annual Runoff Values for the period: 1992 - 2012

Station Name : Sabarmati at Derol Bridge (01 02 12 006)
Local River : Sabarmati

Division : Mahi Division, Gandhinagar
Sub-Division : N.W.R.Sub Div., Himatnagar



Note: Missing values have not been considered while arriving at Annual Runoff

Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Sabarmati at Derol Bridge (01 02 12 006) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : N.W.R.Sub Div., Himatnagar**



Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Sabarmati at Derol Bridge (01 02 12 006) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : N.W.R.Sub Div., Himatnagar**

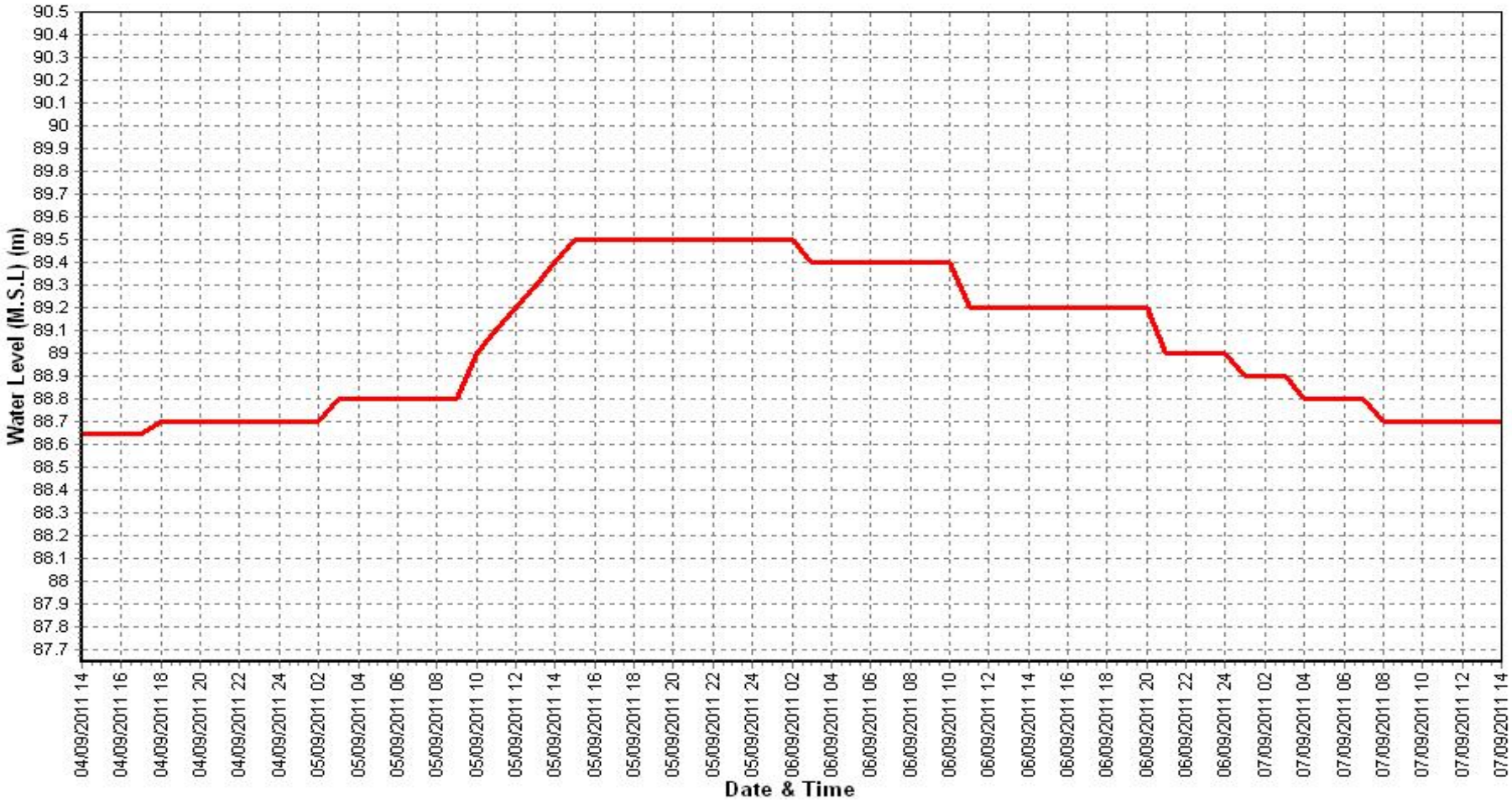


Time Span: 72 Hrs

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Sabarmati at Derol Bridge (01 02 12 006) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : N.W.R.Sub Div., Himatnagar**



Time Span: 72 Hrs

HISTORY SHEET

			Water Year	**:**	**2011-2012**
Site	**:**	**Sabarmati at Kheroj**	**Code**	**:**	**01 02 12 003**
State	:	Gujarat	District		Sabarkantha
Basin	:	Sabarmati	Independent River	:	Sabarmati
Tributary	:	Sabarmati	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Sabarmati
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	N.W.R.Sub Div., Himatnagar
Drainage Area	:	3650 Sq. Km.	Bank	:	Left
Latitude	:	24°13'45"N	Longitude	:	73°00'26"E
Zero of Gauge (m)	:	0 (A)	01/01/1981	-	31/12/1987
		211.68 (m.s.l)	01/01/1988	-	30/06/1993
		210.5 (m.s.l)	01/07/1993	-	16/07/2003
		208 (m.s.l)	17/07/2003	-	
		Opening Date	Closing Date		
Gauge	:	01/06/1981			
Discharge	:	22/06/1992			
Sediment	:	--			
Water Quality	:	--			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1992-1993	325.0	213.880	08/09/1992	0.000	River Dry	19/03/1993
1993-1994	653.4	215.180	17/07/1993	0.000	River Dry	26/01/1994
1994-1995	790.2	215.000	20/08/1994	0.000	211.830	03/04/1995
1995-1996	164.5	213.170	31/07/1995	0.000	211.600	31/01/1996
1996-1997	470.7	214.060	11/09/1996	0.000	River Dry	20/12/1996
1997-1998	401.0	213.475	25/06/1997	0.000	211.760	26/01/1998
1998-1999	229.3	211.680	27/08/1998	0.000	River Dry	23/05/1999
1999-2000	23.70	212.455	21/07/1999	0.000	River Dry	20/11/1999
2000-2001	30.63	212.500	02/07/2000	0.000	River Dry	29/01/2001
2001-2002	118.5	213.440	14/06/2001	0.000	River Dry	28/01/2002
2002-2003	148.5	212.800	02/09/2002	0.000	River Dry	24/11/2002
2003-2004	265.8	210.950	29/07/2003	0.000	River Dry	14/01/2004
2004-2005	87.18	210.650	08/08/2004	0.000	River Dry	09/05/2005
2005-2006	955.1	213.250	02/08/2005	0.000	River Dry	01/06/2005
2006-2007	1402	215.450	01/06/2006	0.000	River Dry	01/06/2006
2007-2008	619.4	212.850	09/07/2007	0.000	208.600	01/06/2007
2008-2009	205.3	210.875	12/08/2008	0.000	River Dry	01/06/2008
2009-2010	270.9	211.335	23/07/2009	0.000	River Dry	01/06/2009
2010-2011	224.03	211.115	31/08/2010	0.000	River Dry	01/06/2010
2011-2012	441.8	212.090	12/09/2011	0.000	River Dry	22/04/2012

Stage-Discharge Data for the period 2011 - 2012

Station Name : Sabarmati at Kheroj (01 02 12 003) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : N.W.R.Sub Div., Himatnagar**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	R Dry	0.000	R Dry	0.000	209.790	18.11	210.470	82.24	210.220	48.77 *	209.890	14.02
2	R Dry	0.000	R Dry	0.000	209.760	15.19	210.470	81.78	210.200	46.39 *	209.880	12.38
3	R Dry	0.000	R Dry	0.000	209.740	13.81	210.400	76.15	210.180	53.53	209.870	11.86
4	R Dry	0.000	R Dry	0.000	209.720	12.45	210.400	72.00 *	210.160	39.59 #	209.860	10.63
5	R Dry	0.000	R Dry	0.000	209.890	19.67	210.750	154.0	210.140	47.74	209.860	9.991
6	R Dry	0.000	R Dry	0.000	209.850	18.33	210.460	81.72	210.140	39.59 *	209.860	14.29 *
7	R Dry	0.000	R Dry	0.000	209.780	9.160 *	210.400	80.58	210.130	39.06	209.860	14.29 *
8	R Dry	0.000	R Dry	0.000	209.710	10.93	210.740	151.8	210.120	30.15	209.860	14.29 *
9	R Dry	0.000	R Dry	0.000	209.690	9.967	210.630	134.5	210.090	34.27 *	209.860	14.29 *
10	R Dry	0.000	R Dry	0.000	211.475	291.2 #	210.520	90.05	210.080	26.21	209.850	13.39 *
11	R Dry	0.000	R Dry	0.000	210.345	69.64	211.680	328.6	210.070	25.06	209.850	13.39 *
12	R Dry	0.000	R Dry	0.000	210.210	53.33	212.090	441.8	210.060	26.68	209.840	9.535
13	R Dry	0.000	R Dry	0.000	211.125	222.3	211.310	274.8	210.060	26.74	209.830	12.25 *
14	R Dry	0.000	R Dry	0.000	210.635	133.2	210.940	170.0	210.050	25.76	209.830	9.123
15	R Dry	0.000	208.660	0.000 *	210.290	58.03	210.750	135.7	210.040	24.67	209.830	9.111
16	R Dry	0.000	208.900	0.000 *	211.140	231.9	210.660	122.0	210.040	29.30 *	209.820	8.331
17	R Dry	0.000	208.900	0.000 *	210.695	147.5	210.580	104.8	210.030	22.20	209.820	8.009
18	R Dry	0.000	208.870	0.000 *	210.490	88.08	210.730	125.9 *	210.020	21.57	209.810	7.737
19	R Dry	0.000	208.870	0.000 *	210.280	76.89	210.620	112.8	210.000	20.74	209.800	7.488
20	R Dry	0.000	208.860	0.000 *	210.230	65.76	210.550	97.90	209.980	18.51	209.800	10.35 *
21	R Dry	0.000	208.860	0.000 *	210.270	54.92 *	210.490	87.07	209.970	17.89	209.790	7.318
22	R Dry	0.000	208.850	0.000 *	210.310	60.08 *	210.430	76.89	209.960	17.18	209.790	7.225
23	R Dry	0.000	208.850	0.000 *	210.180	52.27	210.390	70.38	209.960	22.66 *	209.780	7.063
24	R Dry	0.000	208.850	0.000 *	210.170	46.15	210.350	67.20	209.950	16.37	209.780	6.953
25	R Dry	0.000	208.840	0.000 *	210.170	39.60	210.320	61.40 *	209.940	15.61	209.770	7.080
26	R Dry	0.000	208.860	0.000 *	210.355	77.46	210.310	66.22	209.930	19.57 *	209.770	6.635
27	R Dry	0.000	208.920	0.000 *	210.280	71.12	210.300	63.13	209.930	15.37	209.770	8.580 *
28	R Dry	0.000	210.100	44.95	210.390	80.22	210.280	58.99	209.930	15.03	209.760	6.403
29	R Dry	0.000	209.875	20.47	210.290	76.44	210.260	55.92	209.920	14.50	209.760	6.381
30	R Dry	0.000	209.990	24.72	210.620	125.7	210.240	53.62	209.920	18.77 *	209.760	6.274
31			209.900	22.17	210.745	159.8			209.910	13.98		
Ten-Daily Mean												
I Ten-Daily		0.000			209.941	41.89	210.524	100.5	210.146	40.53	209.865	12.94
II Ten-Daily		0.000	208.843	0.000	210.544	114.7	210.991	191.4	210.035	24.12	209.823	9.532
III Ten-Daily		0.000	209.263	10.21	210.344	76.71	210.337	66.08	209.938	16.99	209.773	6.991
Monthly												
Min.		0.000	208.660	0.000	209.690	9.160	210.240	53.62	209.910	13.98	209.760	6.274
Max.		0.000	210.100	44.95	211.475	291.2	212.090	441.8	210.220	53.53	209.890	14.29
Mean		0	209.115	6.606	210.278	77.72	210.617	119.3	210.036	26.89	209.820	9.822

Annual Runoff in MCM = 636 Annual Runoff in mm = 174

Peak Observed Discharge = 441.8 cumecs on 12/09/2011 Corres. Water Level :212.09 m

Lowest Observed Discharge = 0.000 cumecs on 01/06/2011

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Sabarmati at Kheroj (01 02 12 003) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : N.W.R.Sub Div., Himatnagar**

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	209.750	7.490 *	209.600	1.480 *	209.500	0.000 *	209.420	0.000 *	R Dry	0.000	R Dry	0.000
2	209.750	7.490 *	209.590	1.974	209.500	0.000 *	209.410	0.000 *	R Dry	0.000	R Dry	0.000
3	209.740	5.729	209.580	1.729	209.500	0.000 *	209.410	0.000 *	R Dry	0.000	R Dry	0.000
4	209.740	6.970 *	209.570	0.790 #	209.490	0.000 *	209.410	0.000 *	R Dry	0.000	R Dry	0.000
5	209.730	5.478 #	209.560	1.278	209.490	0.000 *	209.410	0.000 *	R Dry	0.000	R Dry	0.000
6	209.730	6.460 *	209.560	0.600 *	209.490	0.000 *	209.400	0.000 *	R Dry	0.000	R Dry	0.000
7	209.720	5.213	209.560	0.600 *	209.490	0.000 *	209.400	0.000 *	R Dry	0.000	R Dry	0.000
8	209.720	5.970 #	209.560	0.600 *	209.480	0.000 *	209.390	0.000 *	R Dry	0.000	R Dry	0.000
9	209.710	4.777	209.550	0.430 *	209.480	0.000 *	209.390	0.000 *	R Dry	0.000	R Dry	0.000
10	209.700	4.480	209.550	0.430 *	209.480	0.000 *	209.390	0.000 *	R Dry	0.000	R Dry	0.000
11	209.700	5.050 *	209.540	0.290 *	209.480	0.000 *	209.380	0.000 *	R Dry	0.000	R Dry	0.000
12	209.690	4.229	209.540	0.290 *	209.480	0.000 *	209.380	0.000 *	R Dry	0.000	R Dry	0.000
13	209.690	4.081	209.540	0.290 *	209.470	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
14	209.680	3.835	209.540	0.290 *	209.470	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
15	209.680	3.714	209.540	0.290 *	209.470	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
16	209.670	3.479	209.530	0.180 *	209.470	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
17	209.670	3.372	209.530	0.180 *	209.460	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
18	209.670	3.780 *	209.530	0.180 *	209.460	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
19	209.660	3.176	209.530	0.180 *	209.460	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
20	209.660	3.100	209.520	0.090 *	209.460	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
21	209.650	2.959	209.520	0.090 *	209.450	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
22	209.650	2.607	209.520	0.090 *	209.450	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
23	209.640	2.680 #	209.520	0.090 *	209.450	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
24	209.630	2.350 #	209.510	0.000 *	209.440	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
25	209.630	2.350 *	209.510	0.000 *	209.440	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
26	209.620	2.135	209.510	0.000 *	209.440	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
27	209.620	3.299	209.510	0.000 *	209.430	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
28	209.610	2.757	209.510	0.000 *	209.430	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
29	209.610	2.672	209.500	0.000 *	209.430	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
30	209.600	1.480 *	209.500	0.000 *			R Dry	0.000	R Dry	0.000	R Dry	0.000
31	209.600	1.480 *	209.500	0.000 *			R Dry	0.000			R Dry	0.000
Ten-Daily Mean												
I Ten-Daily	209.729	6.006	209.568	0.991	209.490	0.000	209.403	0.000		0.000		0.000
II Ten-Daily	209.677	3.782	209.534	0.226	209.468	0.000	209.380	0.000		0.000		0.000
III Ten-Daily	209.624	2.434	209.510	0.025	209.440	0.000		0.000		0.000		0.000
Monthly												
Min.	209.600	1.480	209.500	0.000	209.430	0.000	209.380	0.000		0.000		0.000
Max.	209.750	7.490	209.600	1.974	209.500	0.000	209.420	0.000		0.000		0.000
Mean	209.675	4.021	209.536	0.401	209.467	0	209.399	0		0		0

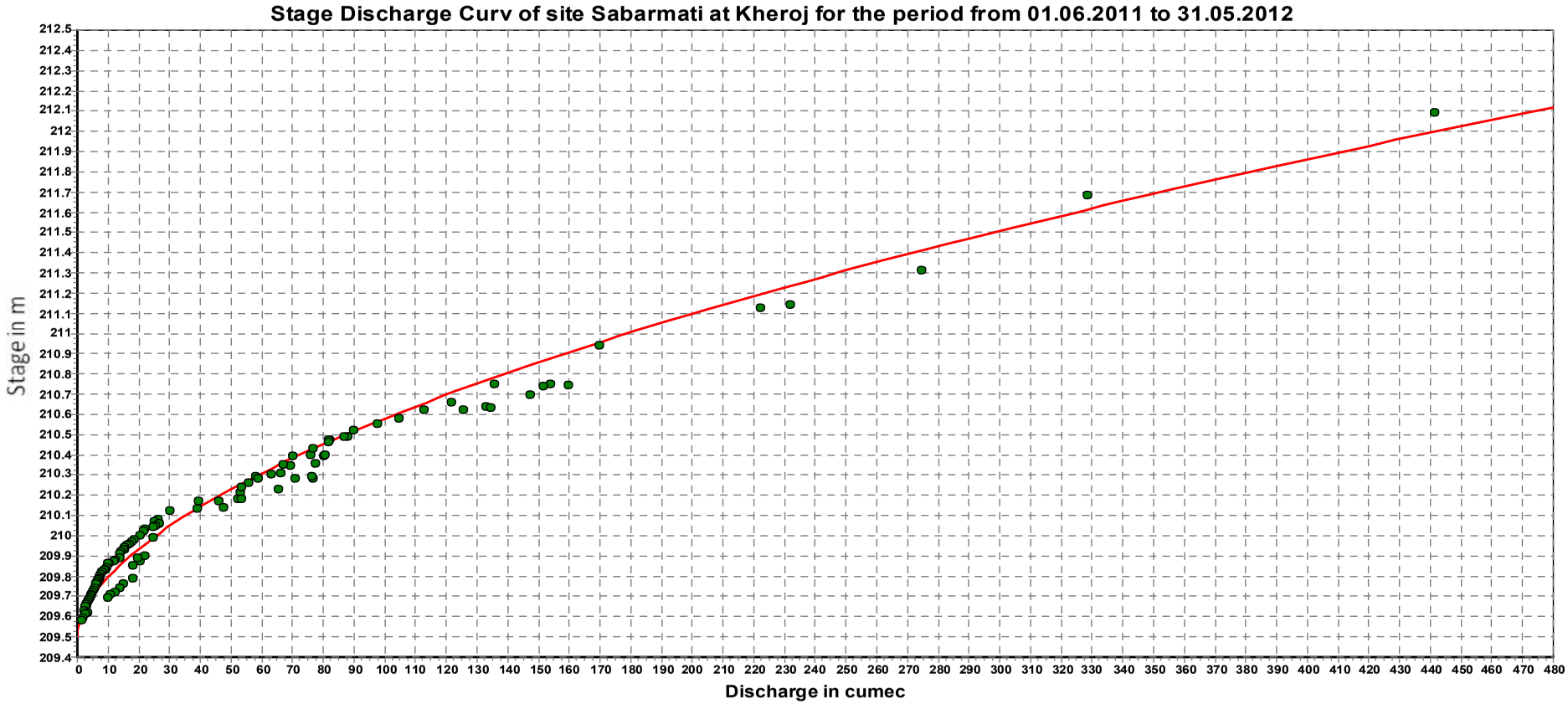
Peak Computed Discharge = 125.9 cumecs on 18/09/2011 **Corres. Water Level :210.73 m**

Lowest Computed Discharge = 0.000 cumecs on 15/07/2011 **Corres. Water Level :208.66 m**

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff



Procedure : Standard

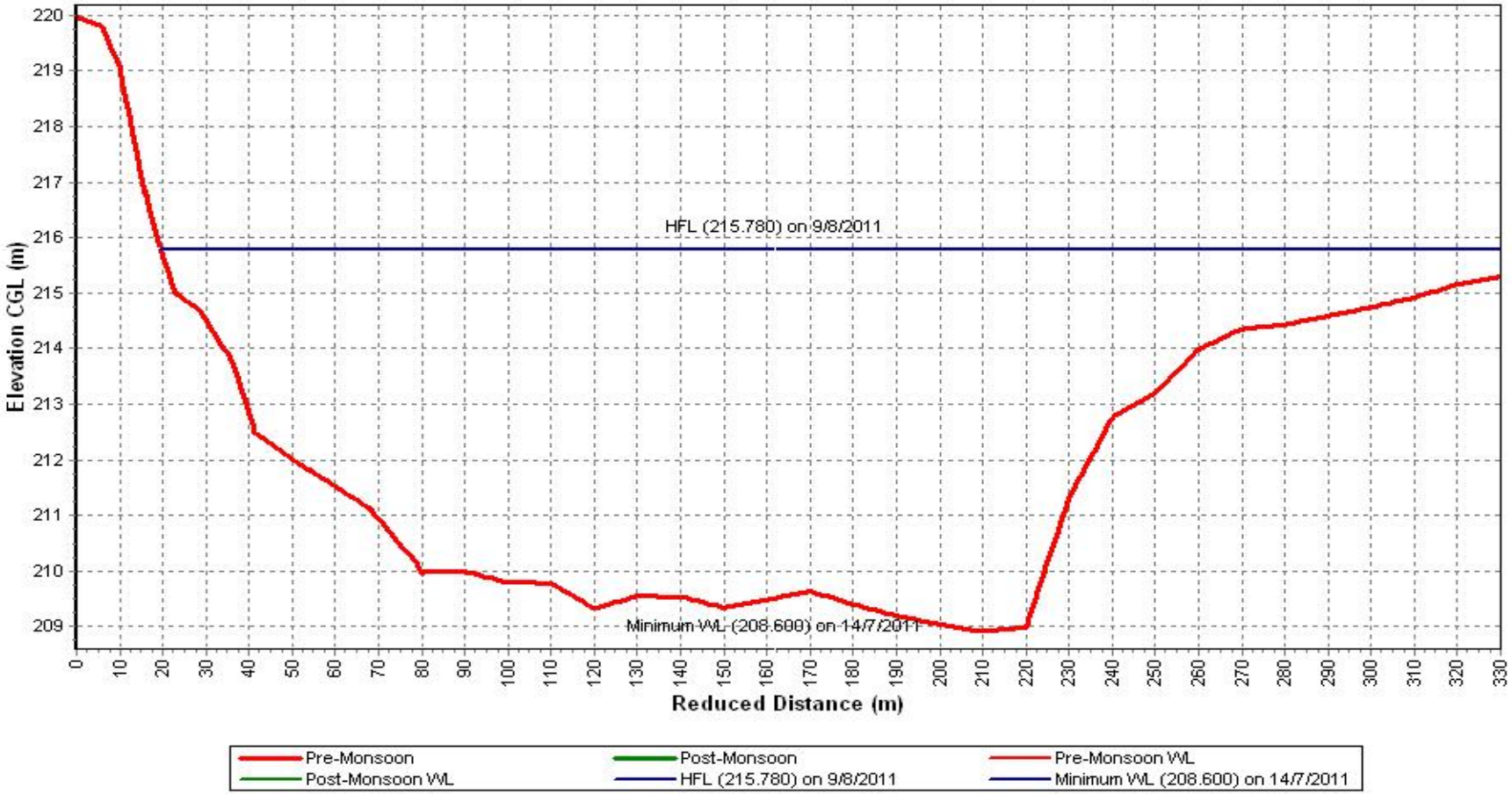
Equation type: Power

Q = c (h+a)^b, a = -209.5, b = 1.771, c = 87.255

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Sabarmati at Kheroj (01 02 12 003) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : N.W.R.Sub Div., Himatnagar**

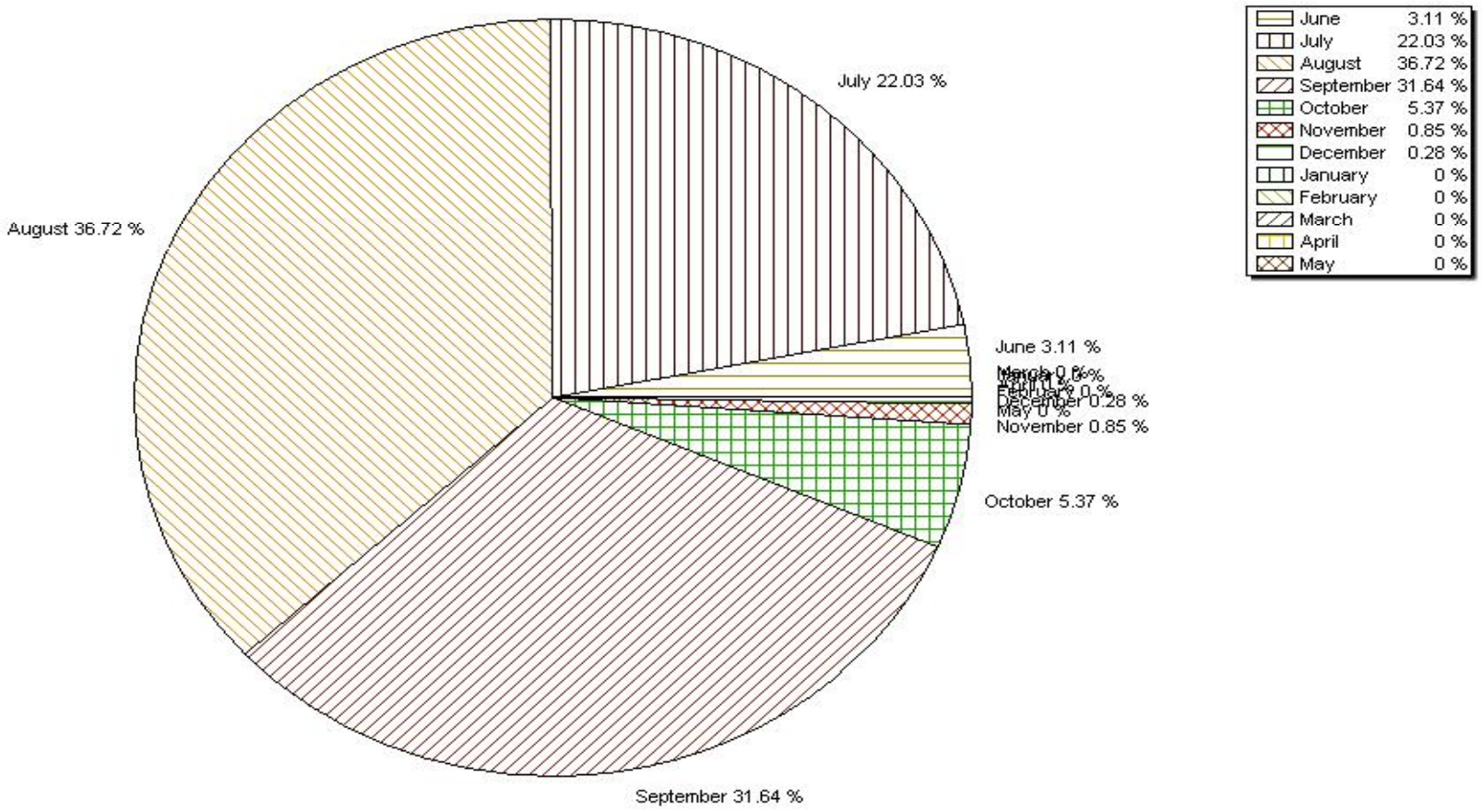


Historic Flood Level-218.0m on 20.08.2006 at 0600hrs

Monthly Average Runoff based on period : 1992-2011

Station Name : Sabarmati at Kheroj (01 02 12 003)
Local River : Sabarmati

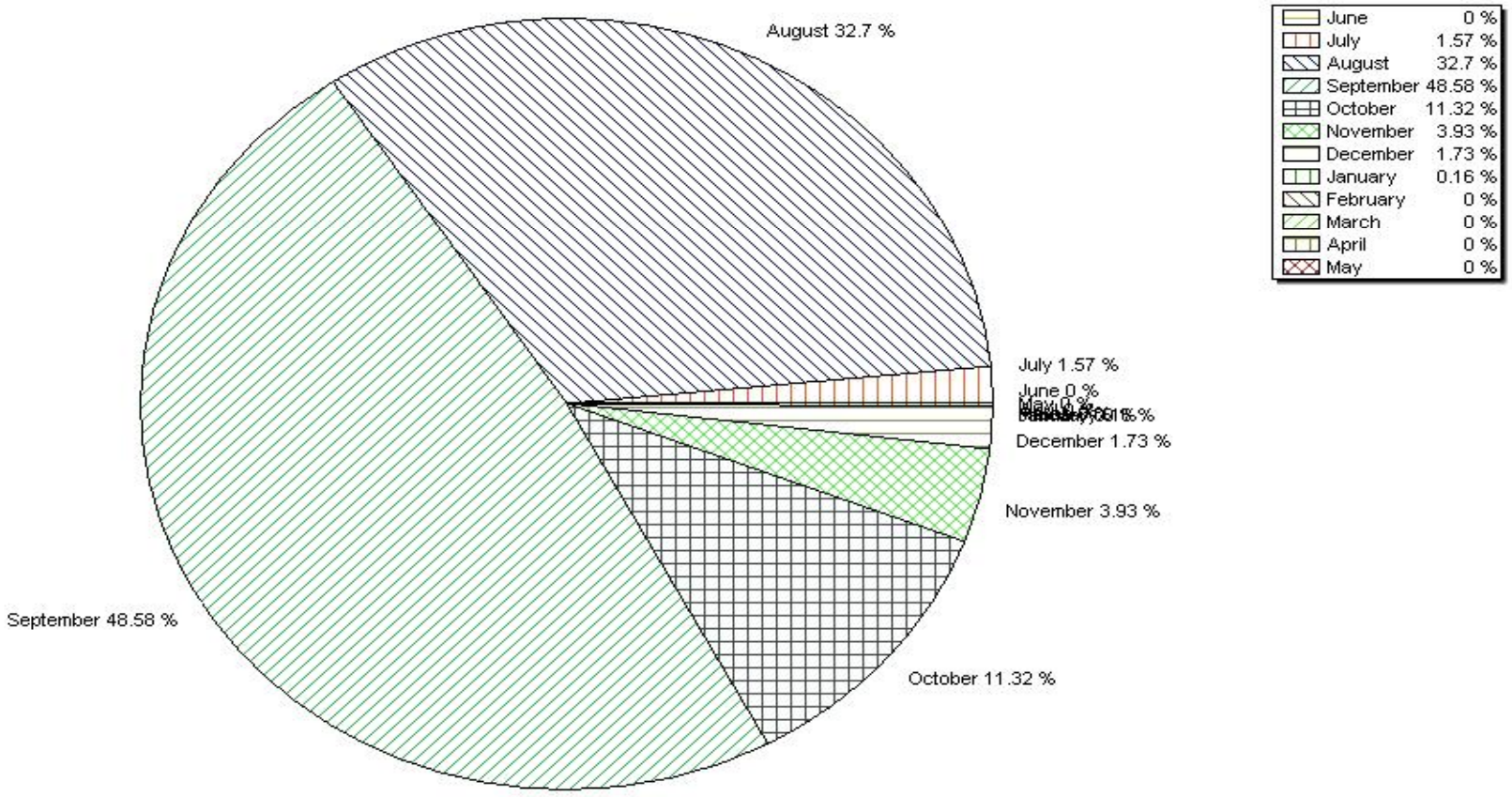
Division : Mahi Division, Gandhinagar
Sub-Division : N.W.R.Sub Div., Himatnagar



Monthly Runoff for the Year : 2011-2012

Station Name : Sabarmati at Kheroj (01 02 12 003)
Local River : Sabarmati

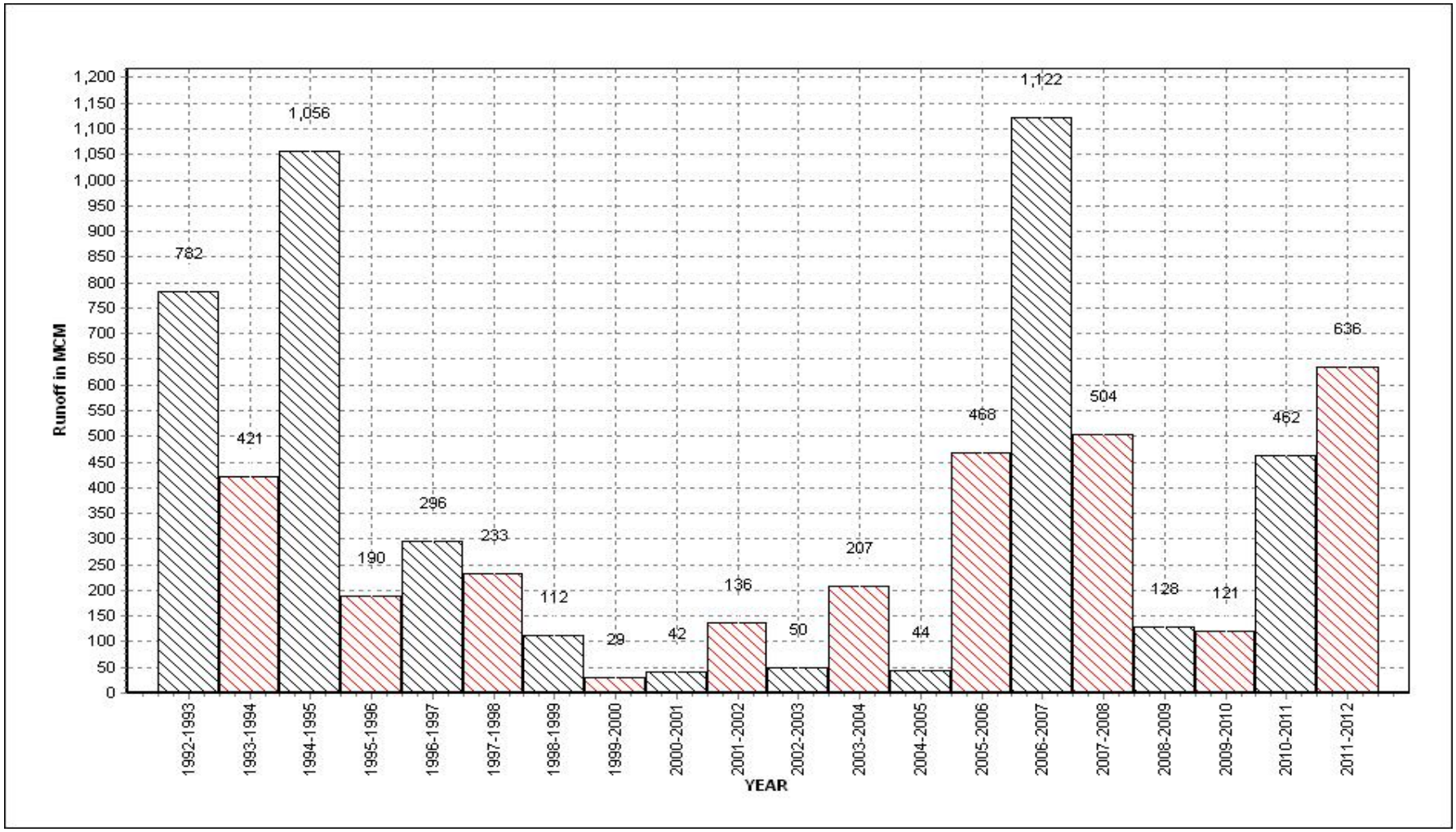
Division : Mahi Division, Gandhinagar
Sub-Division : N.W.R.Sub Div., Himatnagar



Annual Runoff Values for the period: 1992 - 2012

Station Name : Sabarmati at Kheroj (01 02 12 003)
Local River : Sabarmati

Division : Mahi Division, Gandhinagar
Sub-Division : N.W.R.Sub Div., Himatnagar

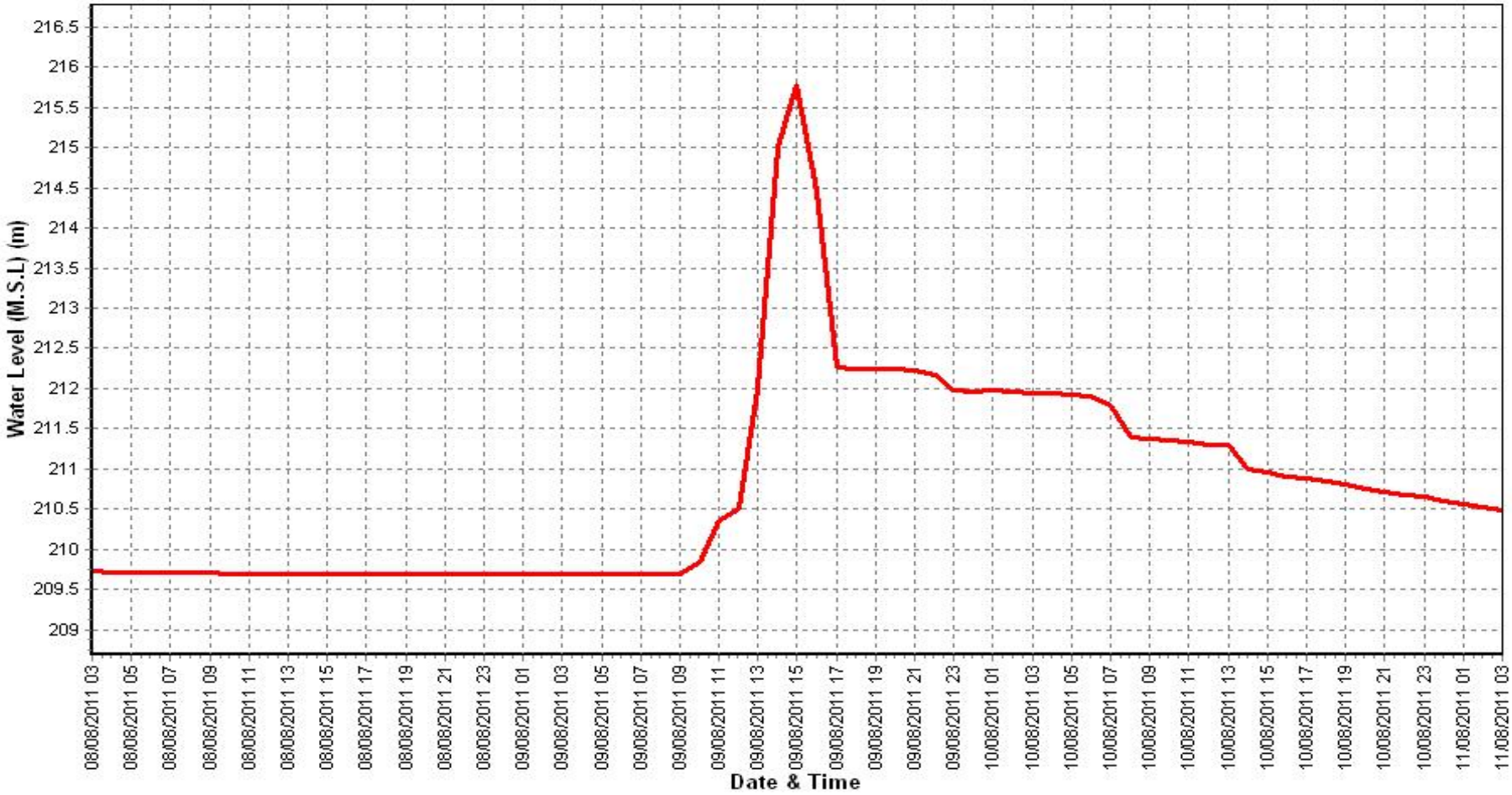


Note: Missing values have not been considered while arriving at Annual Runoff

Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Sabarmati at Kheroj (01 02 12 003) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : N.W.R.Sub Div., Himatnagar**



Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Sabarmati at Kheroj (01 02 12 003) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : N.W.R.Sub Div., Himatnagar**

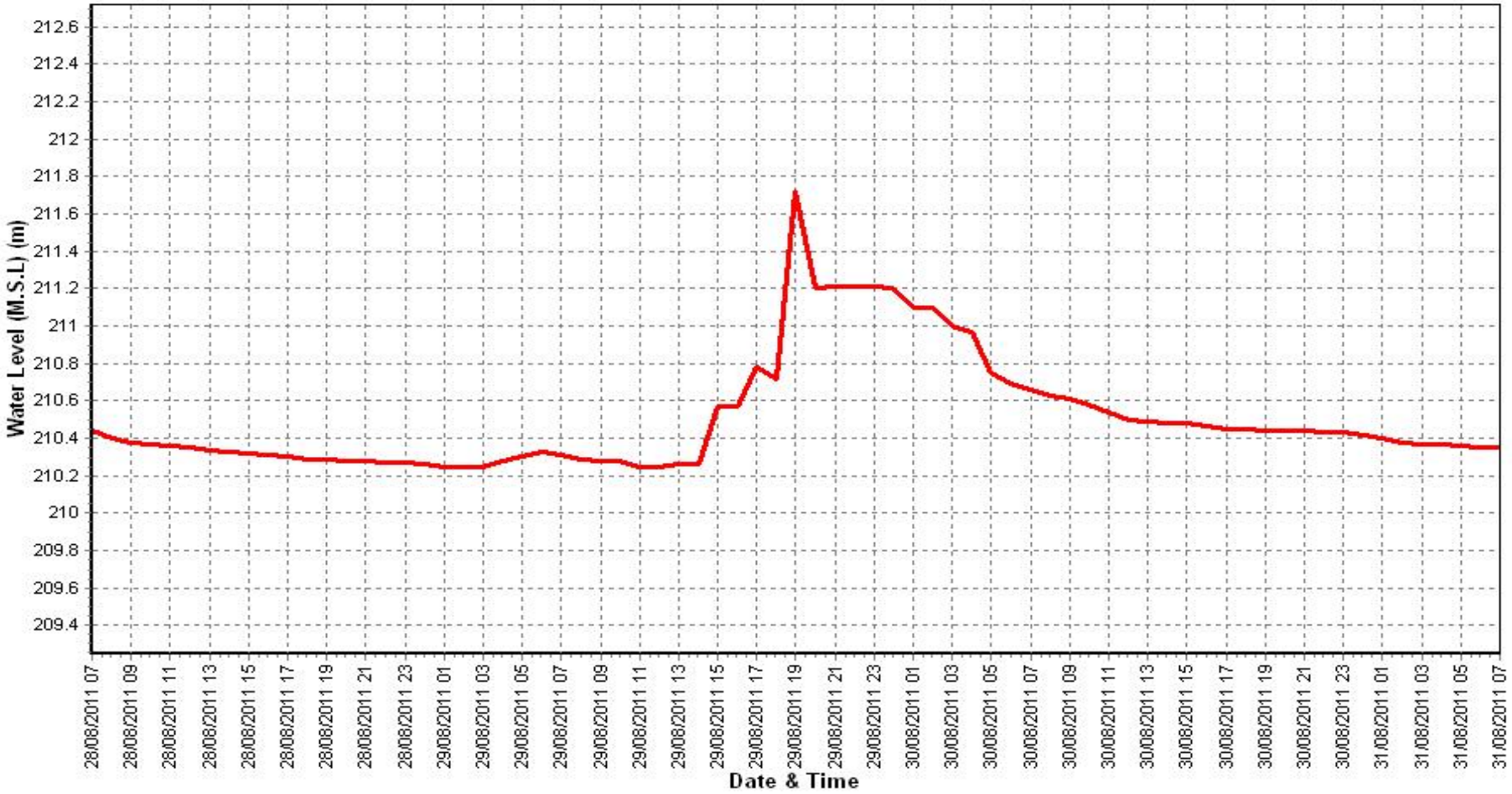


Time Span: 72 Hrs

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Sabarmati at Kheroj (01 02 12 003) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : N.W.R.Sub Div., Himatnagar**



Time Span: 72 Hrs

HISTORY SHEET

			Water Year	**:**	**2011-2012**
Site	**:**	**Wakal at Kotra(Jotasan)**	**Code**	**:**	**01 02 12 001**
State	:	Gujarat	District		Sabarkantha
Basin	:	Sabarmati	Independent Rive	:	Sabarmati
Tributary	:	Wakal	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Wakal
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	N.W.R.Sub Div., Himatnagar
Drainage Area	:	1421 Sq. Km.	Bank	:	Left
Latitude	:	24°21'20"N	Longitude	:	73°10'05" E
Zero of Gauge (m)	:	0 (A)(Kotra)	01/06/1979	-	31/05/1987
		200 (m.s.l)(Kotra)	01/06/1987	-	03/08/1995
		199 (m.s.l)(Jotasan)	04/08/1995	-	31/05/2002
		285 (m.s.l)(Jotasan)	01/06/2002	-	
		Opening Date	Closing Date		
Gauge	:	03/07/1979(Kotra) 14/06/95(Jotasan)			
Discharge	:	14/06/1995(Jotasan)			
Sediment	:	--			
Water Quality	:	--			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1995-1996	45.00	200.380	03/09/1995	0.000	River Dry	26/01/1996
1996-1997	49.60	200.820	11/09/1996	0.000	199.040	26/01/1997
1997-1998	49.20	200.850	02/08/1997	0.000	River Dry	01/06/1997
1998-1999	19.60	200.500	19/09/1998	0.000	199.090	29/10/1998
1999-2000	24.30	200.380	20/07/1999	0.000	River Dry	02/01/2000
2000-2001	14.65	200.830	14/07/2000	0.000	River Dry	04/12/2000
2001-2002	29.40	200.340	12/08/2001	0.000	River Dry	20/01/2002
2002-2003	49.00	287.590	02/09/2002	0.000	River Dry	10/05/2003
2003-2004	62.00	287.500	29/07/2003	0.000	River Dry	03/04/2004
2004-2005	82.50	287.360	08/08/2004	0.000	River Dry	06/02/2005
2005-2006	93.13	287.590	26/09/2005	0.000	River Dry	01/06/2005
2006-2007	1340	291.550	20/08/2006	0.000	River Dry	01/06/2006
2007-2008	267.1	288.325	09/07/2007	0.000	River Dry	01/06/2007
2008-2009	80.03	287.435	05/08/2008	0.000	River Dry	01/06/2008
2009-2010	113.7	287.835	23/07/2009	0.000	River Dry	01/06/2009
2010-2011	210.1	288.325	25/07/2010	0.000	River Dry	01/06/2010
2011-2012	291.7	288.700	12/09/2011	0.000	River Dry	01/06/2011

Stage-Discharge Data for the period 2011 - 2012

Station Name : Wakal at Kotra(Jotasan) (01 02 12 001) **Division : Mahi Division, Gandhinagar**

Local River : Wakal **Sub-Division : N.W.R.Sub Div., Himatnagar**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	R Dry	0.000	R Dry	0.000	286.750	3.878	287.270	27.97	287.080	17.07	286.760	5.831
2	R Dry	0.000	R Dry	0.000	286.710	3.649	287.225	25.97	287.070	16.65	286.750	5.637
3	R Dry	0.000	R Dry	0.000	286.680	1.692	287.190	21.60	287.060	15.79	286.740	5.285
4	R Dry	0.000	R Dry	0.000	287.115	17.65	287.170	20.83	287.050	15.80	286.730	5.158
5	R Dry	0.000	R Dry	0.000	286.710	3.629	287.285	34.12	287.040	15.11	286.720	4.741
6	R Dry	0.000	R Dry	0.000	286.650	1.321	287.230	29.21	287.030	13.86	286.710	3.867 *
7	R Dry	0.000	R Dry	0.000	286.620	2.211 *	287.210	24.54	287.020	14.57	286.710	3.867 *
8	R Dry	0.000	R Dry	0.000	286.600	1.916 *	287.425	48.92	287.010	14.21	286.700	4.413
9	R Dry	0.000	R Dry	0.000	287.185	22.53	287.380	39.19	286.990	13.39	286.690	4.269
10	R Dry	0.000	R Dry	0.000	287.825	137.4	287.350	34.49	286.970	12.80	286.680	3.252 *
11	R Dry	0.000	286.800	6.094	287.100	18.78	287.750	115.1	286.950	12.32	286.670	3.923
12	R Dry	0.000	286.800	6.291	287.065	16.03	288.700	291.7	286.940	11.82	286.660	3.662
13	R Dry	0.000	286.660	2.878 *	287.285	33.21	287.670	101.2	286.930	11.81	286.660	2.878 *
14	R Dry	0.000	286.560	1.403 *	287.225	27.96	287.475	52.66	286.920	10.43	286.650	3.168
15	R Dry	0.000	286.530	1.080 *	287.140	19.79	287.390	40.84	286.910	10.34	286.640	2.964
16	R Dry	0.000	286.780	5.032	287.410	43.85	287.310	31.27	286.830	7.015 *	286.630	2.819
17	R Dry	0.000	286.785	5.279	287.315	30.94	287.280	30.08	286.890	9.905	286.630	2.782
18	R Dry	0.000	286.955	10.20	287.195	21.28	287.330	32.41	286.880	9.772	286.620	2.684
19	R Dry	0.000	286.900	8.250	287.120	16.91	287.285	31.46	286.870	9.137	286.620	2.643
20	R Dry	0.000	286.850	6.752	287.070	15.69	287.255	29.30	286.850	8.362	286.620	2.211 *
21	R Dry	0.000	286.790	5.327	287.070	15.87	287.225	27.41	286.840	7.644	286.610	2.342
22	R Dry	0.000	286.740	3.932	287.185	19.86	287.190	22.10	286.830	7.420	286.610	2.159
23	R Dry	0.000	286.660	2.878 *	287.075	15.89	287.170	20.95	286.830	7.015 *	286.600	2.032
24	R Dry	0.000	286.610	2.060 *	287.040	12.93	287.160	19.71	286.820	7.159	286.600	1.911
25	R Dry	0.000	286.750	4.791 *	287.000	11.93	287.130	18.87	286.810	7.015	286.590	1.700
26	R Dry	0.000	286.835	6.934	287.280	33.72	287.120	18.60	286.810	6.410 *	286.590	1.701
27	R Dry	0.000	286.700	3.649	287.185	20.41	287.110	18.38	286.790	5.839 *	286.580	1.648 *
28	R Dry	0.000	286.880	8.281	287.195	20.51	287.100	18.09	286.790	6.750	286.580	1.464
29	R Dry	0.000	287.550	66.90	287.140	19.66	287.100	17.81	286.780	6.412	286.580	1.437
30	R Dry	0.000	287.035	12.21	287.315	30.48	287.080	17.13	286.780	5.565 *	286.570	1.349
31			286.800	6.447	287.345	33.00			286.770	6.146		
Ten-Daily Mean												
I Ten-Daily		0.000		0.000	286.884	19.59	287.273	30.68	287.032	14.93	286.719	4.632
II Ten-Daily		0.000	286.762	5.326	287.193	24.44	287.544	75.59	286.897	10.09	286.640	2.973
III Ten-Daily		0.000	286.850	11.22	287.166	21.30	287.139	19.91	286.805	6.670	286.591	1.774
Monthly												
Min.		0.000	286.530	0.000	286.600	1.321	287.080	17.13	286.770	5.565	286.570	1.349
Max.		0.000	287.550	66.90	287.825	137.4	288.700	291.7	287.080	17.07	286.760	5.831
Mean		0	286.808	5.699	287.084	21.76	287.319	42.06	286.908	10.44	286.650	3.127

Annual Runoff in MCM = 220 Annual Runoff in mm = 155

Peak Observed Discharge = 291.7 cumecs on 12/09/2011 Corres. Water Level :288.7 m

Lowest Observed Discharge = 0.000 cumecs on 01/06/2011

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Wakal at Kotra(Jotasan) (01 02 12 001) **Division : Mahi Division, Gandhinagar**

Local River : Wakal **Sub-Division : N.W.R.Sub Div., Himatnagar**

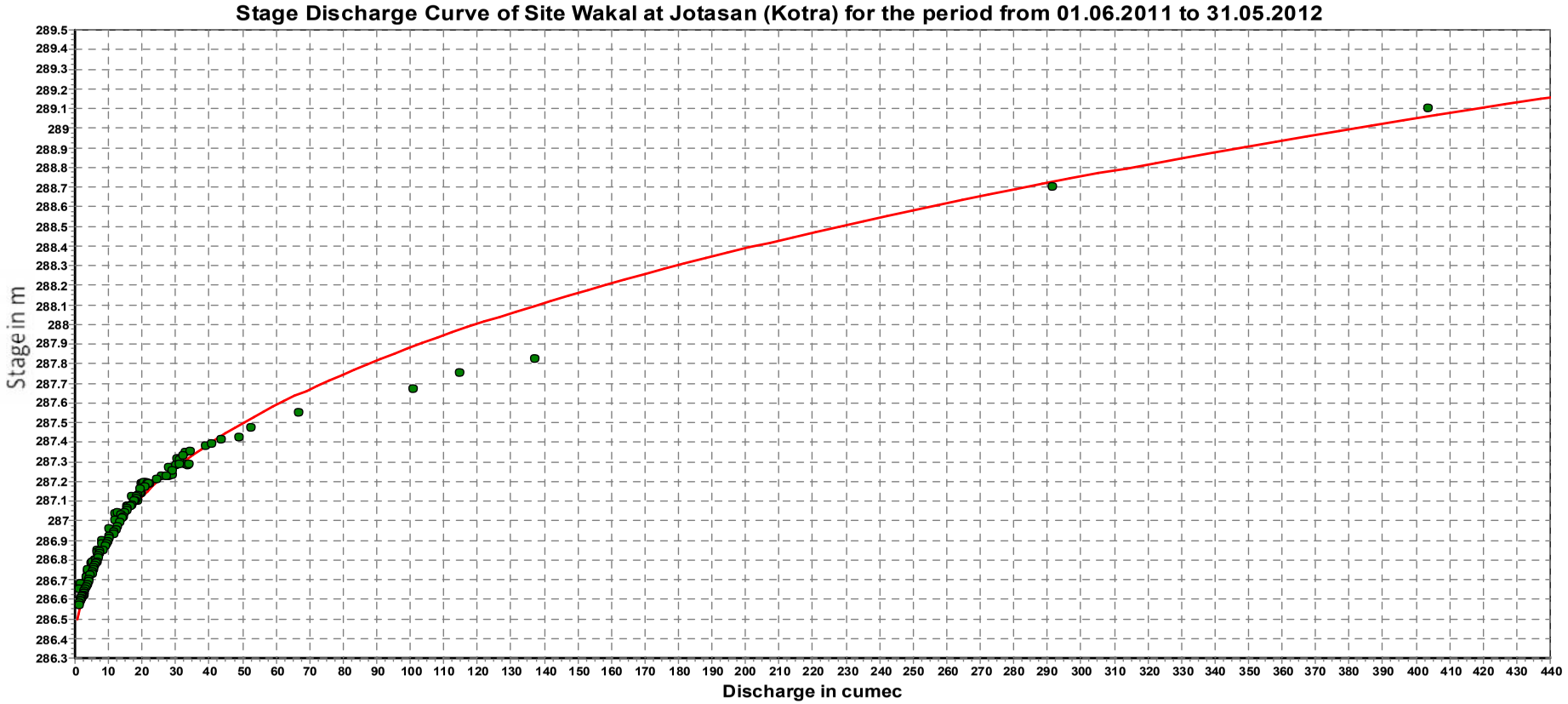
Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	286.570	1.520 *	286.520	0.000 *	286.500	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
2	286.570	1.520 *	286.520	0.000 *	286.500	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
3	286.570	1.520 *	286.520	0.000 *	286.500	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
4	286.560	1.400 *	286.520	0.000 *	286.500	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
5	286.560	1.400 *	286.520	0.000 *	286.500	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
6	286.560	1.400 *	286.520	0.000 *	286.490	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
7	286.560	1.400 *	286.520	0.000 *	286.490	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
8	286.550	1.290 *	286.520	0.000 *	286.490	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
9	286.550	1.290 *	286.510	0.000 *	286.490	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
10	286.550	1.290 *	286.510	0.000 *	286.490	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
11	286.550	1.290 *	286.510	0.000 *	286.490	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
12	286.550	1.290 *	286.510	0.000 *	286.490	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
13	286.550	1.290 *	286.510	0.000 *	286.490	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
14	286.550	1.290 *	286.510	0.000 *	286.490	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
15	286.540	0.000 *	286.510	0.000 *	286.490	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
16	286.540	0.000 *	286.510	0.000 *	286.490	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
17	286.540	0.000 *	286.510	0.000 *	286.480	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
18	286.540	0.000 *	286.510	0.000 *	286.480	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
19	286.540	0.000 *	286.510	0.000 *	286.480	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
20	286.530	0.000 *	286.510	0.000 *	286.480	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
21	286.530	0.000 *	286.500	0.000 *	286.480	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
22	286.530	0.000 *	286.500	0.000 *	286.480	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
23	286.530	0.000 *	286.500	0.000 *	286.480	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
24	286.530	0.000 *	286.500	0.000 *	286.480	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
25	286.530	0.000 *	286.500	0.000 *	286.480	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
26	286.520	0.000 *	286.500	0.000 *	286.480	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
27	286.520	0.000 *	286.500	0.000 *	286.470	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
28	286.520	0.000 *	286.500	0.000 *	286.470	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
29	286.520	0.000 *	286.500	0.000 *	286.470	0.000 *	R Dry	0.0	R Dry	0.0	R Dry	0.0
30	286.520	0.000 *	286.500	0.000 *			R Dry	0.0	R Dry	0.0	R Dry	0.0
31	286.520	0.000 *	286.500	0.000 *			R Dry	0.0			R Dry	0.0
Ten-Daily Mean												
I Ten-Daily	286.560	1.403	286.518	0.000	286.495	0.000						
II Ten-Daily	286.543	0.516	286.510	0.000	286.486	0.000						
III Ten-Daily	286.525	0.000	286.500	0.000	286.477	0.000						
Monthly												
Min.	286.520	0.000	286.500	0.000	286.470	0.000						
Max.	286.570	1.520	286.520	0.000	286.500	0.000						
Mean	286.542	0.619	286.509	0	286.486	0						

Peak Computed Discharge = 7.015 cumecs on 16/10/2011 **Corres. Water Level :286.83 m**

Lowest Computed Discharge = 0.000 cumecs on 15/12/2011 **Corres. Water Level :286.54 m**

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

Note:Missing values ignored while arriving at Annual Runoff



Procedure : Standard

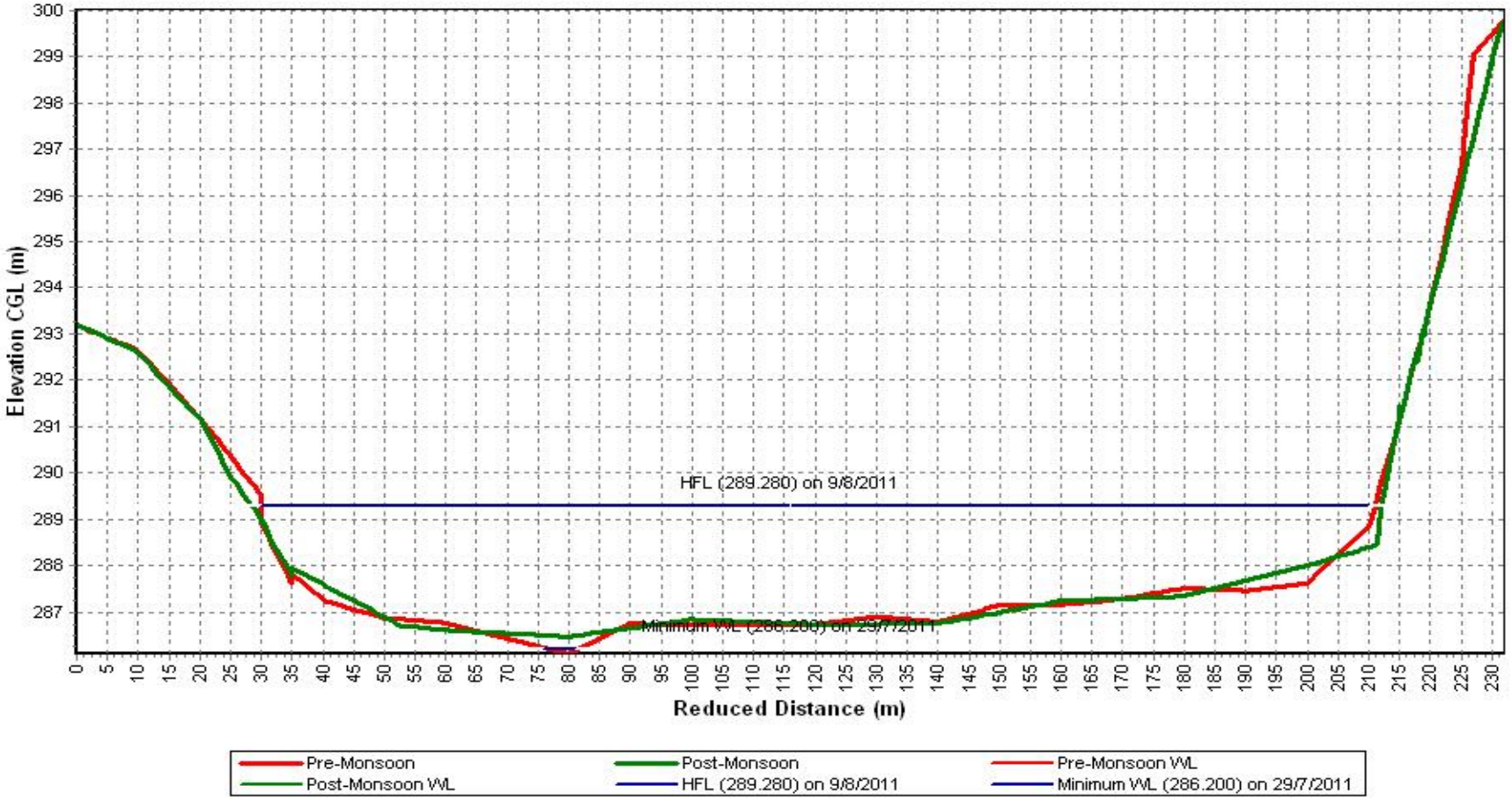
Equation type: Power

Q = c (h+a)^b, a = -286.25, b = 2.569, c = 28.431

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Wakal at Kotra(Jotasan) (01 02 12 001) **Division : Mahi Division, Gandhinagar**

Local River : Wakal **Sub-Division : N.W.R.Sub Div., Himatnagar**

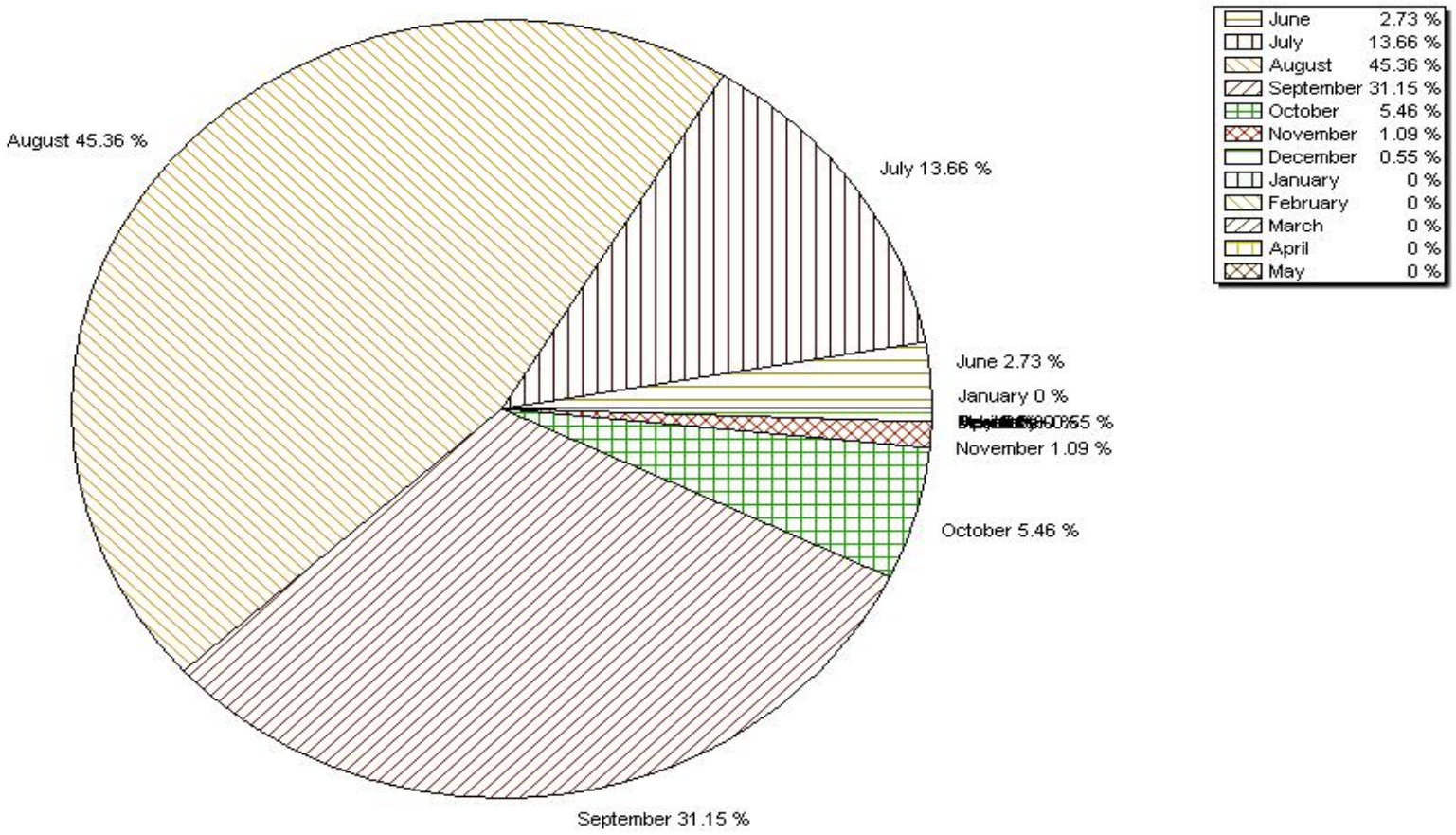


Historic Flood Level-291.600m on 20.08.2006 at 0700hrs

Monthly Average Runoff based on period : 1995-2011

Station Name : Wakal at Kotra(Jotasan) (01 02 12 001)
Local River : Wakal

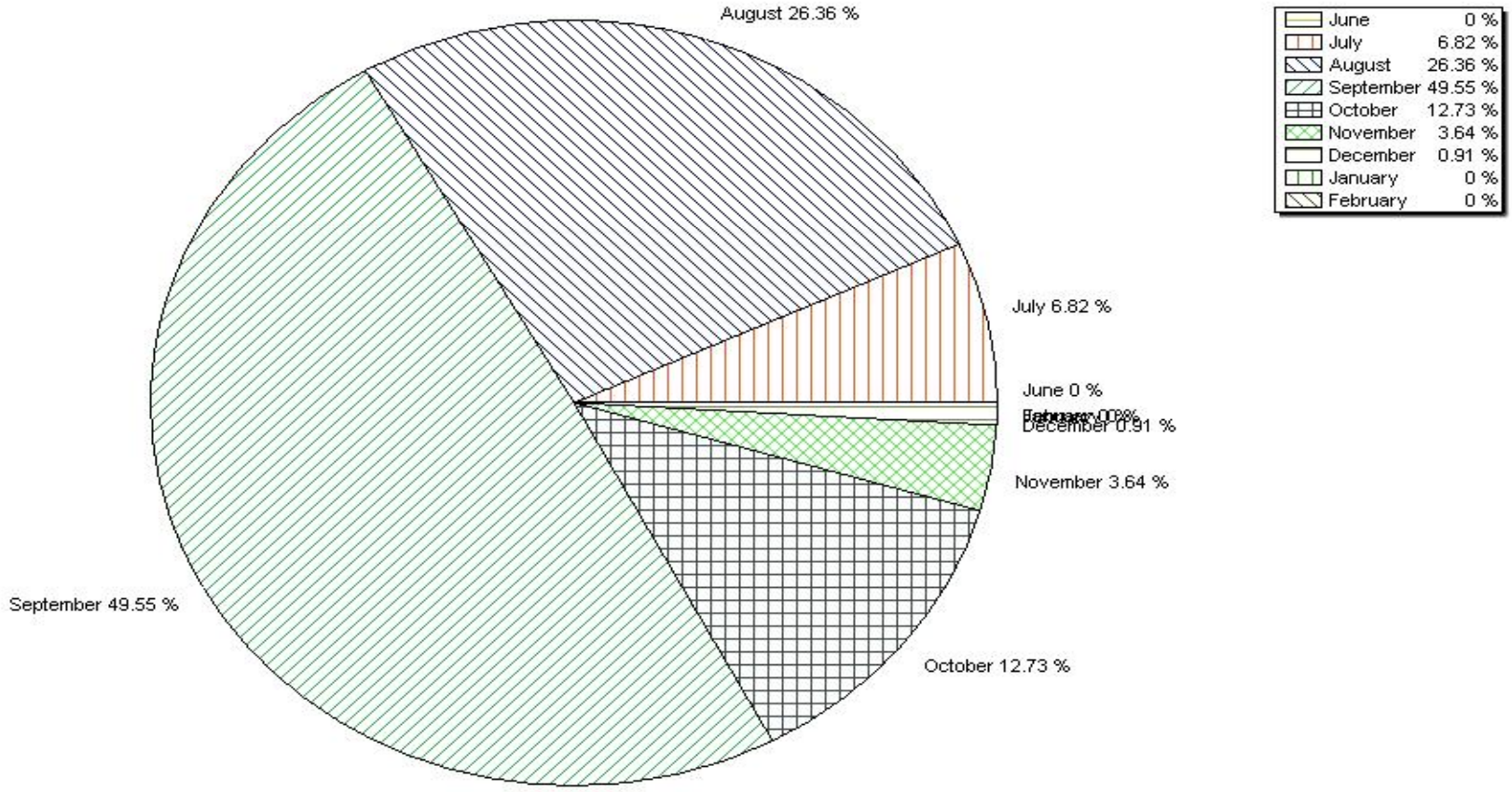
Division : Mahi Division, Gandhinagar
Sub-Division : N.W.R.Sub Div., Himatnagar



Monthly Runoff for the Year : 2011-2012

Station Name : Wakal at Kotra(Jotasan) (01 02 12 001)
Local River : Wakal

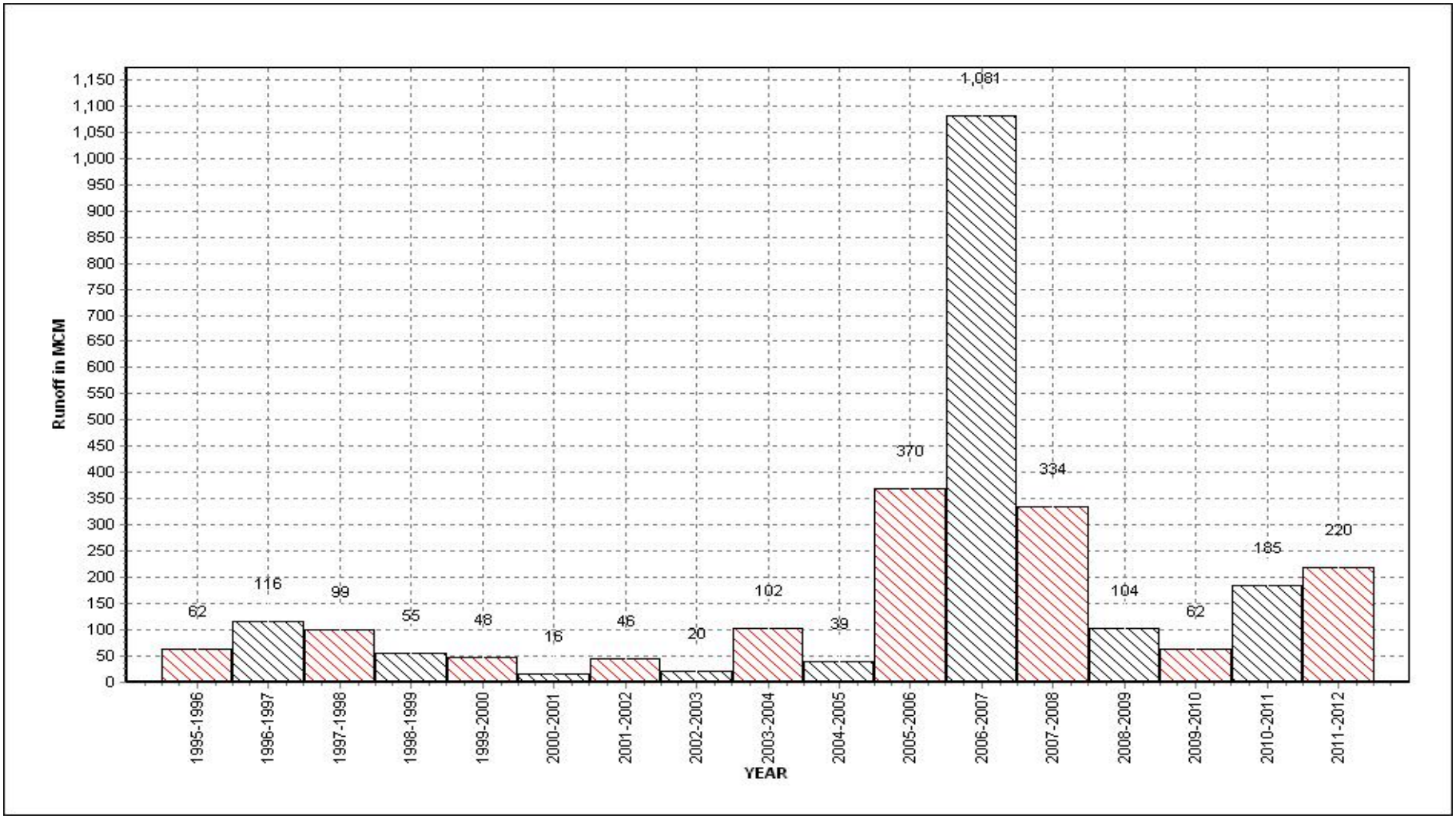
Division : Mahi Division, Gandhinagar
Sub-Division : N.W.R.Sub Div., Himatnagar



Annual Runoff Values for the period: 1995 - 2012

Station Name : Wakal at Kotra(Jotasan) (01 02 12 001)
Local River : Wakal

Division : Mahi Division, Gandhinagar
Sub-Division : N.W.R.Sub Div., Himatnagar

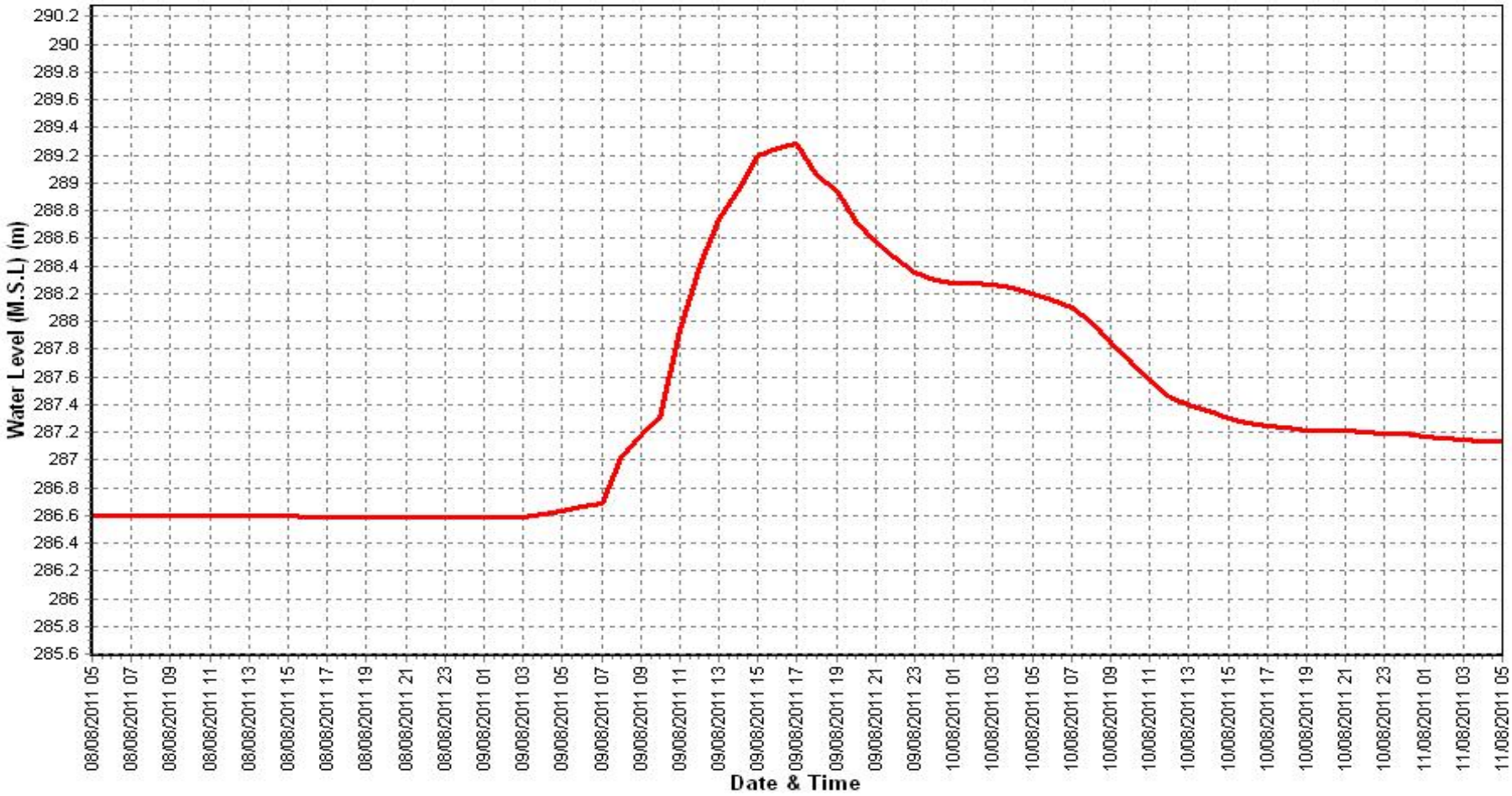


Note: Missing values have not been considered while arriving at Annual Runoff

Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Wakal at Kotra(Jotasan) (01 02 12 001) **Division : Mahi Division, Gandhinagar**

Local River : Wakal **Sub-Division : N.W.R.Sub Div., Himatnagar**

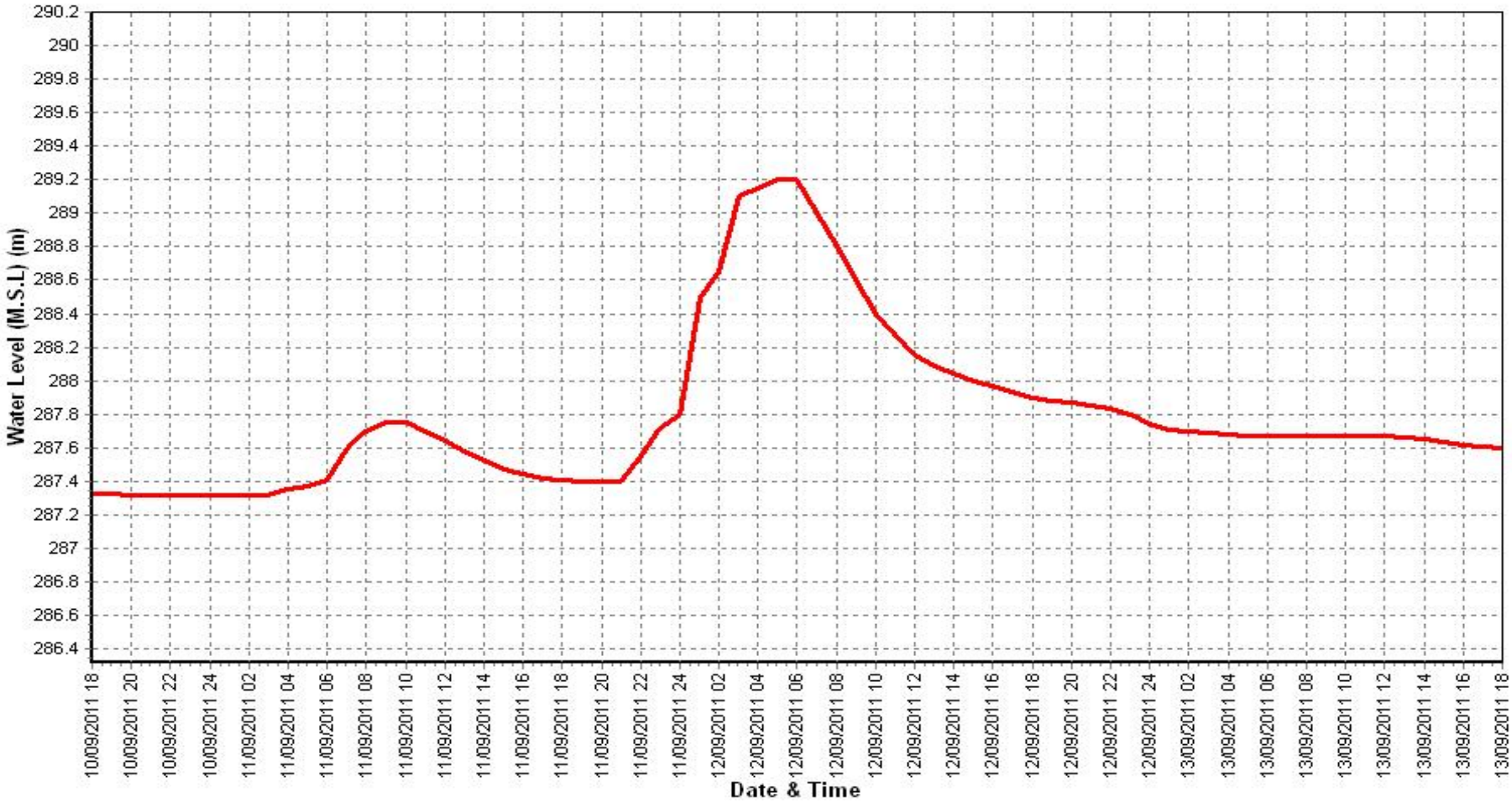


Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Wakal at Kotra(Jotasan) (01 02 12 001) **Division : Mahi Division, Gandhinagar**

Local River : Wakal **Sub-Division : N.W.R.Sub Div., Himatnagar**



Time Span: 72 Hrs

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Wakal at Kotra(Jotasan) (01 02 12 001) **Division : Mahi Division, Gandhinagar**

Local River : Wakal **Sub-Division : N.W.R.Sub Div., Himatnagar**



Time Span: 72 Hrs

HISTORY SHEET

			Water Year	**:**	**2011-2012**
Site	**:**	**Luni at Gandhav**	**Code**	**:**	**01 02 01 002**
State	:	Rajasthan	District		Badmer
Basin	:	WFR of Kach.-Saur. & Luni	Independent River	:	Luni
Tributary	:	-	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Luni
Drainage Area	:	32010 Sq. Km.	Bank	:	
Latitude	:	24°59'22"	Longitude	:	71°40'47"
Zero of Gauge (m)	:	31.000	24/06/1974	-	
		Opening Date	Closing Date		
Gauge	:	24/06/1974			
Discharge	:	24/06/1974			
Sediment	:				
Water Quality	:				

Annual Maximum / Minimum discharge with mean WL during observation

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1974-1975	River Dry					
1975-1976	813.8	35.532	18/09/1975	0.000	River Dry	16/02/1976
1976-1977	1116	35.720	17/08/1976	0.000	River Dry	02/03/1977
1977-1978	562.1	35.540	04/08/1977	0.000	River Dry	27/01/1978
1978-1979	207.0	35.000	02/09/1978	0.000	River Dry	25/01/1979
1979-1980	4300	38.880	19/07/1979	0.000	River Dry	26/01/1980
1980-1981	95.00	34.840	04/08/1980	0.000	River Dry	26/01/1981
1981-1982	6.000	31.905	28/07/1981	0.000	River Dry	25/01/1982
1982-1983	138.0	33.150	22/08/1982	0.000	River Dry	25/01/1983
1983-1984	1655	34.855	29/07/1983	0.000	River Dry	27/02/1984
1986-1987	1.100	32.455	28/07/1986	0.000	River Dry	25/01/1987
1987-1988	River Dry					
1988-1989	River Dry					
1989-1990	River Dry					
1990-1991	4191	37.475	07/07/1990	0.000	River Dry	18/05/1991
1991-1992	3.102	31.650	03/08/1991	0.000	31.345	22/01/1992
1992-1993	1761	35.200	09/09/1992	0.000	River Dry	02/04/1993
1993-1994	310.2	33.450	19/07/1993	0.000	River Dry	09/05/1994
1994-1995	407.1	33.140	23/08/1994	0.000	River Dry	07/04/1995
1995-1996	1505	34.200	28/07/1995	0.000	River Dry	30/01/1996
1996-1997	51.80	32.740	23/08/1996	0.000	River Dry	25/01/1997
1997-1998	531.2	32.645	29/08/1997	0.000	River Dry	12/01/1998
1998-1999	43.75	32.550	11/06/1998	0.000	River Dry	25/01/1999
1999-2000	130.6	34.300	04/08/1999	0.000	River Dry	26/01/2000
2000-2001	7.580	32.140	15/07/2000	0.000	River Dry	25/01/2001
2001-2002	545.5	34.410	13/07/2001	0.000	River Dry	01/05/2002
2002-2003	River Dry					
2003-2004	9.697	32.690	26/07/2003	0.000	River Dry	26/01/2004
2004-2005	2.338	32.320	17/07/2004	0.000	River Dry	25/05/2005
2005-2006	River Dry					
2006-2007	River Dry					
2007-2008	1236*	35.400	09/07/2007	0.000	River Dry	01/06/2007
2008-2009	River Dry					
2009-2010	0	32.0	10/09/2009	0.000	River Dry	01/06/2009
2010-2011	0	32.56	22/10/2010	0.000	River Dry	01/06/2010
2011-2012	River Dry					

Stage-Discharge Data for the period 2011 - 2012

Station Name : Luni at Gandhav (01 02 01 002) **Division : Mahi Division, Gandhinagar**

Local River : Luni **Sub-Division : B.L.Sub Divn, Palanpur**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	32.940	0.000	R Dry	0.000	33.660	0.000	34.060	0.000	33.750	0.000	33.350	0.000
2	32.880	0.000	R Dry	0.000	33.660	0.000	34.060	0.000	33.600	0.000	33.350	0.000
3	32.880	0.000	R Dry	0.000	33.660	0.000	34.060	0.000	33.600	0.000	33.350	0.000
4	32.880	0.000	R Dry	0.000	33.650	0.000	34.060	0.000	33.600	0.000	33.350	0.000
5	32.880	0.000	R Dry	0.000	33.650	0.000	34.100	0.000	33.600	0.000	33.340	0.000
6	32.880	0.000	R Dry	0.000	33.640	0.000	34.100	0.000	33.600	0.000	33.340	0.000
7	32.880	0.000	R Dry	0.000	33.530	0.000	34.100	0.000	33.600	0.000	33.340	0.000
8	32.880	0.000	R Dry	0.000	33.520	0.000	34.100	0.000	33.600	0.000	33.330	0.000
9	32.880	0.000	R Dry	0.000	33.560	0.000	34.100	0.000	33.600	0.000	33.330	0.000
10	32.860	0.000	R Dry	0.000	33.520	0.000	34.100	0.000	33.600	0.000	33.330	0.000
11	32.860	0.000	R Dry	0.000	33.520	0.000	34.100	0.000	33.600	0.000	33.330	0.000
12	32.750	0.000	R Dry	0.000	33.800	0.000	34.100	0.000	33.600	0.000	33.330	0.000
13	32.700	0.000	R Dry	0.000	33.800	0.000	34.100	0.000	33.450	0.000	33.330	0.000
14	32.650	0.000	R Dry	0.000	33.800	0.000	34.100	0.000	33.450	0.000	33.330	0.000
15	32.610	0.000	R Dry	0.000	34.200	0.000	34.100	0.000	33.450	0.000	33.330	0.000
16	32.570	0.000	R Dry	0.000	34.240	0.000	34.100	0.000	33.450	0.000	33.330	0.000
17	32.540	0.000	R Dry	0.000	34.420	0.000	34.350	0.000	33.450	0.000	33.330	0.000
18	32.540	0.000	R Dry	0.000	34.420	0.000	34.350	0.000	33.450	0.000	33.330	0.000
19	32.540	0.000	R Dry	0.000	34.040	0.000	34.350	0.000	33.450	0.000	33.330	0.000
20	32.540	0.000	R Dry	0.000	34.030	0.000	34.350	0.000	33.430	0.000	33.330	0.000
21	R Dry	0.000	R Dry	0.000	34.030	0.000	34.350	0.000	33.420	0.000	33.330	0.000
22	R Dry	0.000	R Dry	0.000	34.030	0.000	34.350	0.000	33.420	0.000	33.330	0.000
23	R Dry	0.000	R Dry	0.000	34.030	0.000	34.350	0.000	33.420	0.000	33.560	0.000
24	R Dry	0.000	33.310	0.000	34.060	0.000	34.350	0.000	33.410	0.000	33.560	0.000
25	R Dry	0.000	33.740	0.000	34.060	0.000	34.350	0.000	33.400	0.000	33.560	0.000
26	R Dry	0.000	33.640	0.000	34.060	0.000	34.100	0.000	33.390	0.000	33.560	0.000
27	R Dry	0.000	33.640	0.000	34.060	0.000	33.750	0.000	33.380	0.000	33.560	0.000
28	R Dry	0.000	33.640	0.000	34.060	0.000	33.750	0.000	33.370	0.000	33.560	0.000
29	R Dry	0.000	33.660	0.000	34.060	0.000	33.750	0.000	33.360	0.000	33.560	0.000
30	R Dry	0.000	33.660	0.000	34.060	0.000	33.750	0.000	33.360	0.000	33.560	0.000
31			33.660	0.000	34.060	0.000			33.360	0.000		
Ten-Daily Mean												
I Ten-Daily	32.884			0.000	33.605		34.084		33.615		33.341	
II Ten-Daily	32.630			0.000	34.027		34.200		33.478		33.330	
III Ten-Daily			33.619	0.000	34.052		34.085		33.390		33.514	
Monthly												
Min.	32.540		33.310	0.000	33.520		33.750		33.360		33.330	
Max.	32.940		33.740	0.000	34.420		34.350		33.750		33.560	
Mean	32.757		33.619	0	33.900		34.123		33.491		33.395	

Annual Runoff in MCM = 0 Annual Runoff in mm = 0

Peak Observed Discharge = 0.000 cumecs on 01/07/2011

Lowest Observed Discharge = 0.000 cumecs on 01/07/2011

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Luni at Gandhav (01 02 01 002) **Division : Mahi Division, Gandhinagar**

Local River : Luni **Sub-Division : B.L.Sub Divn, Palanpur**

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	33.550	0.000	34.000	0.000	34.000	0.000	R Dry	0.000	34.000	0.000	34.000	0.000
2	33.550	0.000	34.000	0.000	34.000	0.000	R Dry	0.000	34.000	0.000	34.000	0.000
3	33.550	0.000	34.000	0.000	34.000	0.000	R Dry	0.000	34.000	0.000	34.000	0.000
4	33.550	0.000	34.000	0.000	34.000	0.000	R Dry	0.000	34.000	0.000	34.000	0.000
5	33.550	0.000	34.000	0.000	34.000	0.000	R Dry	0.000	34.000	0.000	34.000	0.000
6	33.550	0.000	34.000	0.000	34.000	0.000	R Dry	0.000	34.000	0.000	34.000	0.000
7	33.550	0.000	34.000	0.000	34.000	0.000	R Dry	0.000	34.000	0.000	34.000	0.000
8	33.550	0.000	34.000	0.000	34.000	0.000	R Dry	0.000	34.000	0.000	34.000	0.000
9	33.550	0.000	34.000	0.000	34.000	0.000	R Dry	0.000	34.000	0.000	34.000	0.000
10	33.550	0.000	34.000	0.000	34.000	0.000	R Dry	0.000	34.000	0.000	34.000	0.000
11	33.550	0.000	34.000	0.000	34.000	0.000	R Dry	0.000	34.000	0.000	34.000	0.000
12	33.480	0.000	34.000	0.000	34.000	0.000	R Dry	0.000	34.000	0.000	34.000	0.000
13	33.480	0.000	34.000	0.000	34.000	0.000	R Dry	0.000	34.000	0.000	34.000	0.000
14	33.480	0.000	34.000	0.000	34.000	0.000	R Dry	0.000	34.000	0.000	34.000	0.000
15	33.480	0.000	34.000	0.000	34.000	0.000	R Dry	0.000	34.000	0.000	34.000	0.000
16	33.480	0.000	34.000	0.000	34.000	0.000	R Dry	0.000	34.000	0.000	34.000	0.000
17	33.480	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000
18	33.050	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000
19	33.060	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000
20	33.060	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000
21	33.060	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000
22	33.060	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000
23	33.060	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000
24	33.060	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000
25	33.060	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000
26	33.050	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000
27	33.050	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000
28	33.050	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000
29	33.050	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000	34.000	0.000
30	33.050	0.000	34.000	0.000			34.000	0.000	34.000	0.000	34.000	0.000
31	33.050	0.000	34.000	0.000			34.000	0.000			34.000	0.000
Ten-Daily Mean												
I Ten-Daily	33.550		34.000		34.000				34.000		34.000	
II Ten-Daily	33.360		34.000		34.000		34.000		34.000		34.000	
III Ten-Daily	33.055		34.000		34.000		34.000		34.000		34.000	
Monthly												
Min.	33.050		34.000		34.000		34.000		34.000		34.000	
Max.	33.550		34.000		34.000		34.000		34.000		34.000	
Mean	33.313		34.000		34.000		34.000		34.000		34.000	

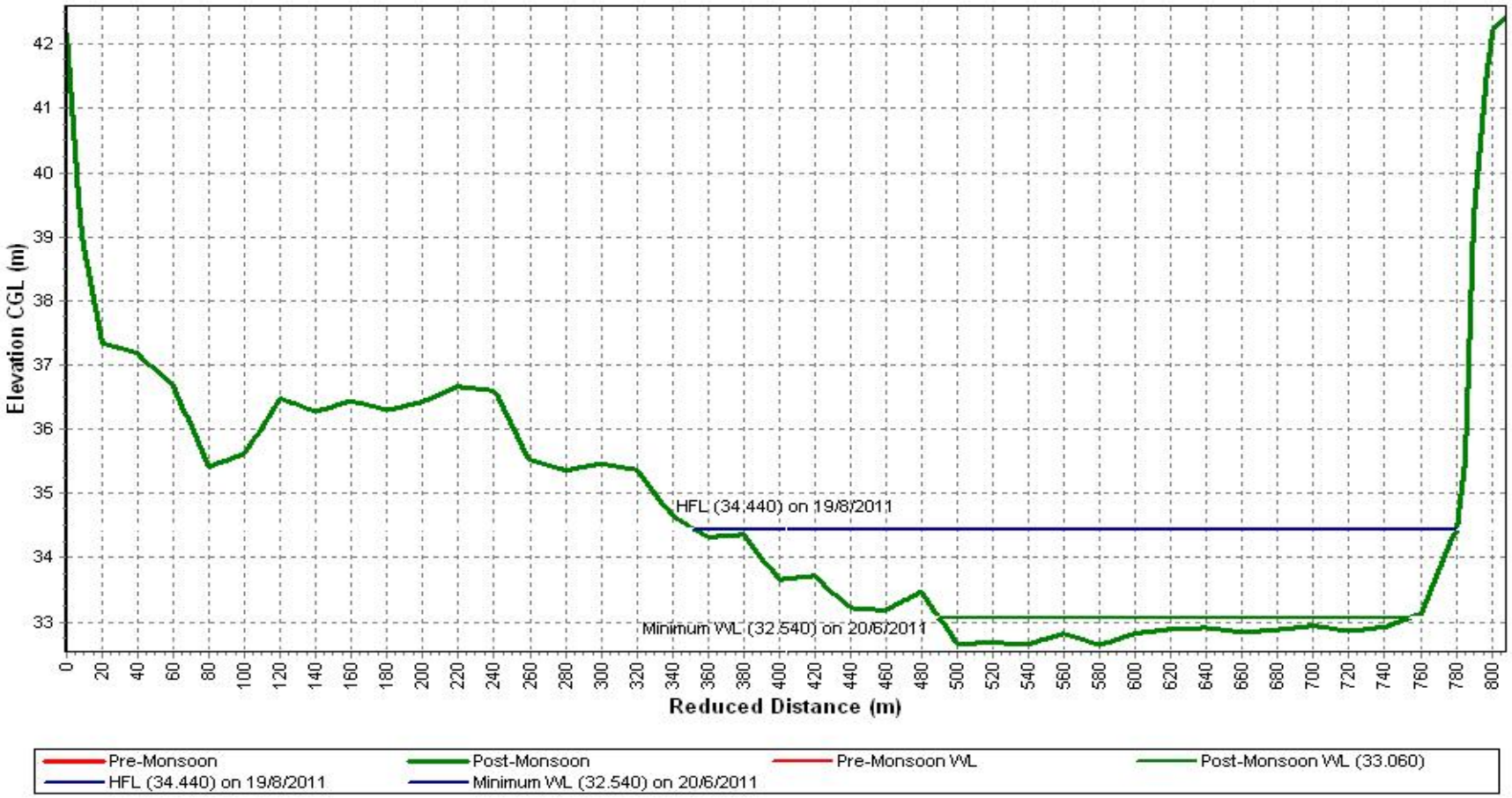
Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

Note:Missing values ignored while arriving at Annual Runoff

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Luni at Gandhav (01 02 01 002)
Local River : Luni

Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur

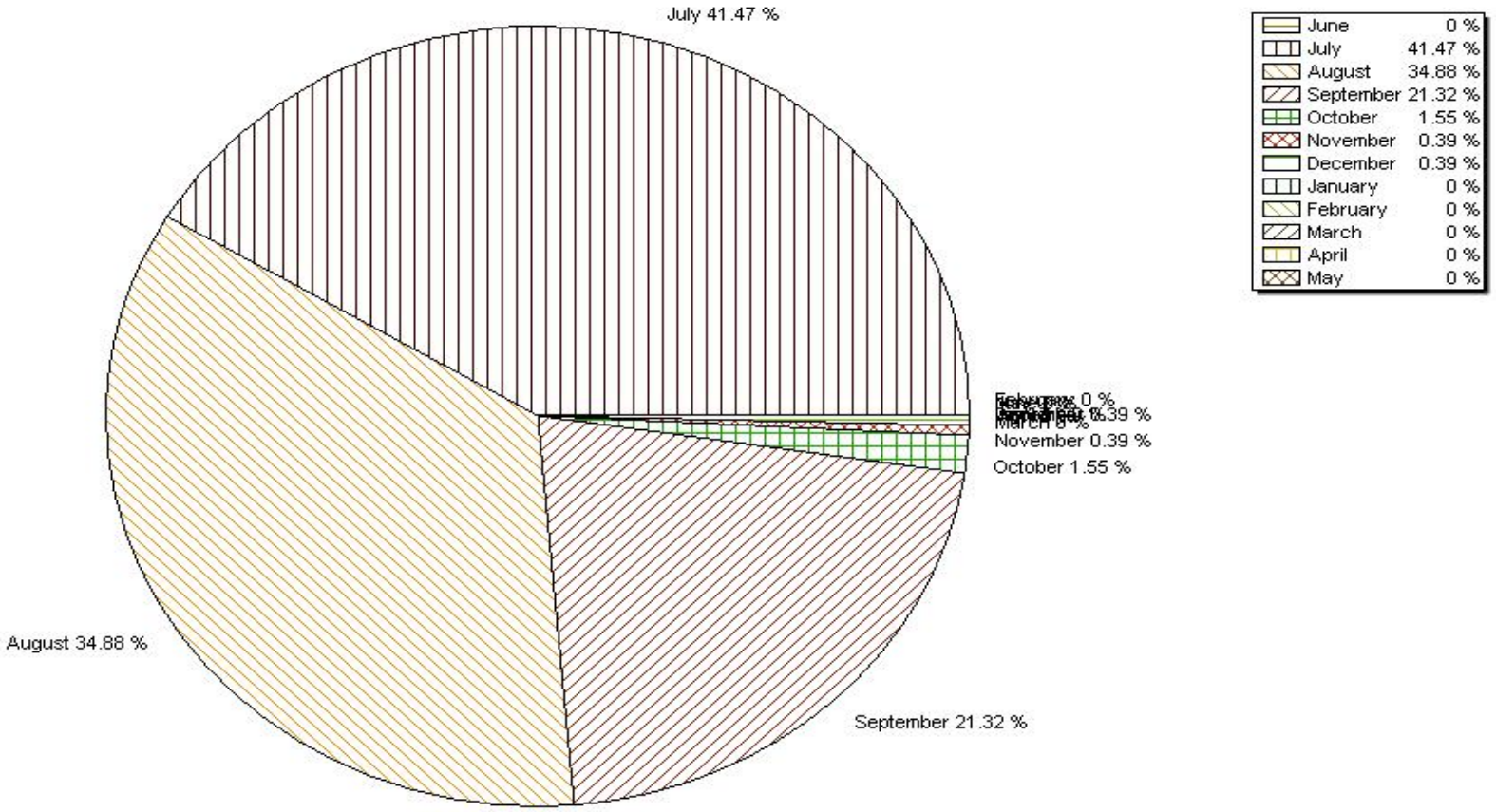


Historic Flood Level - 37.625 m on 07.07.1990 at 2100 hrs

Monthly Average Runoff based on period : 1974-2011

Station Name : Luni at Gandhav (01 02 01 002)
Local River : Luni

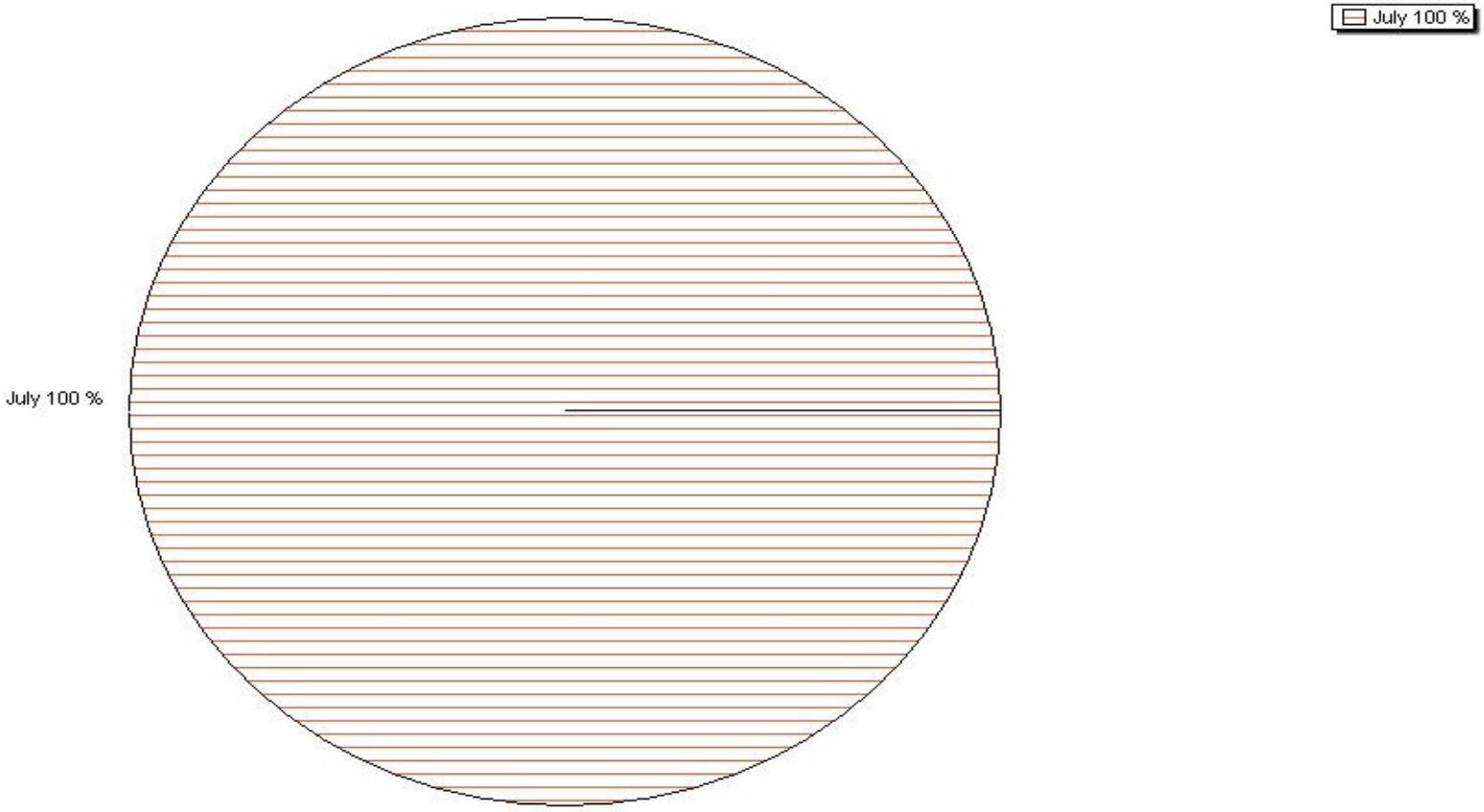
Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur



Monthly Runoff for the Year : 2011-2012

Station Name : Luni at Gandhav (01 02 01 002)
Local River : Luni

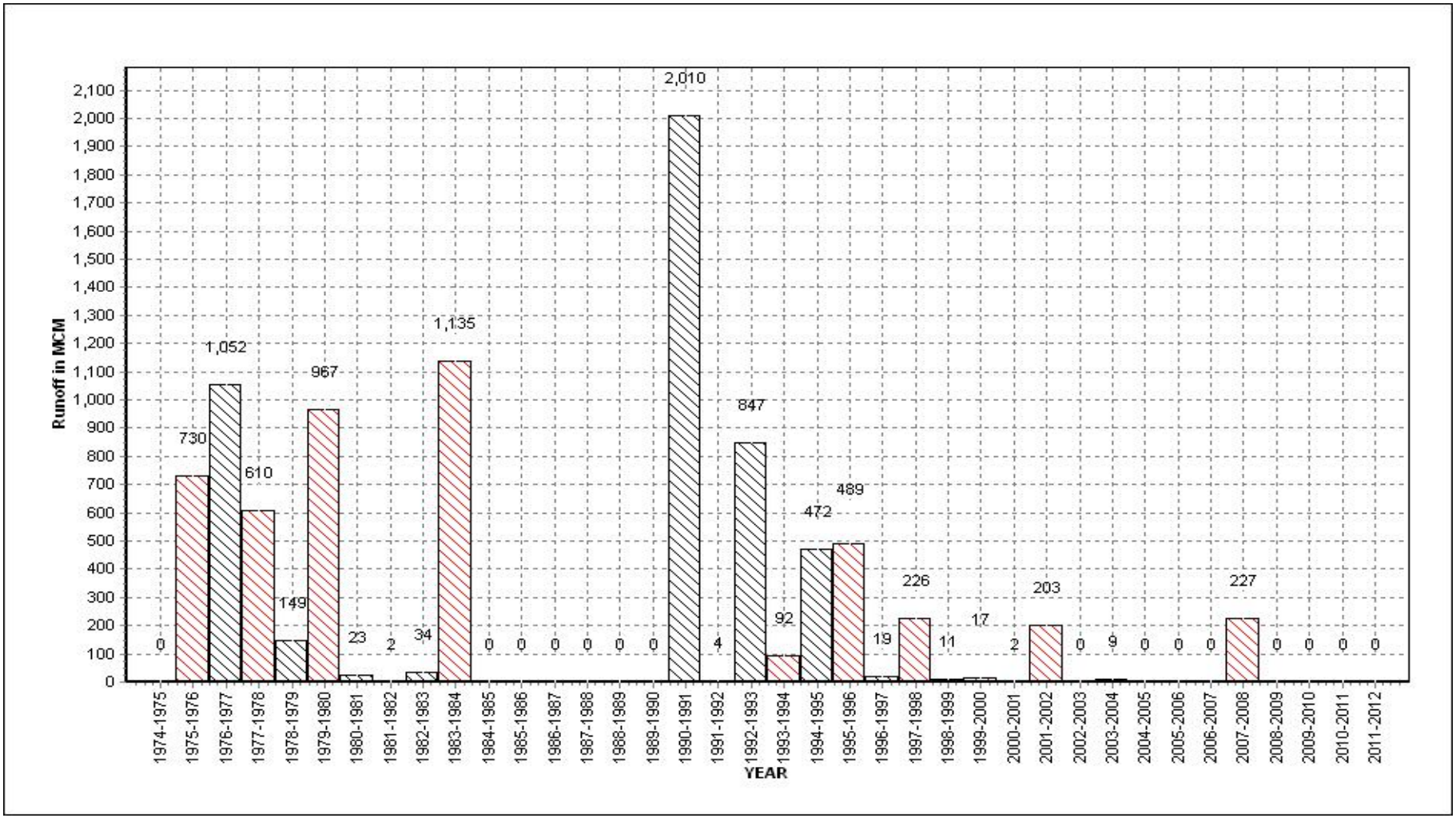
Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur



Annual Runoff Values for the period: 1974 - 2012

Station Name : Luni at Gandhav (01 02 01 002)
Local River : Luni

Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur



Note: Missing values have not been considered while arriving at Annual Runoff

HISTORY SHEET

			Water Year	**:**	**2011-2012**
Site	**:**	**Luni at Balotra**	**Code**	**:**	**01 02 01 001**
State	:	Rajasthan	District		Badmer
Basin	:	WFR of Kach.-Saur. & Luni	Independent River	:	Luni
Tributary	:		Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Luni
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	B.L.Sub Divn, Palanpur
Drainage Area	:	19000 Sq. Km.	Bank	:	Left
Latitude	:	25°49'19" N	Longitude	:	72°13'23" E
Zero of Gauge (m)	:	102 (m.s.l)	05/07/1990	-	
		Opening Date	Closing Date		
Gauge	:	05/07/1990			
Discharge	:	05/07/1990			
Sediment	:	--			
Water Quality	:	--			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1990-1991	1875	107.150	06/07/1990	0.000	Dry	25/01/1991
1991-1992	River Dry					
1992-1993	2907	106.040	09/09/1992	0.000	Dry	25/01/1993
1993-1994	30.36	102.890	20/07/1993	0.000	Dry	25/01/1994
1994-1995	364.3	103.797	16/08/1994	0.000	Dry	25/01/1995
1995-1996	2691	105.450	28/07/1995	0.000	Dry	26/01/1996
1996-1997	130.0	103.200	21/08/1996	0.000	Dry	25/01/1997
1997-1998	785.0	104.420	28/08/1997	0.000	Dry	25/01/1998
1998-1999	River Dry					
1999-2000	468.1	103.915	02/08/1999	0.000	Dry	27/01/2000
2000-2001	River Dry					
2001-2002	River Dry					
2002-2003	River Dry					
2003-2004	River Dry					
2004-2005	River Dry					
2005-2006	River Dry					
2006-2007	617.8	104.075	02/08/2006	0.000	Dry	01/06/2006
2007-2008	918.5	104.180	08/07/2007	0.000	Dry	01/06/2008
2008-2009	River Dry					
2009-2010	River Dry					
2010-2011	River Dry					
2011-2012	River Dry					

Note :River remain dry condition during the season

Stage-Discharge Data for the period 2011 - 2012

Station Name : Luni at Balotra (01 02 01 001) **Division : Mahi Division, Gandhinagar**

Local River : Luni **Sub-Division : B.L.Sub Divn, Palanpur**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
2	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
3	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
4	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
5	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
6	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
7	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
8	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
9	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
10	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
11	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
12	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
13	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
14	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
15	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
16	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
17	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
18	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
19	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
20	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
21	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
22	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
23	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
24	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
25	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
26	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
27	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
28	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
29	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
30	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
31			R Dry	0.000	R Dry	0.000			R Dry	0.000		
Ten-Daily Mean												
I Ten-Daily		0.000		0.000		0.000		0.000		0.000		0.000
II Ten-Daily		0.000		0.000		0.000		0.000		0.000		0.000
III Ten-Daily		0.000		0.000		0.000		0.000		0.000		0.000
Monthly												
Min.		0.000		0.000		0.000		0.000		0.000		0.000
Max.		0.000		0.000		0.000		0.000		0.000		0.000
Mean		0		0		0		0		0		0

Annual Runoff in MCM = 0 Annual Runoff in mm = 0

Peak Observed Discharge = 0.000 cumecs on 01/06/2011

Lowest Observed Discharge = 0.000 cumecs on 01/06/2011

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Luni at Balotra (01 02 01 001) **Division : Mahi Division, Gandhinagar**

Local River : Luni **Sub-Division : B.L.Sub Divn, Palanpur**

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
2	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
3	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
4	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
5	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
6	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
7	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
8	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
9	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
10	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
11	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
12	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
13	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
14	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
15	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
16	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
17	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
18	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
19	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
20	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
21	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
22	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
23	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
24	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
25	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
26	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
27	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
28	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
29	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
30	R Dry	0.000	R Dry	0.000			R Dry	0.000	R Dry	0.000	R Dry	0.000
31	R Dry	0.000	R Dry	0.000			R Dry	0.000			R Dry	0.000
Ten-Daily Mean												
I Ten-Daily		0.000		0.000		0.000		0.000		0.000		0.000
II Ten-Daily		0.000		0.000		0.000		0.000		0.000		0.000
III Ten-Daily		0.000		0.000		0.000		0.000		0.000		0.000
Monthly												
Min.		0.000		0.000		0.000		0.000		0.000		0.000
Max.		0.000		0.000		0.000		0.000		0.000		0.000
Mean		0		0		0		0		0		0

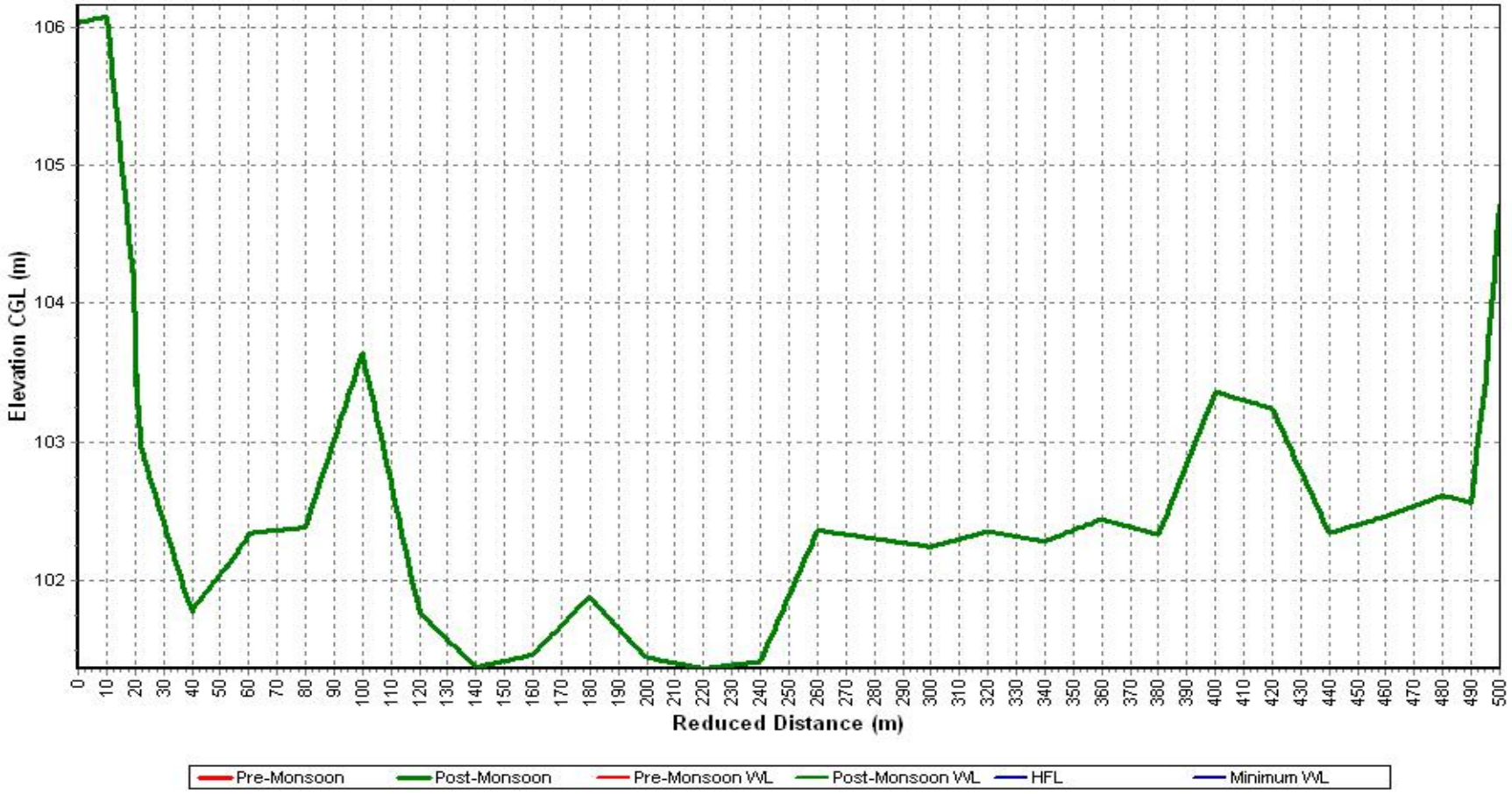
Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m

Note:Missing values ignored while arriving at Annual Runoff

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Luni at Balotra (01 02 01 001)
Local River : Luni

Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur

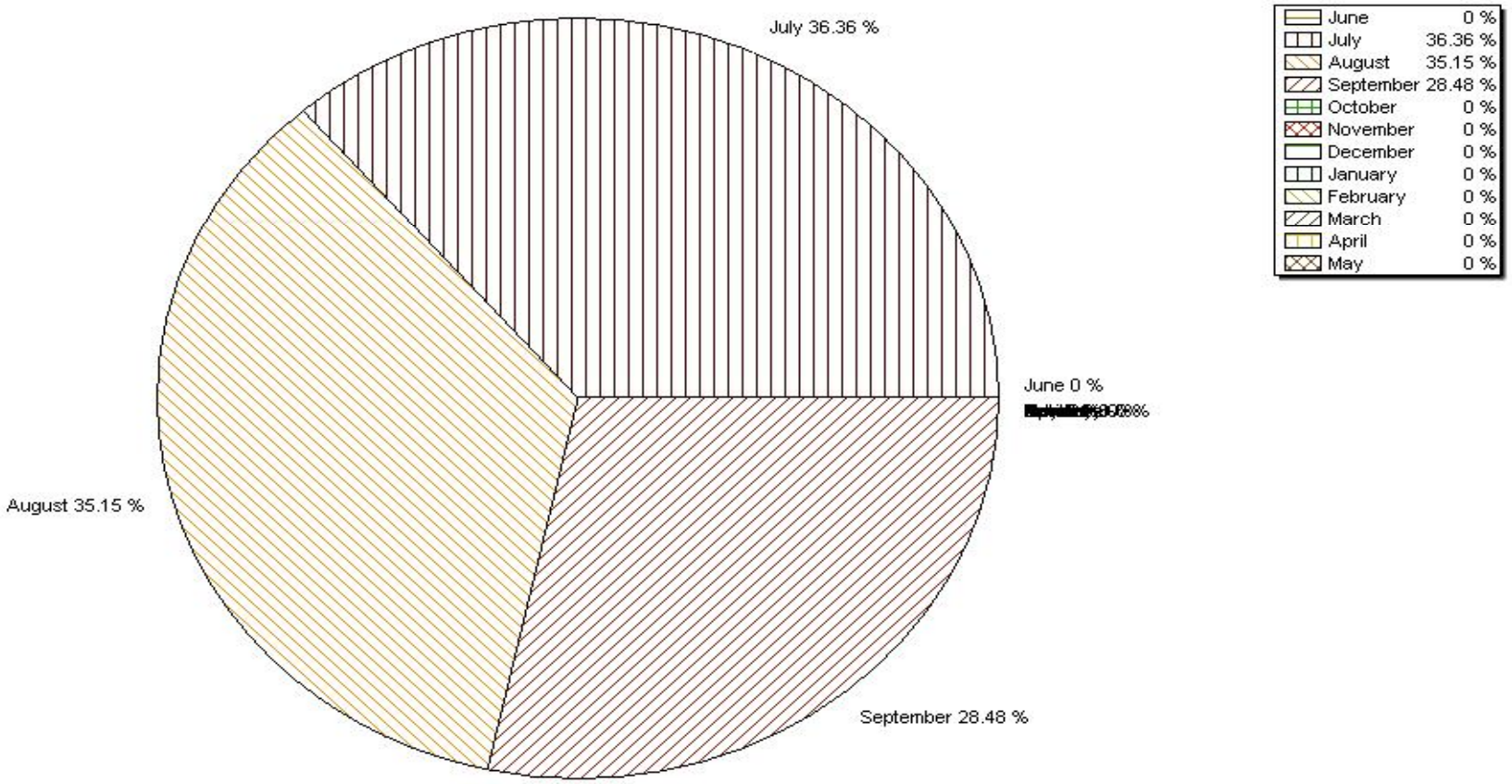


Historic Flood Level - 108.755 m on 18.07.1979

Monthly Average Runoff based on period : 1990-2011

Station Name : Luni at Balotra (01 02 01 001)
Local River : Luni

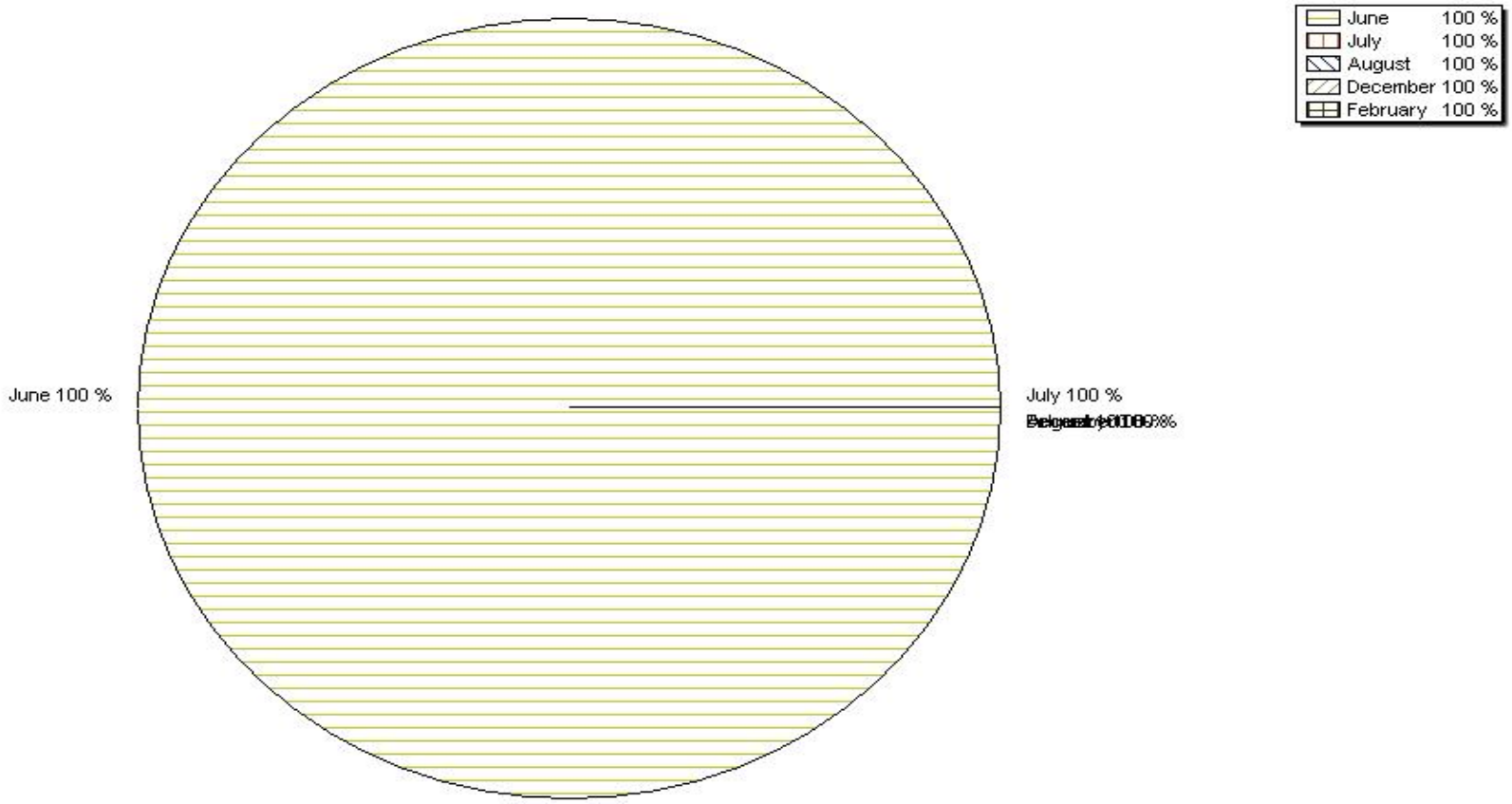
Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur



Monthly Runoff for the Year : 2011-2012

Station Name : Luni at Balotra (01 02 01 001)
Local River : Luni

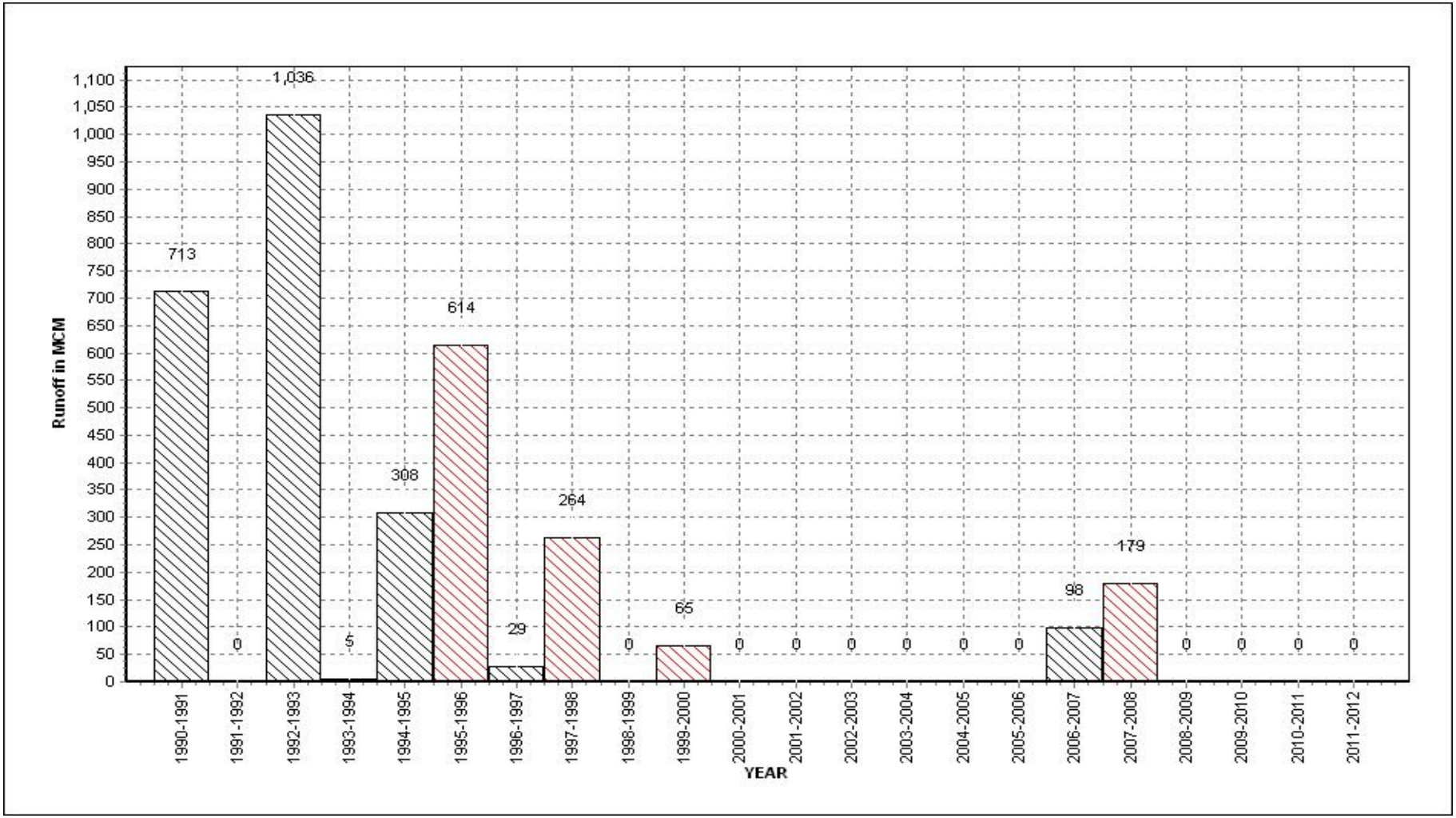
Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur



Annual Runoff Values for the period: 1990 - 2012

Station Name : Luni at Balotra (01 02 01 001)
Local River : Luni

Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur



Note: Missing values have not been considered while arriving at Annual Runoff

HISTORY SHEET

			Water Year	**:**	**2011-2012**
Site	**:**	**Banas at Kamalpur**	**Code**	**:**	**01 02 02 007**
State	:	Gujarat	District		Banaskantha
Basin	:	WFR of Kach.-Saur. & Luni	Independent River	:	Banas
Tributary	:	-	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Banas
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	B.L.Sub Divn, Palanpur
Drainage Area	:	6960 Sq. Km.	Bank	:	Right
Latitude	:	23°47'59" N	Longitude	:	71°45'00" E
Zero of Gauge (m)	:	34 (m.s.l)	01/06/1970	-	
		Opening Date	Closing Date		
Gauge	:	21/07/1971			
Discharge	:	25/07/1971			
Sediment	:	25/08/1973			
Water Quality	:	01/06/1977			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1971-1972	0.000	34.460	05/10/1971	0.000	River Dry	26/01/1972
1972-1973	River Dry					
1973-1974	371.0	36.515	05/09/1973	0.000	River Dry	28/06/1973
1974-1975	13.50	35.115	23/08/1974	0.000	River Dry	27/01/1975
1975-1976	380.7	36.175	13/08/1975	0.000	River Dry	16/06/1975
1976-1977	906.7	36.710	17/08/1976	0.000	River Dry	22/05/1977
1977-1978	3678	37.375	27/07/1977	0.100	34.775	09/06/1977
1978-1979	591.4	36.365	31/08/1978	0.600	35.085	27/05/1979
1979-1980	100.0	35.930	13/08/1979	0.000	River Dry	21/05/1980
1980-1981	262.7	36.032	24/06/1980	0.000	River Dry	12/05/1981
1981-1982	175.1	36.095	18/08/1981	0.000	River Dry	30/03/1982
1982-1983	1515	37.305	25/07/1982	0.000	River Dry	13/03/1983
1983-1984	342.7	36.375	03/08/1983	0.000	River Dry	06/03/1984
1984-1985	330.0	37.100	05/08/1984	0.000	River Dry	07/02/1985
1985-1986	38.51	35.395	07/08/1985	0.000	River Dry	25/01/1986
1986-1987	River Dry					
1987-1988	River Dry					
1988-1989	190.0	36.200	06/08/1988	0.000	River Dry	29/01/1989
1989-1990	70.00	35.235	26/08/1989	0.000	River Dry	25/01/1990
1990-1991	776.0	36.525	24/08/1990	0.000	River Dry	25/01/1991
1991-1992	6.233	35.303	24/07/1991	0.000	River Dry	26/01/1992
1992-1993	4221	38.010	08/09/1992	0.000	River Dry	26/01/1993
1993-1994	3120	36.771	18/07/1993	0.000	River Dry	17/12/1993
1994-1995	3691	37.270	09/09/1994	0.000	River Dry	13/07/1994
1995-1996	456.7	36.075	19/07/1995	0.000	River Dry	09/11/1995
1996-1997	River Dry					
1997-1998	789.4	37.165	26/06/1997	0.000	River Dry	12/01/1998
1998-1999	63.00	35.850	17/10/1998	0.000	River Dry	12/01/1999
1999-2000	River Dry					
2000-2001	20.04	35.570	16/07/2000	0.000	River Dry	25/01/2001
2001-2002	11.40	35.400	18/06/2001	0.000	River Dry	26/01/2002
2002-2003	River Dry					
2003-2004	395.3	36.245	29/07/2003	0.000	River Dry	26/01/2004
2004-2005	73.00	35.950	06/08/2004	0.000	River Dry	12/02/2005
2005-2006	43.74	35.700	02/08/2005	0.000	River Dry	01/06/2005
2006-2007	1480	37.545	20/08/2006	0.000	River Dry	01/06/2006
2007-2008	51.81	35.140	08/08/2007	0.000	River Dry	01/06/2007
2008-2009	117.6	35.465	02/08/2008	0.000	River Dry	01/06/2008
2009-2010	11.25	34.890	30/09/2009	0.000	River Dry	01/06/2009
2010-2011	320.2	36.080	25/07/2010	0.000	River Dry	01/06/2010
2011-2012	82.4	35.455	13/09/2011	0.000	River Dry	24/11/2011

Stage-Discharge Data for the period 2011 - 2012

Station Name : Banas at Kamalpur (01 02 02 007) **Division : Mahi Division, Gandhinagar**

Local River : Banas **Sub-Division : B.L.Sub Divn, Palanpur**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	R Dry	0.000	R Dry	0.000	R Dry	0.000	35.090	26.65	34.990	15.07	R Dry	0.000
2	R Dry	0.000	R Dry	0.000	R Dry	0.000	35.120	31.89	34.990	18.67 *	R Dry	0.000
3	R Dry	0.000	R Dry	0.000	R Dry	0.000	35.105	32.28	34.940	13.74	R Dry	0.000
4	R Dry	0.000	R Dry	0.000	R Dry	0.000	35.080	26.17 *	34.940	14.83	R Dry	0.000
5	R Dry	0.000	R Dry	0.000	R Dry	0.000	34.860	10.11	34.940	14.90	R Dry	0.000
6	R Dry	0.000	R Dry	0.000	R Dry	0.000	34.590	1.427	34.940	15.26 *	R Dry	0.000
7	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	34.960	15.18	R Dry	0.000
8	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	34.960	14.94	R Dry	0.000
9	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	34.880	11.79 *	R Dry	0.000
10	R Dry	0.000	34.780	7.858	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
11	R Dry	0.000	34.652	5.307	R Dry	0.000	34.600	2.580 *	R Dry	0.000	R Dry	0.000
12	R Dry	0.000	34.600	2.645	34.720	6.151	34.610	2.173	R Dry	0.000	R Dry	0.000
13	R Dry	0.000	34.650	5.139	34.660	3.819	35.455	82.36 #	R Dry	0.000	R Dry	0.000
14	R Dry	0.000	34.700	5.592	34.710	5.060 *	34.920	13.40	34.720	4.940	R Dry	0.000
15	R Dry	0.000	34.680	3.923	34.880	15.48	34.860	10.83	34.720	5.003	R Dry	0.000
16	R Dry	0.000	R Dry	0.000	35.400	70.19	34.940	14.86	34.720	5.350 *	R Dry	0.000
17	R Dry	0.000	R Dry	0.000	34.910	19.10	34.990	19.97	34.720	4.658	R Dry	0.000
18	R Dry	0.000	R Dry	0.000	34.840	8.034	34.900	12.87 *	34.760	5.495	R Dry	0.000
19	R Dry	0.000	R Dry	0.000	34.870	13.51	34.940	14.24	R Dry	0.000	R Dry	0.000
20	R Dry	0.000	R Dry	0.000	34.970	16.54	34.940	18.00	R Dry	0.000	R Dry	0.000
21	R Dry	0.000	R Dry	0.000	34.970	17.24 *	34.920	12.53	R Dry	0.000	R Dry	0.000
22	R Dry	0.000	R Dry	0.000	35.070	22.79	34.850	8.065	R Dry	0.000	R Dry	0.000
23	R Dry	0.000	R Dry	0.000	35.110	29.45	34.880	13.03	R Dry	0.000	R Dry	0.000
24	R Dry	0.000	R Dry	0.000	34.850	9.960	34.970	15.54	R Dry	0.000	R Dry	0.000
25	R Dry	0.000	R Dry	0.000	34.980	18.34	35.000	19.41 *	R Dry	0.000	R Dry	0.000
26	R Dry	0.000	R Dry	0.000	35.080	26.43	35.000	18.61	R Dry	0.000	R Dry	0.000
27	R Dry	0.000	R Dry	0.000	35.120	32.49	34.960	17.34	R Dry	0.000	R Dry	0.000
28	R Dry	0.000	R Dry	0.000	35.130	31.17 *	34.970	15.41	R Dry	0.000	R Dry	0.000
29	R Dry	0.000	R Dry	0.000	35.130	33.77	35.000	19.85	R Dry	0.000	R Dry	0.000
30	R Dry	0.000	R Dry	0.000	35.120	28.81	35.000	17.65	R Dry	0.000	R Dry	0.000
31				0.000	35.120	30.12 *			R Dry	0.000		
Ten-Daily Mean												
I Ten-Daily		0.000	34.780	0.786		0.000	34.974	12.85	34.949	13.44		0.000
II Ten-Daily		0.000	34.656	2.826	34.884	15.79	34.916	19.13	34.728	2.545		0.000
III Ten-Daily		0.000		0.000	35.062	25.51	34.955	15.74		0.000		0.000
Monthly												
Min.		0.000	34.600	0.000	34.660	0.000	34.590	0.000	34.720	0.000		0.000
Max.		0.000	34.780	7.858	35.400	70.19	35.455	82.36	34.990	18.67		0.000
Mean		0	34.677	1.05	34.982	14.14	34.944	15.91	34.870	5.156		0

Annual Runoff in MCM = 96 Annual Runoff in mm = 14

Peak Observed Discharge = 82.36 cumecs on 13/09/2011 Corres. Water Level :35.455 m

Lowest Observed Discharge = 0.000 cumecs on 01/06/2011

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Banas at Kamalpur (01 02 02 007) **Division : Mahi Division, Gandhinagar**

Local River : Banas **Sub-Division : B.L.Sub Divn, Palanpur**

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
2	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
3	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
4	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
5	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
6	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
7	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
8	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
9	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
10	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
11	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
12	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
13	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
14	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
15	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
16	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
17	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
18	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
19	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
20	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
21	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
22	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
23	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
24	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
25	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
26	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
27	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
28	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
29	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
30	R Dry	0.000	R Dry	0.000			R Dry	0.000	R Dry	0.000	R Dry	0.000
31	R Dry	0.000	R Dry	0.000			R Dry	0.000			R Dry	0.000
Ten-Daily Mean												
I Ten-Daily		0.000		0.000		0.000		0.000		0.000		0.000
II Ten-Daily		0.000		0.000		0.000		0.000		0.000		0.000
III Ten-Daily		0.000		0.000		0.000		0.000		0.000		0.000
Monthly												
Min.		0.000		0.000		0.000		0.000		0.000		0.000
Max.		0.000		0.000		0.000		0.000		0.000		0.000
Mean		0		0		0		0		0		0

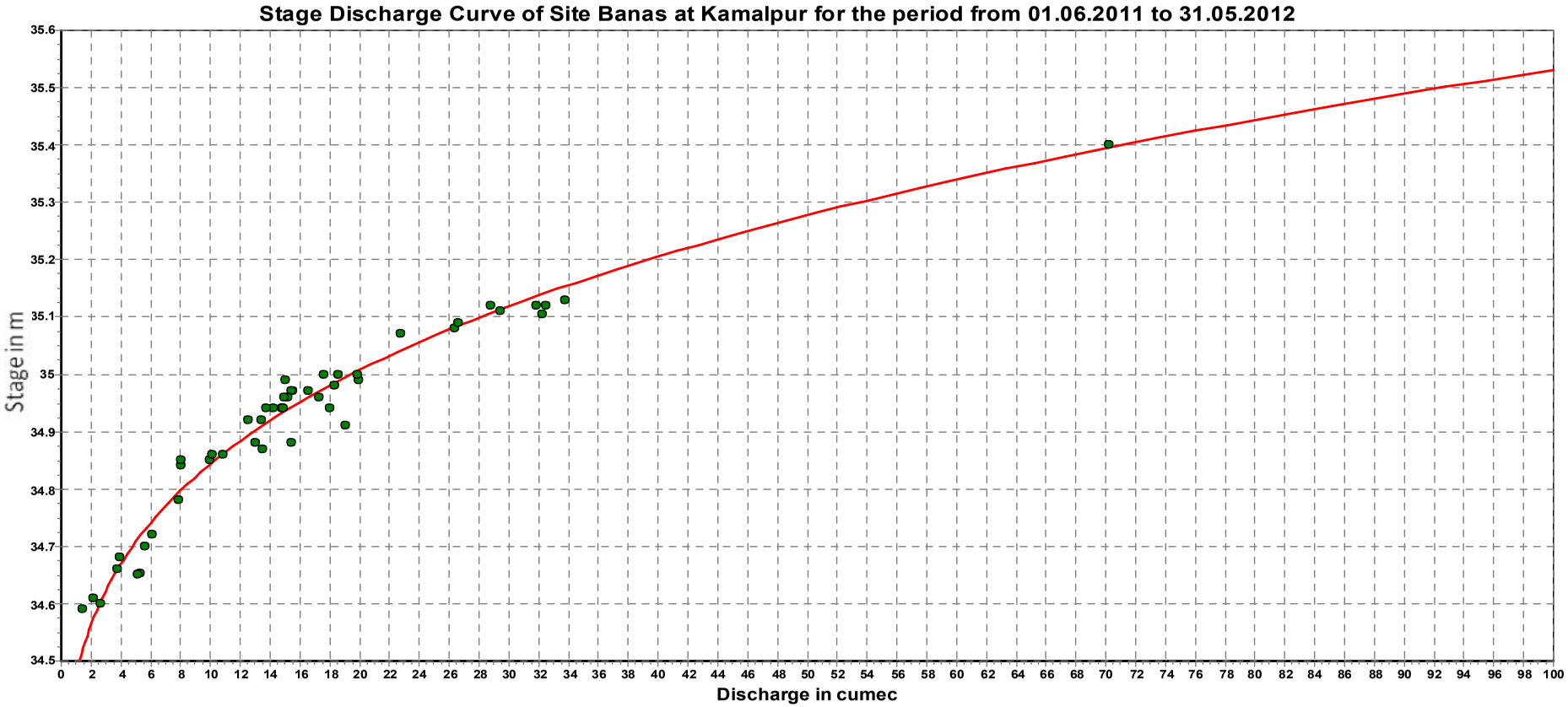
Peak Computed Discharge = 31.17 cumecs on 28/08/2011 **Corres. Water Level :35.13 m**

Lowest Computed Discharge = 2.580 cumecs on 11/09/2011 **Corres. Water Level :34.6 m**

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff



Procedure : Standard

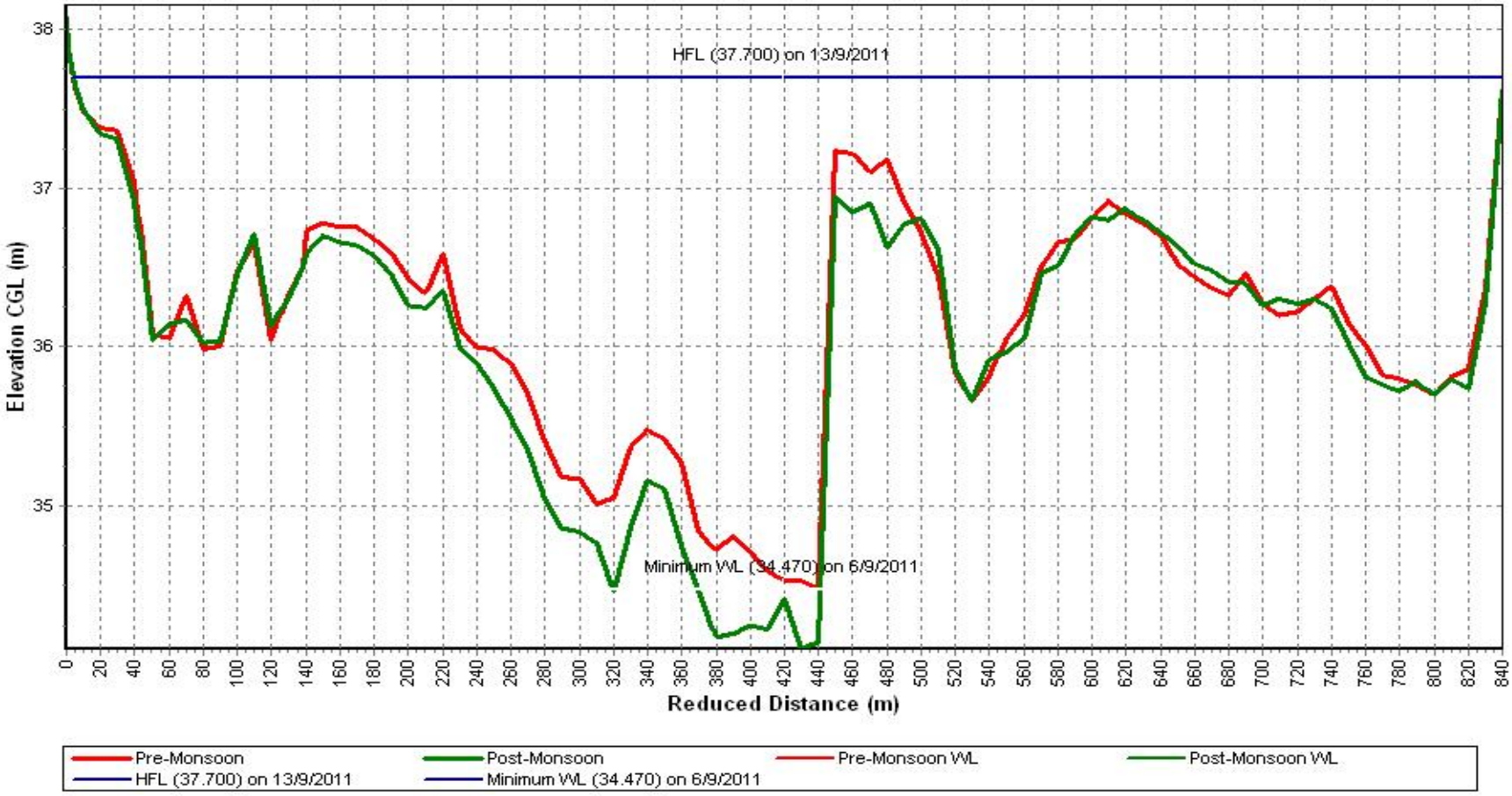
Equation type: Power

Q = c (h+a)^b, a = -34.05, b =3.693, c = 23.462

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Banas at Kamalpur (01 02 02 007)
Local River : Banas

Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur

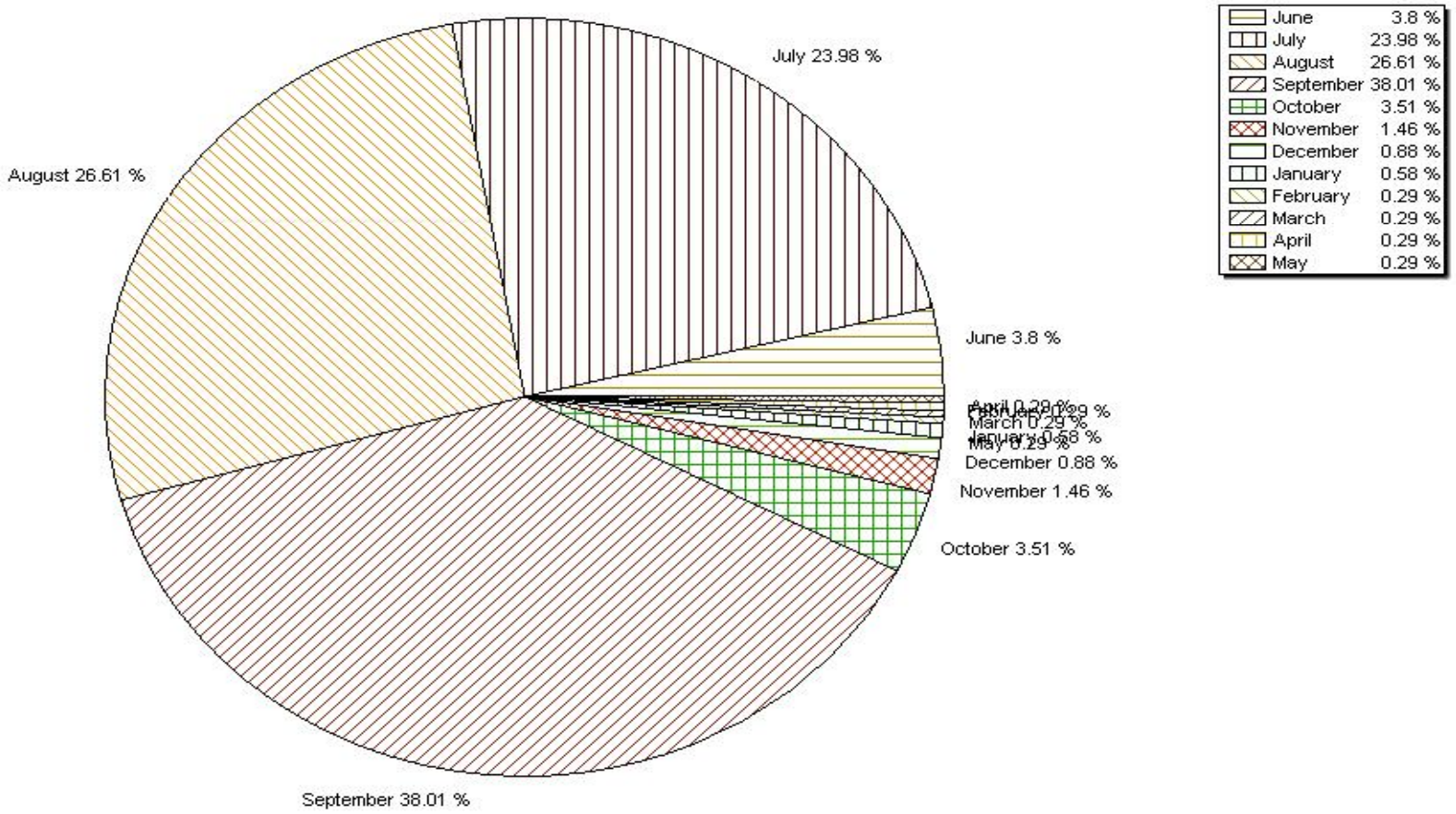


Histroical Flood Level-38.980m on 8.09.1992 at 1700 hrs

Monthly Average Runoff based on period : 1971-2011

Station Name : Banas at Kamalpur (01 02 02 007)
Local River : Banas

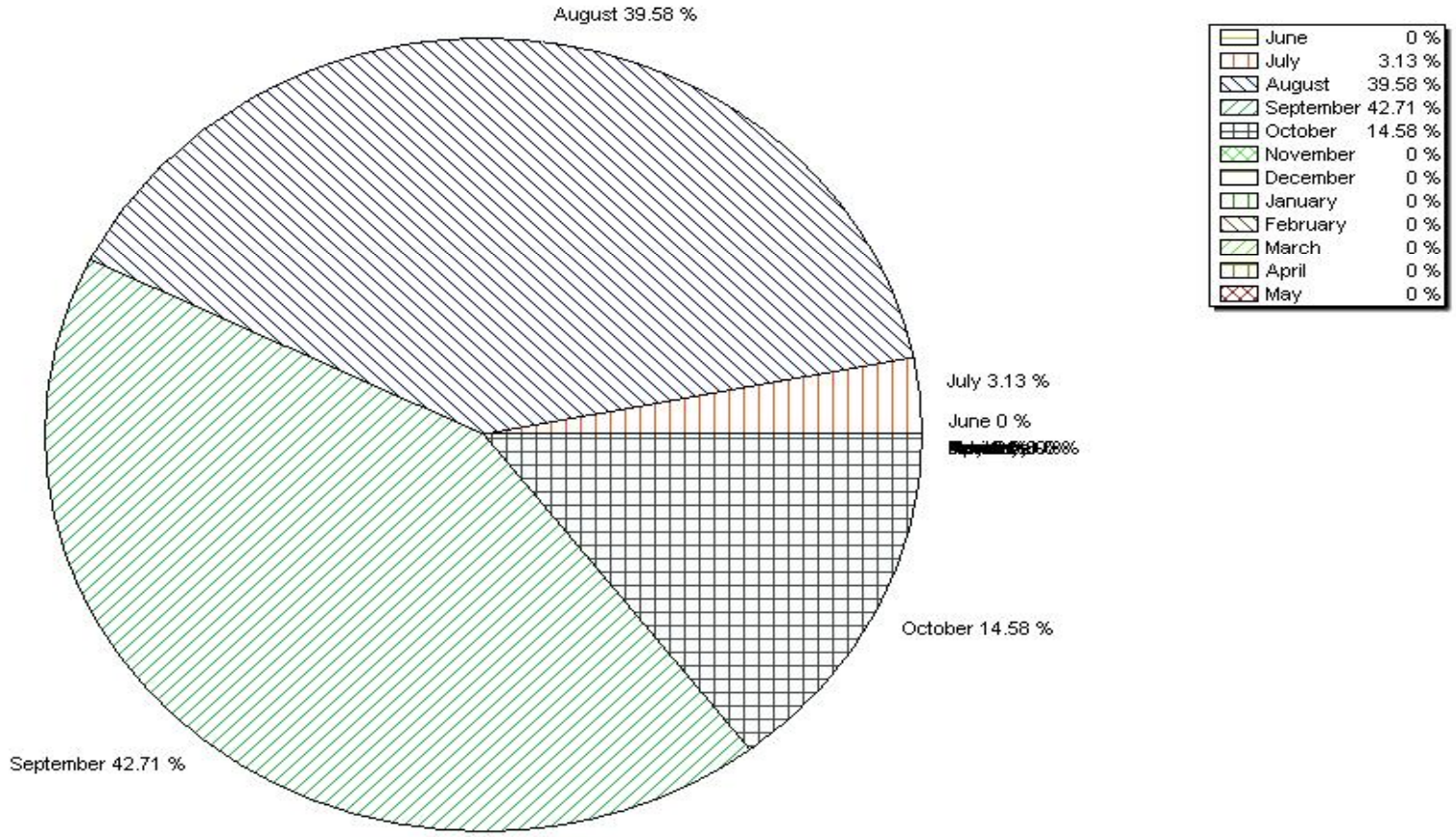
Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur



Monthly Runoff for the Year : 2011-2012

Station Name : Banas at Kamalpur (01 02 02 007)
Local River : Banas

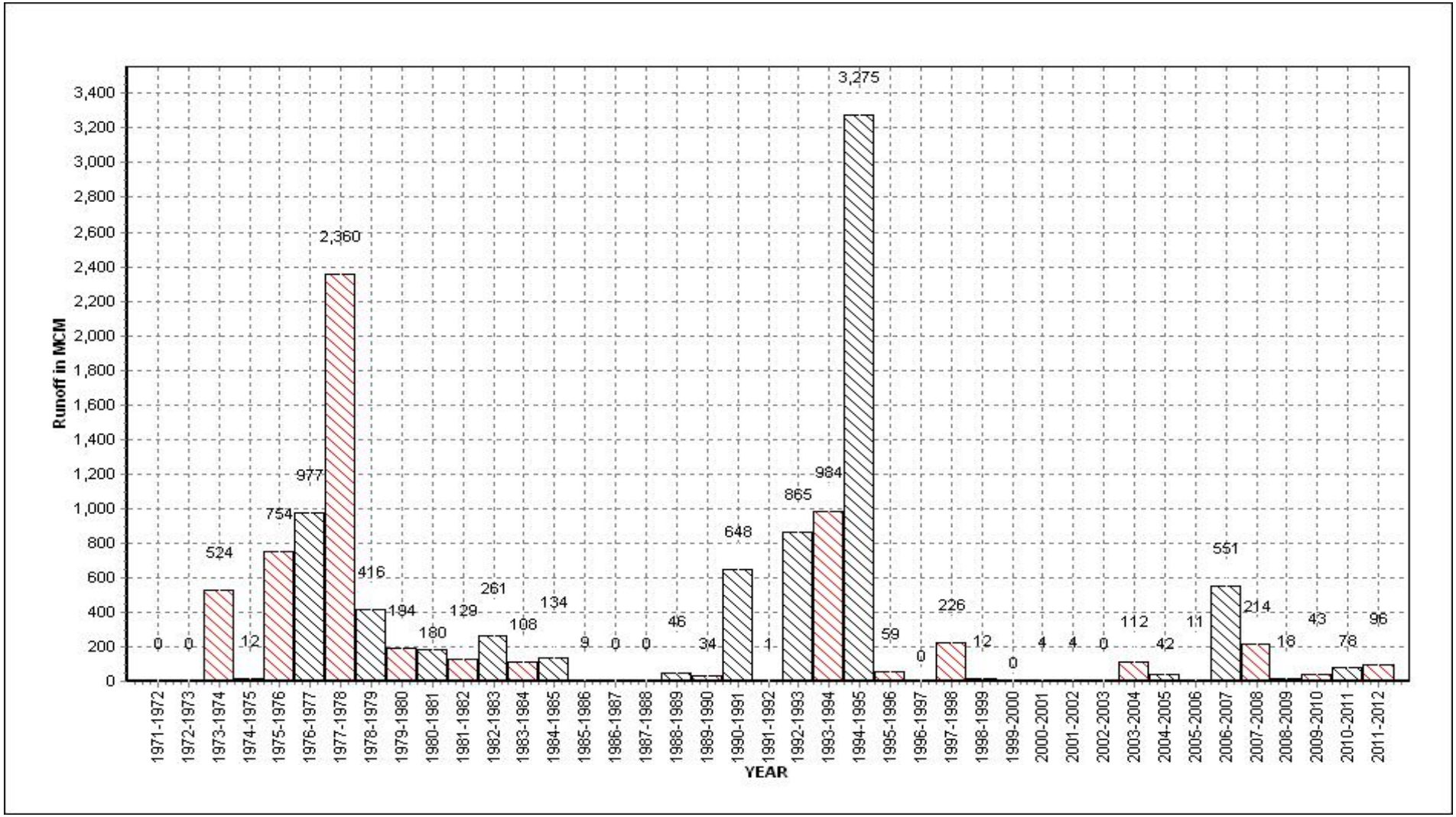
Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur



Annual Runoff Values for the period: 1971 - 2012

Station Name : Banas at Kamalpur (01 02 02 007) **Division : Mahi Division, Gandhinagar**

Local River : Banas **Sub-Division : B.L.Sub Divn, Palanpur**

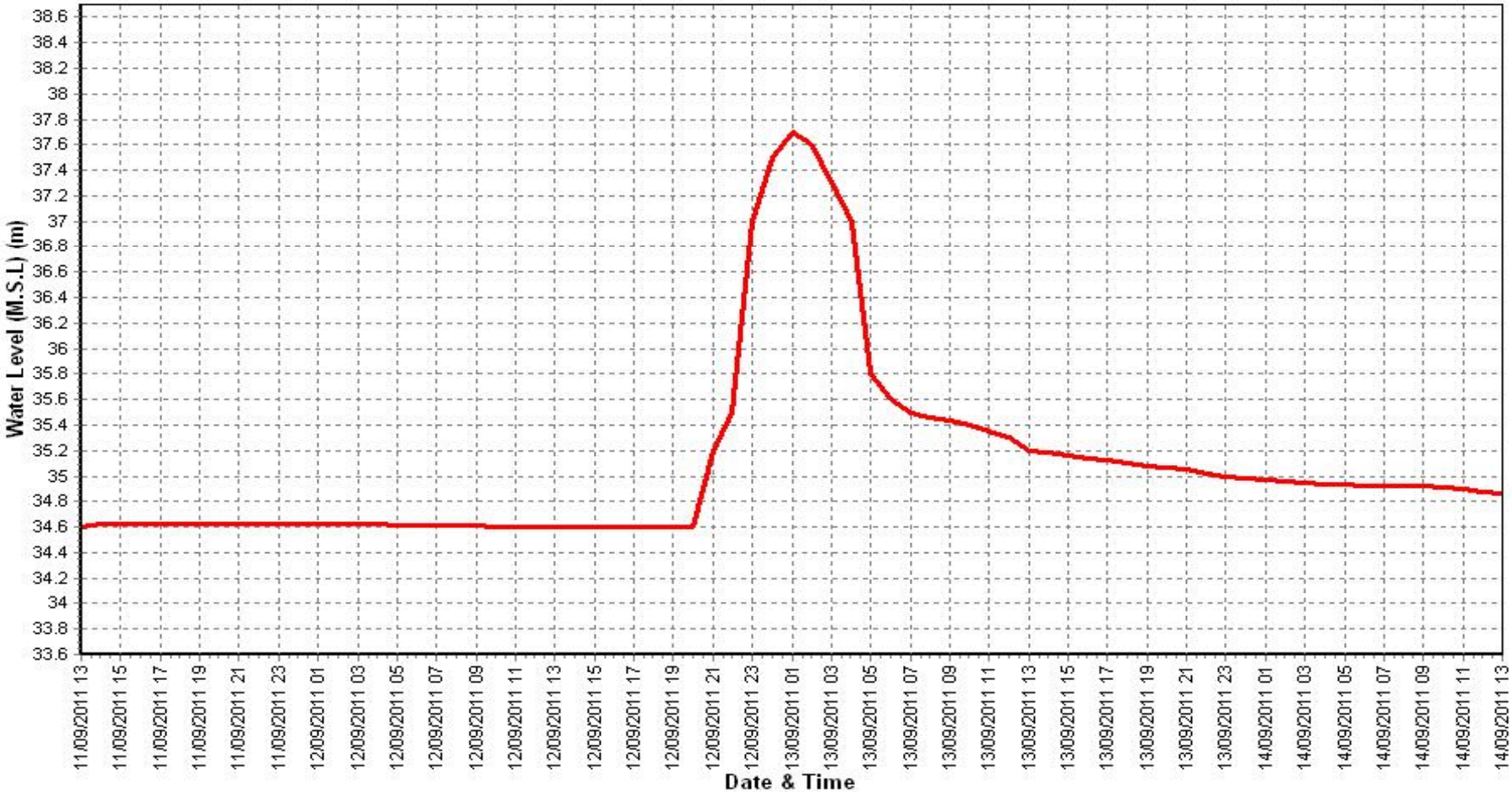


Note: Missing values have not been considered while arriving at Annual Runoff

Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Banas at Kamalpur (01 02 02 007) **Division : Mahi Division, Gandhinagar**

Local River : Banas **Sub-Division : B.L.Sub Divn, Palanpur**

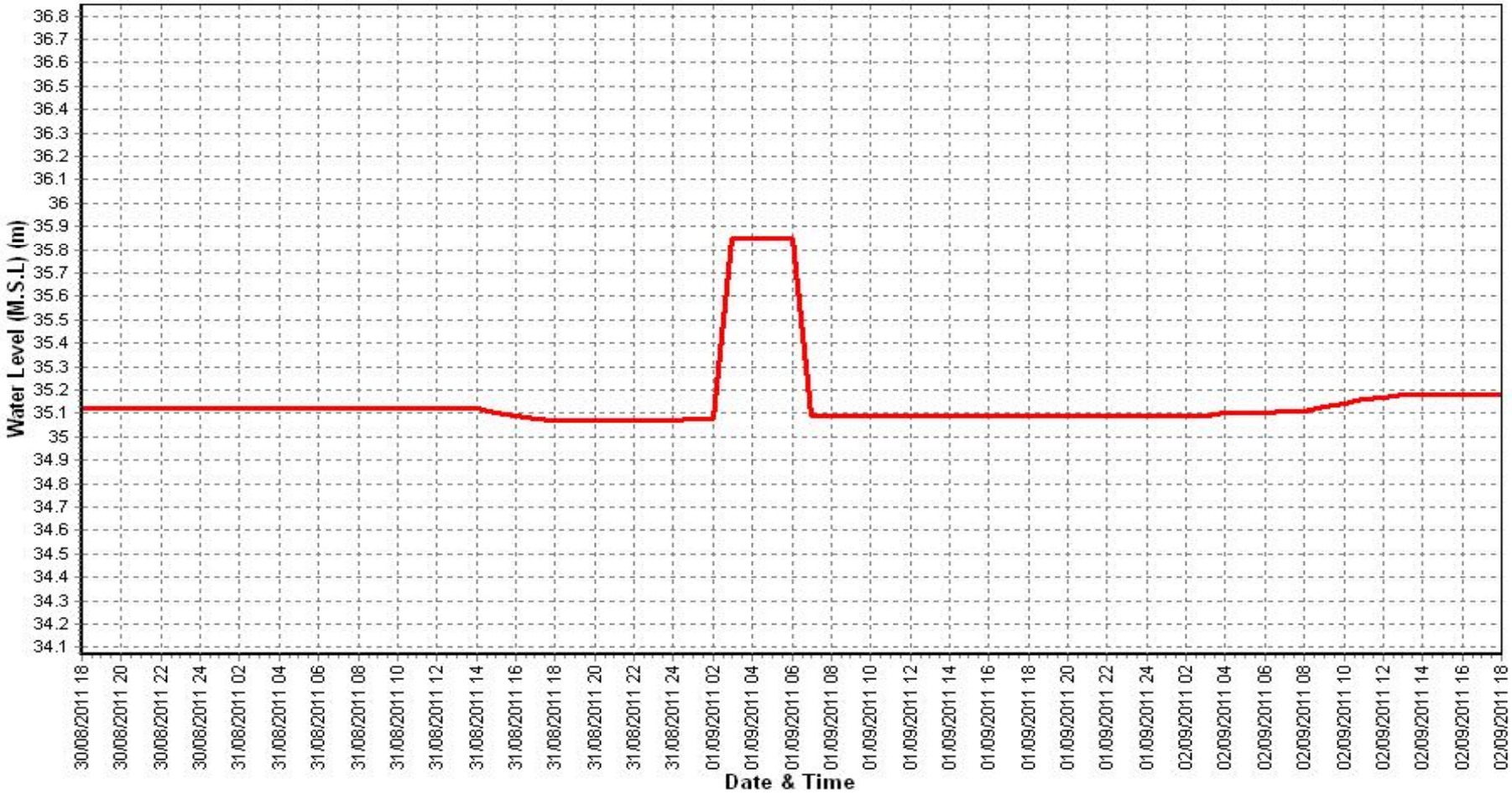


Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Banas at Kamalpur (01 02 02 007) **Division : Mahi Division, Gandhinagar**

Local River : Banas **Sub-Division : B.L.Sub Divn, Palanpur**

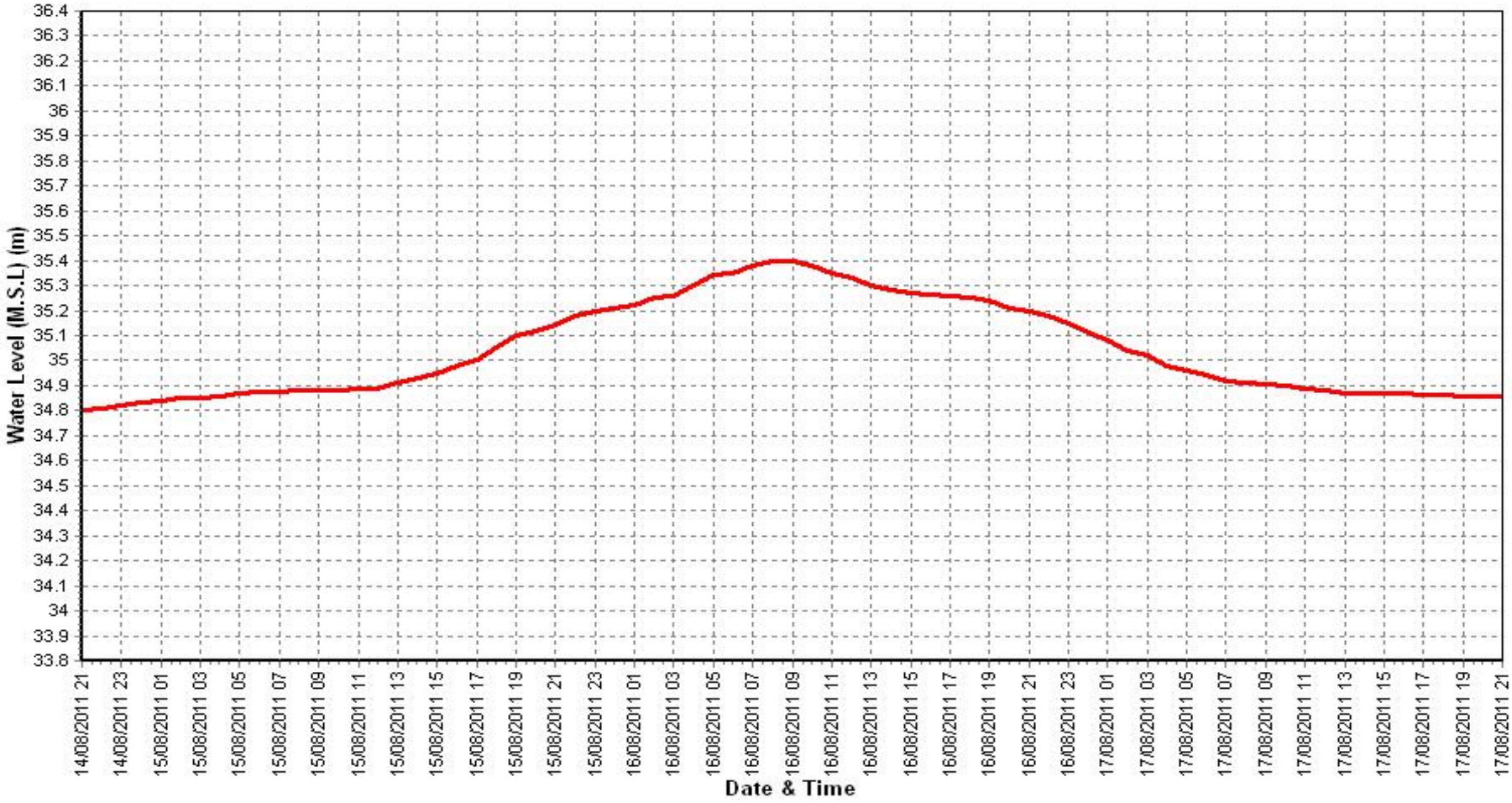


Time Span: 72 Hrs

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Banas at Kamalpur (01 02 02 007) **Division : Mahi Division, Gandhinagar**

Local River : Banas **Sub-Division : B.L.Sub Divn, Palanpur**



Time Span: 72 Hrs

HISTORY SHEET

			Water Year	:	**2011-2012**
Site	:	**Balaram at Chitrasani**	**Code**	:	**01 02 02 004**
State	:	Gujarat	District		Banaskantha
Basin	:	WFR of Kach.-Saur. & Luni	Independent River	:	Banas
Tributary	:	Balaram	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Balaram
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	B.L.Sub Divn, Palanpur
Drainage Area	:	345 Sq. Km.	Bank	:	Left
Latitude	:	24°17'20" N	Longitude	:	72°29'54" E
Zero of Gauge (m)	:	184 (m.s.l)	01/01/1985	-	
		Opening Date	Closing Date		
Gauge	:	08/05/1978			
Discharge	:	01/06/1990			
Sediment	:	--			
Water Quality	:	15/07/1988			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1990-1991	129.5	185.700	04/07/1990	0.000	River Dry	12/01/1991
1991-1992	17.13	185.150	31/07/1991	0.000	River Dry	13/02/1992
1992-1993	274.8	186.750	08/09/1992	0.000	River Dry	15/01/1993
1993-1994	99.91	185.264	10/07/1993	0.000	River Dry	30/12/1993
1994-1995	119.3	185.725	20/08/1994	0.000	184.070	16/05/1995
1995-1996	156.7	185.510	27/08/1995	0.000	184.430	26/01/1996
1996-1997	10.01	185.000	29/07/1996	0.000	184.050	25/01/1997
1997-1998	17.22	185.300	11/09/1997	0.000	184.180	25/01/1998
1998-1999	9.500	185.325	29/08/1998	0.000	184.350	05/12/1998
1999-2000	2.508	184.940	03/10/1999	0.000	River Dry	05/12/1999
2000-2001	1.100	184.500	16/07/2000	0.000	River Dry	08/11/2000
2001-2002	20.90	185.230	24/07/2001	0.000	184.350	10/11/2001
2002-2003	2.103	184.690	29/06/2002	0.000	River Dry	25/05/2003
2003-2004	10.50	185.000	10/07/2003	0.000	River Dry	04/02/2004
2004-2005	1.581	185.580	12/08/2004	0.000	River Dry	14/02/2005
2005-2006	8.668	185.720	16/09/2005	0.000	River Dry	01/06/2005
2006-2007	81.56	186.450	16/08/2006	0.000	River Dry	01/06/2006
2007-2008	40.71	186.285	05/08/2007	0.000	River Dry	01/06/2007
2008-2009	6.999	185.980	15/08/2008	0.000	River Dry	01/06/2008
2009-2010	30.4	186.335	23/07/2009	0.000	River Dry	01/06/2009
2010-2011	23.48	186.460	25/07/2010	0.000	River Dry	01/06/2010
2011-2012	268.557	187.120	12/09/2011	0.000	185.690	28/12/2011

Stage-Discharge Data for the period 2011 - 2012

Station Name : Balaram at Chitrasani (01 02 02 004) **Division : Mahi Division, Gandhinagar**

Local River : Balaram **Sub-Division : B.L.Sub Divn, Palanpur**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	R Dry	0.000	R Dry	0.000	R Dry	0.000	185.890	3.933	185.950	6.206	185.750	0.000
2	R Dry	0.000	R Dry	0.000	R Dry	0.000	185.860	3.491	185.950	5.994	185.740	0.000
3	R Dry	0.000	R Dry	0.000	R Dry	0.000	185.990	7.646	185.940	5.612	185.740	0.000
4	R Dry	0.000	R Dry	0.000	R Dry	0.000	185.930	7.506	185.930	5.301	185.740	0.000
5	R Dry	0.000	R Dry	0.000	R Dry	0.000	186.000	7.951	185.920	4.574	185.730	0.000
6	R Dry	0.000	R Dry	0.000	R Dry	0.000	185.960	6.901	185.900	3.972	185.730	0.000
7	R Dry	0.000	R Dry	0.000	R Dry	0.000	185.970	7.414	185.890	3.669	185.730	0.000
8	R Dry	0.000	R Dry	0.000	R Dry	0.000	186.180	16.83	185.880	3.307	185.720	0.000
9	R Dry	0.000	R Dry	0.000	R Dry	0.000	186.570	133.8	185.880	3.220	185.720	0.000
10	R Dry	0.000	R Dry	0.000	185.835	2.331	186.200	32.98	185.880	3.038	185.720	0.000
11	R Dry	0.000	R Dry	0.000	185.770	1.887	186.570	135.6	185.870	2.836	185.720	0.000
12	R Dry	0.000	R Dry	0.000	185.730	1.355	187.120	268.6	185.860	2.421	185.720	0.000
13	R Dry	0.000	R Dry	0.000	185.975	21.29	186.450	110.4	185.850	2.223	185.720	0.000
14	R Dry	0.000	R Dry	0.000	185.800	2.823	186.280	38.13	185.850	2.145	185.710	0.000
15	R Dry	0.000	R Dry	0.000	185.840	3.445	186.220	30.86	185.850	1.989	185.710	0.000
16	R Dry	0.000	186.285	0.000	186.170	31.09	186.150	25.95	185.840	1.879	185.710	0.000
17	R Dry	0.000	185.410	0.000	186.000	22.03	186.160	28.15	185.840	1.876	185.710	0.000
18	R Dry	0.000	185.600	0.000	185.950	5.772	186.240	32.75	185.840	1.668	185.710	0.000
19	R Dry	0.000	185.600	0.000	185.880	4.441	186.140	24.56	185.840	1.647	185.710	0.000
20	R Dry	0.000	185.590	0.000	185.850	2.980	186.120	23.38	185.830	1.474	185.710	0.000
21	R Dry	0.000	185.580	0.000	185.830	2.717	186.080	22.31	185.830	1.533	185.710	0.000
22	R Dry	0.000	185.580	0.000	185.900	4.790	186.060	21.59	185.810	1.255	185.710	0.000
23	R Dry	0.000	185.570	0.000	185.870	3.215	186.030	10.57	185.810	1.800 *	185.710	0.000
24	R Dry	0.000	185.570	0.000	185.890	3.908	185.990	8.659	185.800	1.134	185.710	0.000
25	R Dry	0.000	185.560	0.000	186.700	127.0 *	185.990	8.339	185.780	0.847	185.710	0.000
26	R Dry	0.000	185.560	0.000	186.100	14.51	185.980	7.752	185.780	1.700 *	185.710	0.000
27	R Dry	0.000	185.560	0.000	186.000	7.475	185.980	7.491	185.770	0.763	185.710	0.000
28	R Dry	0.000	185.560	0.000	185.950	6.390	185.980	7.437	185.779	0.729	185.700	0.000
29	R Dry	0.000	185.560	0.000	186.095	10.86	185.970	6.571	185.760	0.554	185.700	0.000
30	R Dry	0.000	185.560	0.000	186.020	8.525	185.960	6.242	185.760	0.020 *	185.700	0.000
31	R Dry		185.550	0.000	185.910	5.579			185.750	0.506		
Ten-Daily Mean												
I Ten-Daily		0.000		0.000	185.835	0.233	186.055	22.85	185.912	4.489	185.732	0.000
II Ten-Daily		0.000	185.697	0.000	185.896	9.711	186.345	71.83	185.847	2.016	185.713	0.000
III Ten-Daily		0.000	185.565	0.000	186.024	17.72	186.002	10.70	185.784	0.985	185.707	0.000
Monthly												
Min.		0.000	185.410	0.000	185.730	0.000	185.860	3.491	185.750	0.020	185.700	0.000
Max.		0.000	186.285	0.000	186.700	127.0	187.120	268.6	185.950	6.206	185.750	0.000
Mean		0	185.606	0	185.958	9.497	186.134	35.12	185.846	2.448	185.717	0

Annual Runoff in MCM = 123 Annual Runoff in mm = 357

Peak Observed Discharge = 268.6 cumecs on 12/09/2011 Corres. Water Level :187.12 m

Lowest Observed Discharge = 0.000 cumecs on 01/06/2011

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Balaram at Chitrasani (01 02 02 004) **Division : Mahi Division, Gandhinagar**

Local River : Balaram **Sub-Division : B.L.Sub Divn, Palanpur**

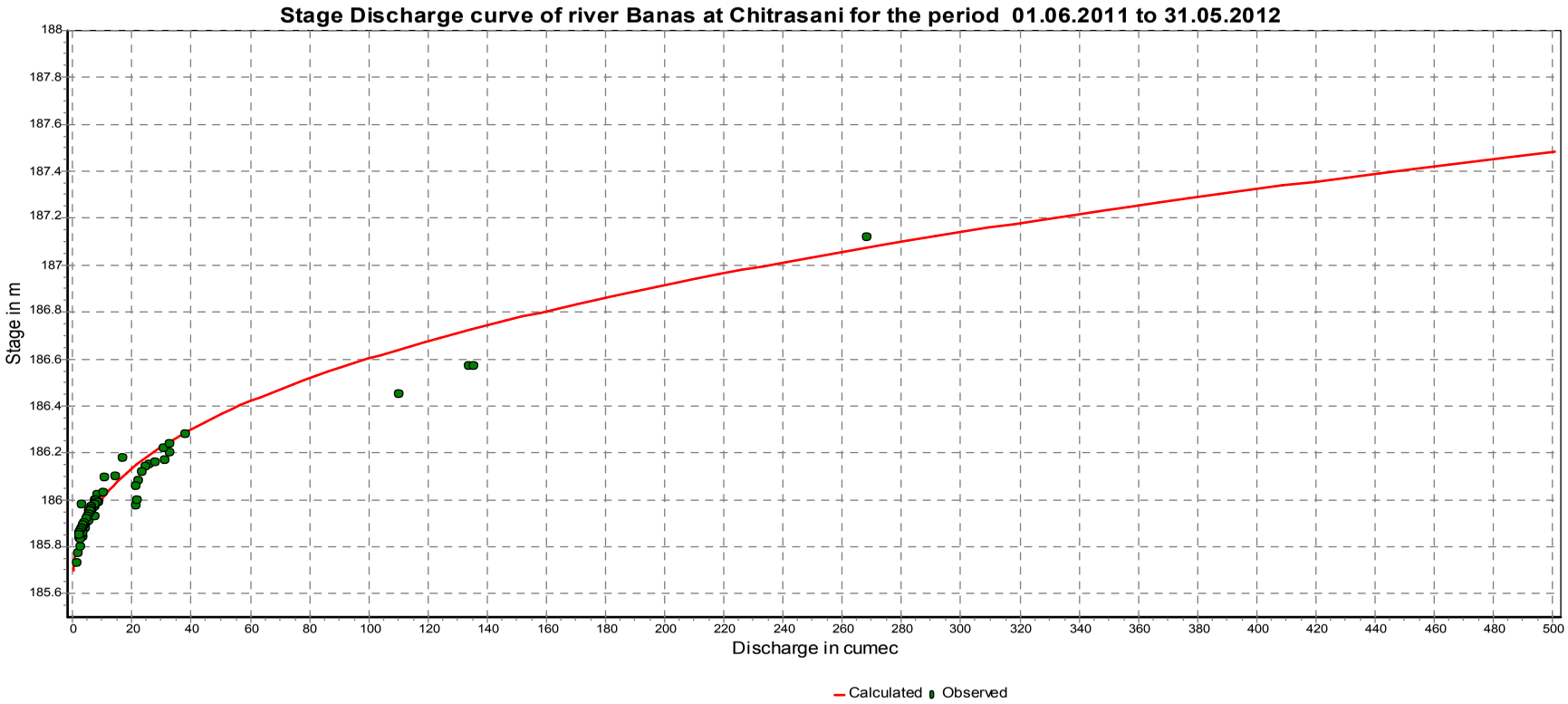
Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	185.700	0.000	185.680	0.000	185.660	0.000	185.640	0.000	185.610	0.000	R Dry	0.000
2	185.700	0.000	185.680	0.000	185.660	0.000	185.640	0.000	185.600	0.000	R Dry	0.000
3	185.700	0.000	185.680	0.000	185.660	0.000	185.640	0.000	185.600	0.000	R Dry	0.000
4	185.700	0.000	185.680	0.000	185.660	0.000	185.640	0.000	185.600	0.000	R Dry	0.000
5	185.700	0.000	185.680	0.000	185.660	0.000	185.630	0.000	185.600	0.000	R Dry	0.000
6	185.700	0.000	185.680	0.000	185.660	0.000	185.630	0.000	185.600	0.000	R Dry	0.000
7	185.700	0.000	185.680	0.000	185.660	0.000	185.630	0.000	185.590	0.000	R Dry	0.000
8	185.700	0.000	185.680	0.000	185.660	0.000	185.630	0.000	185.590	0.000	R Dry	0.000
9	185.700	0.000	185.680	0.000	185.660	0.000	185.630	0.000	185.590	0.000	R Dry	0.000
10	185.700	0.000	185.680	0.000	185.660	0.000	185.630	0.000	185.580	0.000	R Dry	0.000
11	185.700	0.000	185.680	0.000	185.660	0.000	185.630	0.000	185.580	0.000	R Dry	0.000
12	185.700	0.000	185.680	0.000	185.660	0.000	185.630	0.000	185.580	0.000	R Dry	0.000
13	185.690	0.000	185.680	0.000	185.660	0.000	185.620	0.000	R Dry	0.000	R Dry	0.000
14	185.690	0.000	185.680	0.000	185.650	0.000	185.620	0.000	R Dry	0.000	R Dry	0.000
15	185.690	0.000	185.680	0.000	185.650	0.000	185.620	0.000	R Dry	0.000	R Dry	0.000
16	185.690	0.000	185.680	0.000	185.650	0.000	185.620	0.000	R Dry	0.000	R Dry	0.000
17	185.690	0.000	185.670	0.000	185.650	0.000	185.620	0.000	R Dry	0.000	R Dry	0.000
18	185.690	0.000	185.670	0.000	185.650	0.000	185.620	0.000	R Dry	0.000	R Dry	0.000
19	185.690	0.000	185.670	0.000	185.650	0.000	185.620	0.000	R Dry	0.000	R Dry	0.000
20	185.690	0.000	185.670	0.000	185.650	0.000	185.620	0.000	R Dry	0.000	R Dry	0.000
21	185.690	0.000	185.670	0.000	185.640	0.000	185.620	0.000	R Dry	0.000	R Dry	0.000
22	185.690	0.000	185.670	0.000	185.640	0.000	185.620	0.000	R Dry	0.000	R Dry	0.000
23	185.690	0.000	185.670	0.000	185.640	0.000	185.620	0.000	R Dry	0.000	R Dry	0.000
24	185.690	0.000	185.670	0.000	185.640	0.000	185.620	0.000	R Dry	0.000	R Dry	0.000
25	185.690	0.000	185.670	0.000	185.640	0.000	185.620	0.000	R Dry	0.000	R Dry	0.000
26	185.690	0.000	185.670	0.000	185.640	0.000	185.610	0.000	R Dry	0.000	R Dry	0.000
27	185.690	0.000	185.670	0.000	185.640	0.000	185.610	0.000	R Dry	0.000	R Dry	0.000
28	185.690	0.000	185.670	0.000	185.640	0.000	185.610	0.000	R Dry	0.000	R Dry	0.000
29	185.690	0.000	185.670	0.000	185.640	0.000	185.610	0.000	R Dry	0.000	R Dry	0.000
30	185.690	0.000	185.670	0.000			185.610	0.000	R Dry	0.000	R Dry	0.000
31	185.690	0.000	185.670	0.000			185.610	0.000			R Dry	0.000
Ten-Daily Mean												
I Ten-Daily	185.700	0.000	185.680	0.000	185.660	0.000	185.634	0.000	185.596	0.000		0.000
II Ten-Daily	185.692	0.000	185.676	0.000	185.653	0.000	185.622	0.000	185.580	0.000		0.000
III Ten-Daily	185.690	0.000	185.670	0.000	185.640	0.000	185.615	0.000		0.000		0.000
Monthly												
Min.	185.690	0.000	185.670	0.000	185.640	0.000	185.610	0.000	185.580	0.000		0.000
Max.	185.700	0.000	185.680	0.000	185.660	0.000	185.640	0.000	185.610	0.000		0.000
Mean	185.694	0	185.675	0	185.651	0	185.623	0	185.593	0		0

Peak Computed Discharge = 127.0 cumecs on 25/08/2011 **Corres. Water Level :186.7 m**

Lowest Computed Discharge = 0.020 cumecs on 30/10/2011 **Corres. Water Level :185.76 m**

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

Note:Missing values ignored while arriving at Annual Runoff



Procedure : Standard

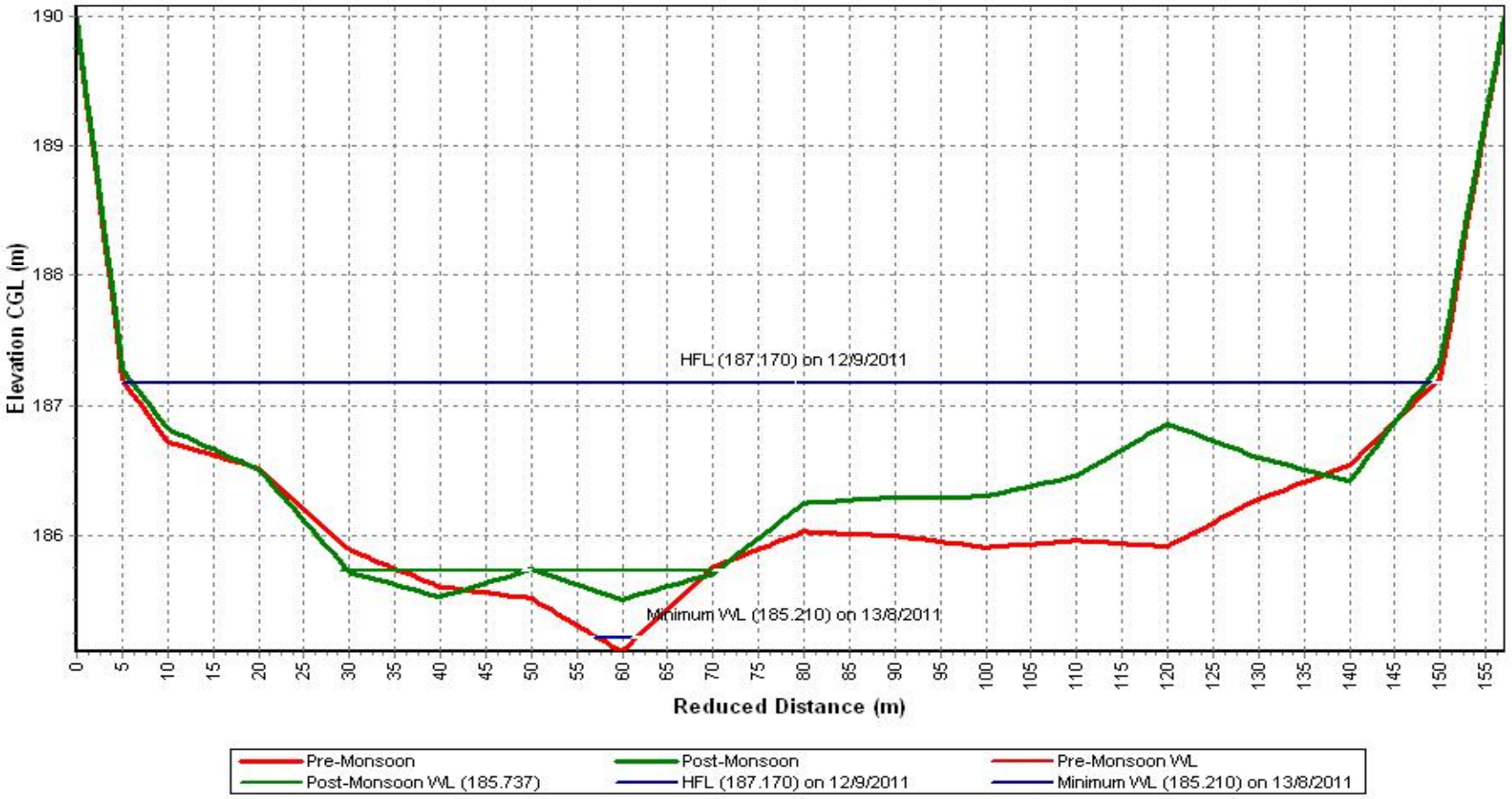
Equation type: Power

Q = c (h+a)^b, a = -185.6, b = 2.554, c = 99.553

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Balaram at Chitrasani (01 02 02 004)
Local River : Balaram

Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur

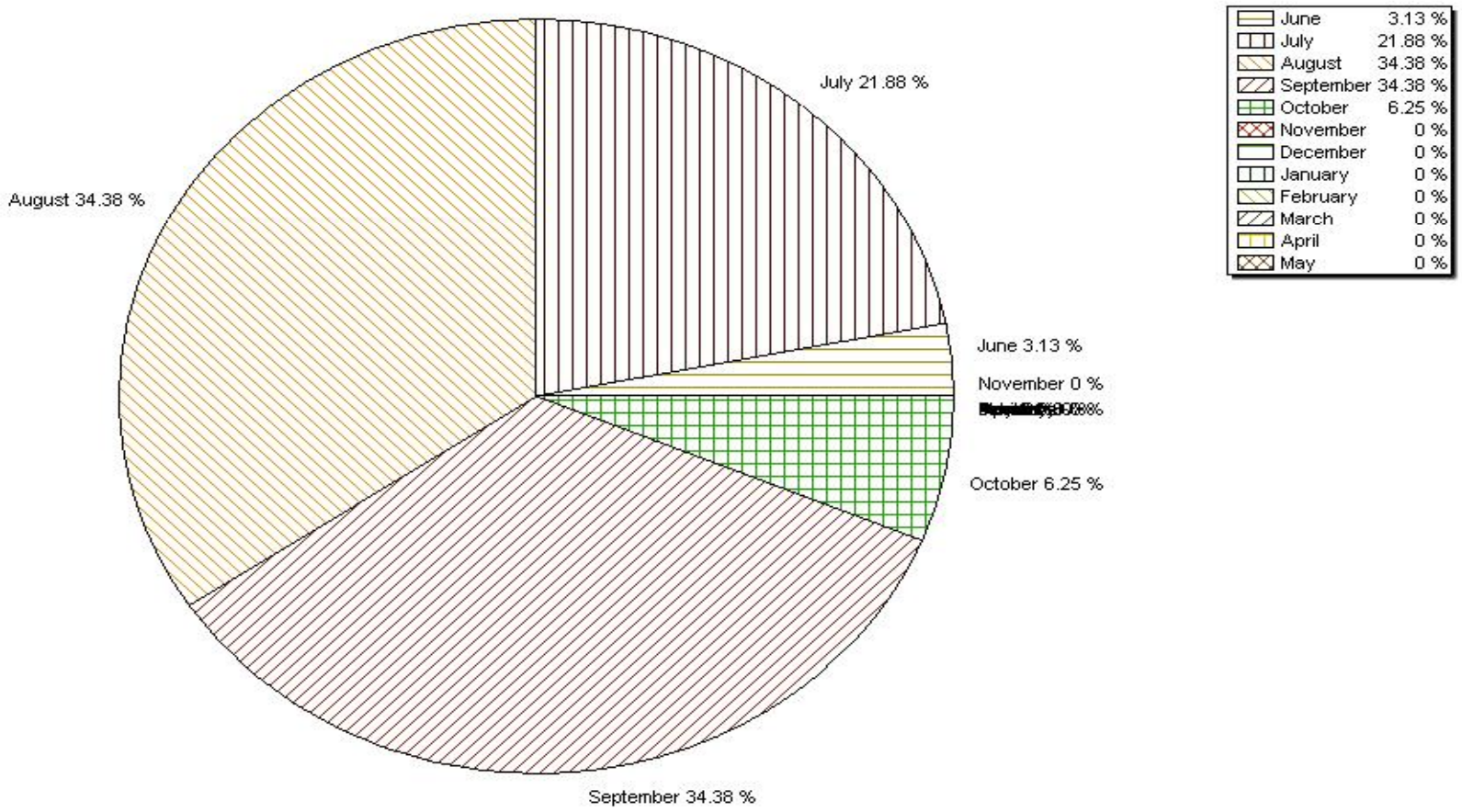


Historic Flood Level-188.200m on 19.08.2006 at 1100 hrs

Monthly Average Runoff based on period : 1990-2011

Station Name : Balaram at Chitrasani (01 02 02 004)
Local River : Balaram

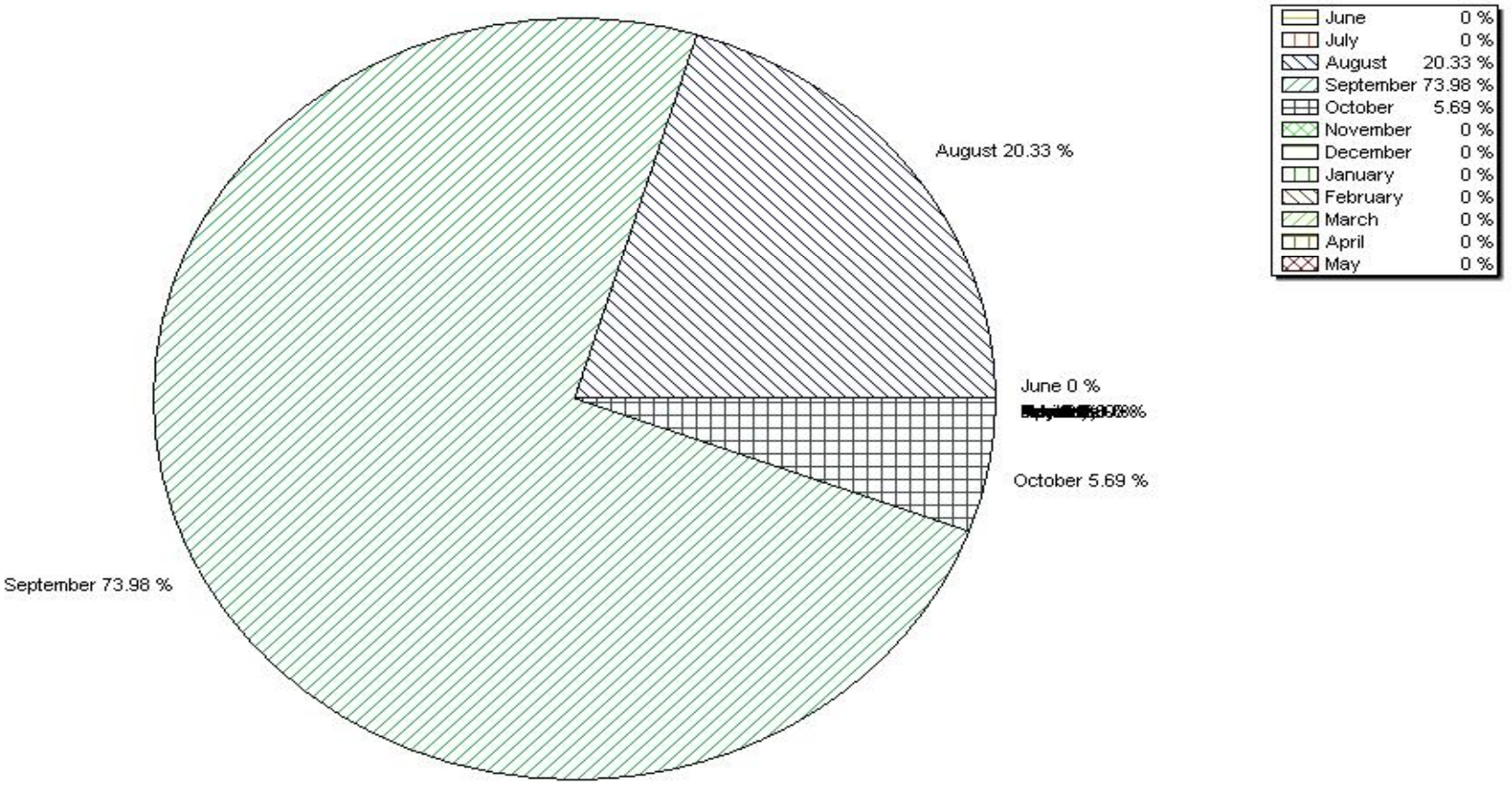
Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur



Monthly Runoff for the Year : 2011-2012

Station Name : Balaram at Chitrasani (01 02 02 004)
Local River : Balaram

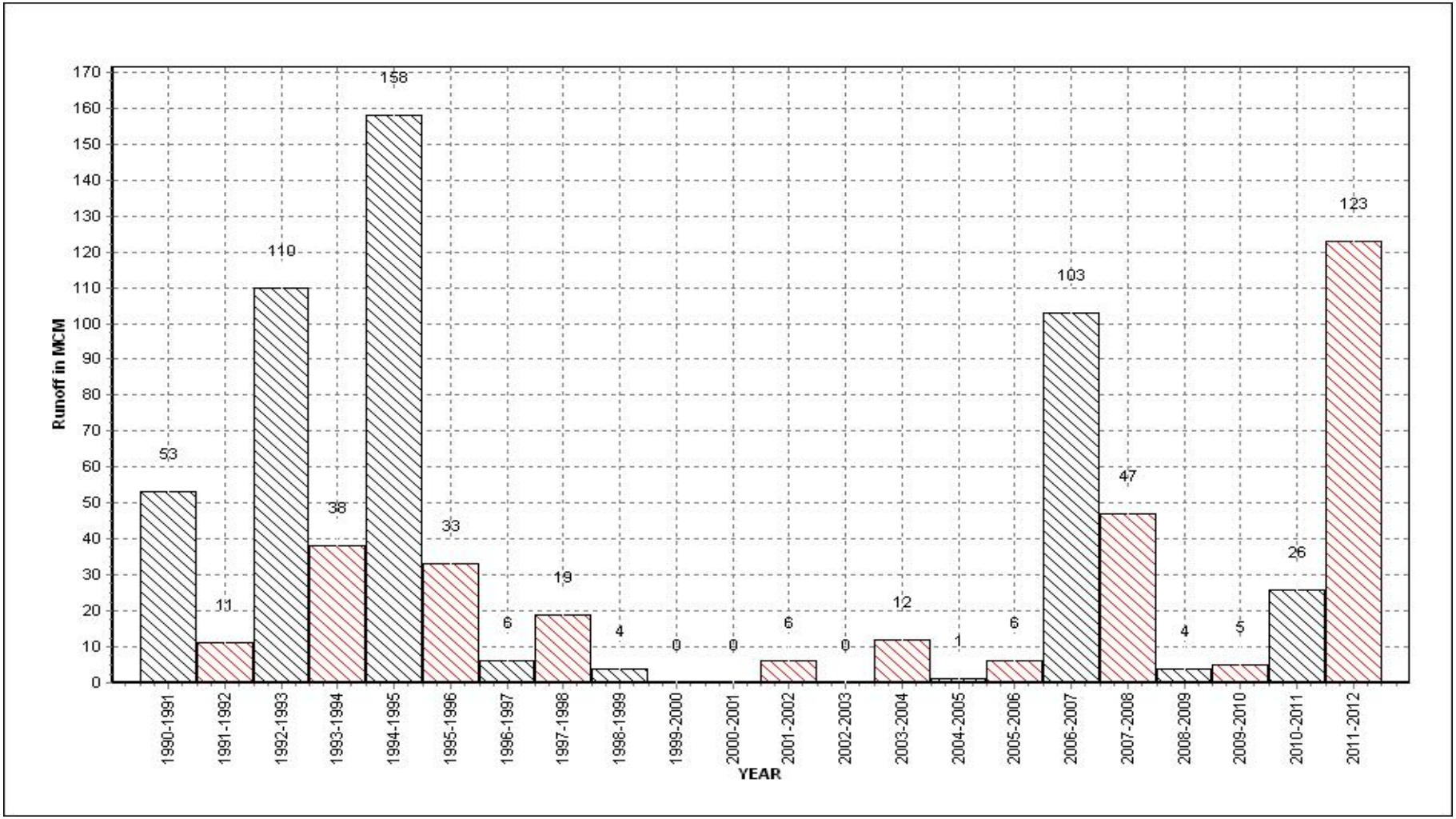
Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur



Annual Runoff Values for the period: 1990 - 2012

Station Name : Balaram at Chitrasani (01 02 02 004)
Local River : Balaram

Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur



Note: Missing values have not been considered while arriving at Annual Runoff

Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Balaram at Chitrasani (01 02 02 004) **Division : Mahi Division, Gandhinagar**

Local River : Balaram **Sub-Division : B.L.Sub Divn, Palanpur**

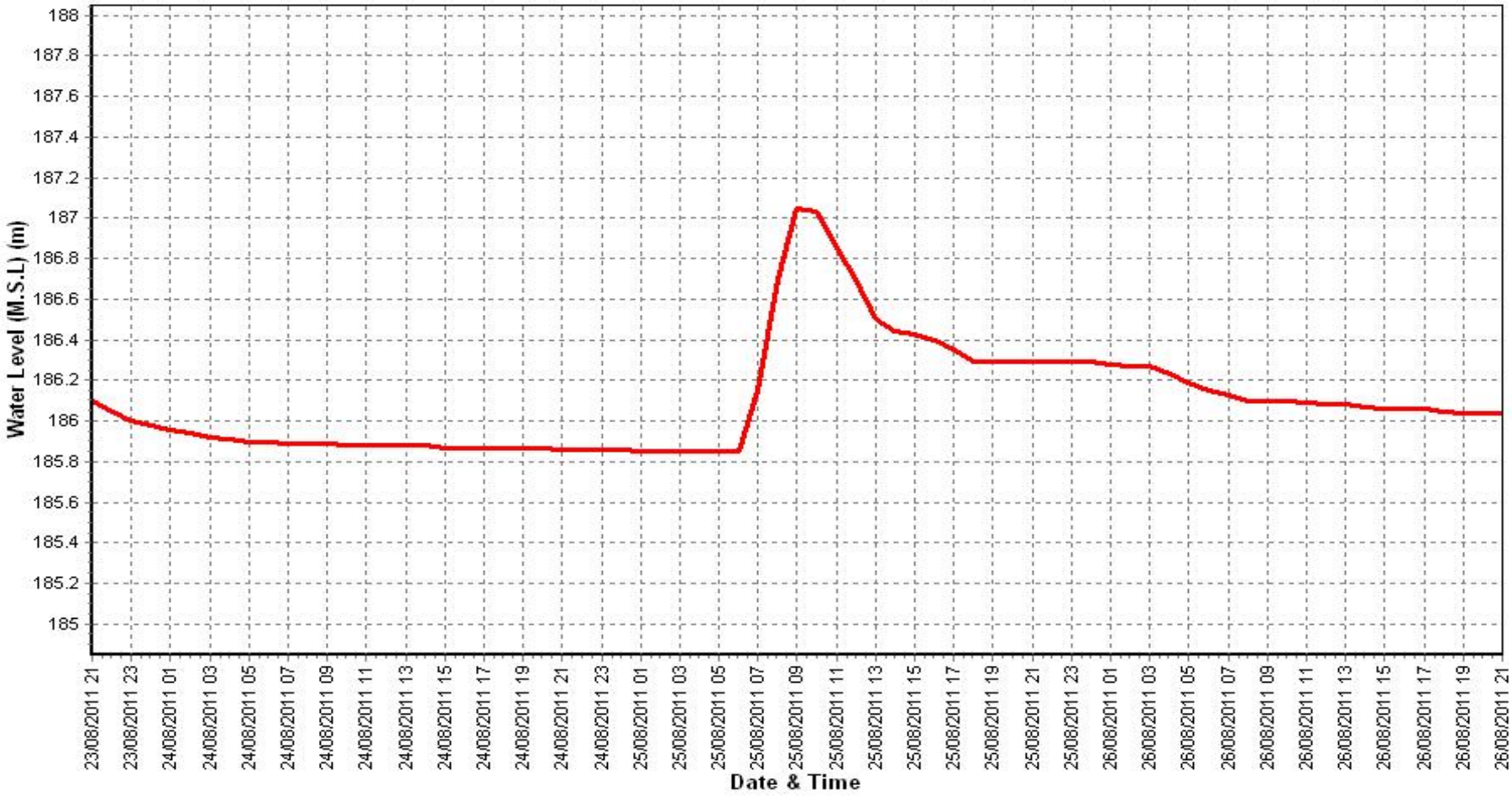


Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Balaram at Chitrasani (01 02 02 004) **Division : Mahi Division, Gandhinagar**

Local River : Balaram **Sub-Division : B.L.Sub Divn, Palanpur**

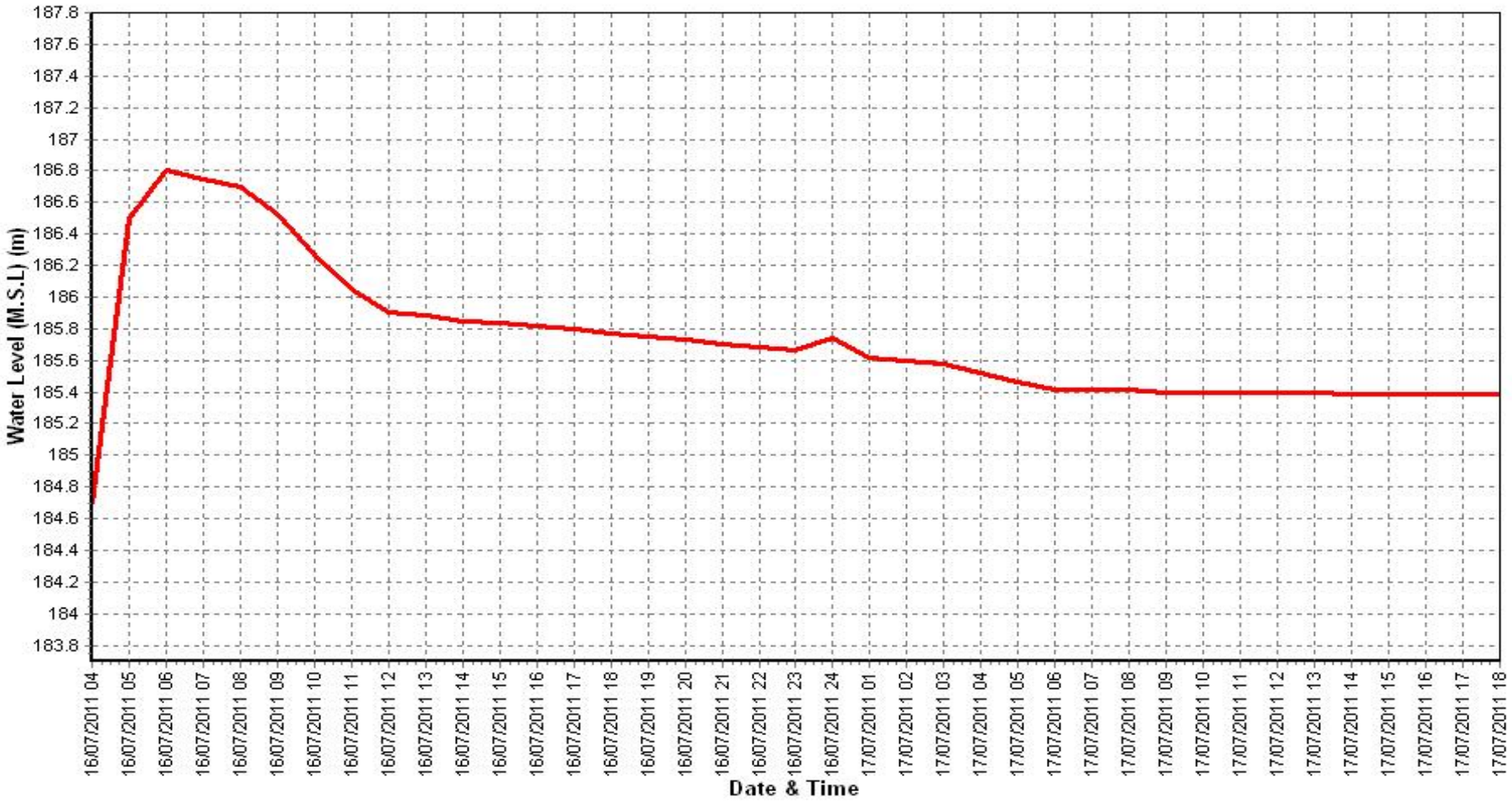


Time Span: 72 Hrs

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Balaram at Chitrasani (01 02 02 004) **Division : Mahi Division, Gandhinagar**

Local River : Balaram **Sub-Division : B.L.Sub Divn, Palanpur**



Time Span: 72 Hrs

HISTORY SHEET

			Water Year	**:**	**2011-2012**
Site	**:**	**Banas at Sarotry**	**Code**	**:**	**01 02 02 003**
State	:	Gujarat	District		Banaskantha
Basin	:	WFR of Kach.-Saur. & Luni	Independent River	:	Banas
Tributary	:	-	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Banas
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	B.L.Sub Divn, Palanpur
Drainage Area	:	2200 Sq. Km.	Bank	:	Left
Latitude	:	24°22'04" N	Longitude	:	72°32'48" E
Zero of Gauge (m)	:	184 (m.s.l) 186 (m.s.l)	01/06/1980 01/08/1989	- -	01/07/1989
		Opening Date	Closing Date		
Gauge	:	12/06/1980			
Discharge	:	01/06/1990			
Sediment	:	---			
Water Quality	:	--			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1989-1990	113.8	187.220	03/07/1989	0.000	River Dry	03/01/1990
1990-1991	1027	188.225	04/07/1990	0.000	River Dry	30/04/1991
1991-1992	194.4	187.305	23/07/1991	0.000	River Dry	17/06/1991
1992-1993	2672	190.780	08/09/1992	0.000	River Dry	02/07/1992
1993-1994	558.0	187.672	18/07/1993	0.000	River Dry	07/05/1994
1994-1995	1324	189.025	08/09/1994	0.000	River Dry	09/06/1994
1995-1996	339.3	188.220	25/07/1995	0.000	186.600	09/03/1996
1996-1997	44.34	187.565	29/07/1996	0.000	186.670	08/11/1996
1997-1998	360.0	188.325	14/09/1997	0.000	186.810	23/01/1998
1998-1999	111.0	187.700	18/10/1998	0.000	186.750	04/12/1998
1999-2000	154.0	187.910	22/06/1999	0.000	River Dry	08/11/1999
2000-2001	20.44	187.200	16/07/2000	0.000	River Dry	26/01/2001
2001-2002	26.27	187.200	15/06/2001	0.000	River Dry	23/11/2001
2002-2003	22.57	187.100	29/06/2002	0.000	River Dry	25/01/2003
2003-2004	244.0	187.950	19/06/2003	0.000	River Dry	31/12/2003
2004-2005	51.89	187.650	02/08/2004	0.000	River Dry	25/01/2005
2005-2006	213.0	188.050	19/09/2005	0.000	River Dry	01/06/2005
2006-2007	1008	188.750	07/09/2006	0.000	River Dry	01/06/2006
2007-2008	1158	186.010	04/07/2007	0.000	River Dry	01/06/2007
2008-2009	28.71	187.015	14/08/2008	0.000	River Dry	01/06/2008
2009-2010	14.03	186.860	24/07/2009	0.000	River Dry	01/06/2009
2010-2011	209.6	187.550	06/08/2010	0.000	River Dry	01/06/2010
2011-2012	1022.9	189.575	12/09/2011	0.000	River Dry	07/05/2012

Stage-Discharge Data for the period 2011 - 2012

Station Name : Banas at Sarotry (01 02 02 003) **Division : Mahi Division, Gandhinagar**

Local River : Banas **Sub-Division : B.L.Sub Divn, Palanpur**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	R Dry	0.000	R Dry	0.000	R Dry	0.000	186.850	23.54	187.000	30.62	186.680	5.856
2	R Dry	0.000	R Dry	0.000	R Dry	0.000	186.895	41.19	186.980	34.30 *	186.680	5.850
3	R Dry	0.000	R Dry	0.000	R Dry	0.000	186.980	56.71	186.950	20.78	186.680	5.766
4	R Dry	0.000	R Dry	0.000	R Dry	0.000	186.845	22.97	186.940	19.66	186.680	5.881
5	R Dry	0.000	R Dry	0.000	R Dry	0.000	186.915	41.92	186.920	17.90	186.670	4.156
6	R Dry	0.000	R Dry	0.000	R Dry	0.000	187.185	102.8	186.900	25.70 *	186.670	7.900 *
7	R Dry	0.000	R Dry	0.000	R Dry	0.000	187.200	105.8	186.900	15.54	186.670	7.900 *
8	R Dry	0.000	R Dry	0.000	R Dry	0.000	187.605	225.0	186.880	14.08	186.670	4.027
9	R Dry	0.000	R Dry	0.000	R Dry	0.000	187.500	209.0	186.860	21.90 *	186.650	3.453
10	R Dry	0.000	R Dry	0.000	187.400	143.9	187.350	130.6	186.850	13.18	186.650	6.900 *
11	R Dry	0.000	R Dry	0.000	186.950	55.33	187.500	209.1	186.840	12.13	186.630	3.281
12	R Dry	0.000	R Dry	0.000	186.925	45.03	189.575	1023	186.830	11.48	186.610	2.839
13	R Dry	0.000	R Dry	0.000	186.800	16.14	187.940	491.2	186.830	11.45	186.610	5.000 *
14	R Dry	0.000	R Dry	0.000	186.900	40.78	187.600	232.7	186.820	10.05	186.600	2.220
15	R Dry	0.000	R Dry	0.000	186.885	39.20	187.500	212.4	186.810	8.927	186.590	2.081
16	R Dry	0.000	R Dry	0.000	187.600	222.5	187.500	212.4	186.810	17.50 *	186.580	1.995
17	R Dry	0.000	R Dry	0.000	187.200	106.6	187.400	154.5	186.780	10.05	186.570	1.834
18	R Dry	0.000	R Dry	0.000	186.950	55.75	187.600	224.0	186.760	9.806	186.560	1.703
19	R Dry	0.000	R Dry	0.000	186.850	23.74	187.400	147.2	186.750	9.116	186.550	1.531
20	R Dry	0.000	R Dry	0.000	186.770	17.32	187.365	127.7	186.740	7.265	186.540	2.400 *
21	R Dry	0.000	R Dry	0.000	186.770	17.08	187.250	103.2	186.730	7.208	186.530	1.274
22	R Dry	0.000	R Dry	0.000	186.760	16.50	187.250	101.2	186.710	7.061	186.520	1.171
23	R Dry	0.000	R Dry	0.000	186.740	15.61	187.245	75.57	186.700	9.700 *	186.520	1.192
24	R Dry	0.000	R Dry	0.000	186.720	11.38	187.215	59.60	186.680	6.336	186.520	1.200
25	R Dry	0.000	R Dry	0.000	186.725	12.28	187.170	48.42	186.680	6.368	186.520	1.180
26	R Dry	0.000	R Dry	0.000	186.775	17.82	187.120	41.76	186.680	8.500 *	186.520	1.230
27	R Dry	0.000	R Dry	0.000	186.750	15.91	187.080	36.00	186.680	6.161	186.520	1.800 *
28	R Dry	0.000	R Dry	0.000	186.725	12.27	187.040	33.95	186.680	6.256	186.510	1.130
29	R Dry	0.000	R Dry	0.000	186.710	10.80	187.030	32.30	186.680	6.344	186.500	1.078
30	R Dry	0.000	R Dry	0.000	186.910	41.58	187.010	31.89	186.680	8.500 *	186.500	1.042
31			R Dry	0.000	186.885	39.21			186.680	6.170		
Ten-Daily Mean												
I Ten-Daily		0.000		0.000	187.400	14.39	187.132	95.96	186.918	21.36	186.670	5.769
II Ten-Daily		0.000		0.000	186.983	62.24	187.738	303.4	186.797	10.78	186.584	2.488
III Ten-Daily		0.000		0.000	186.770	19.13	187.141	56.38	186.689	7.146	186.516	1.230
Monthly												
Min.		0.000		0.000	186.710	0.000	186.845	22.97	186.680	6.161	186.500	1.042
Max.		0.000		0.000	187.600	222.5	189.575	1023	187.000	34.30	186.680	7.900
Mean		0		0	186.895	31.51	187.337	151.9	186.798	12.9	186.590	3.162

Annual Runoff in MCM = 523 Annual Runoff in mm = 238

Peak Observed Discharge = 1023 cumecs on 12/09/2011 Corres. Water Level :189.575 m

Lowest Observed Discharge = 0.000 cumecs on 01/06/2011

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Banas at Sarotry (01 02 02 003) **Division : Mahi Division, Gandhinagar**

Local River : Banas **Sub-Division : B.L.Sub Divn, Palanpur**

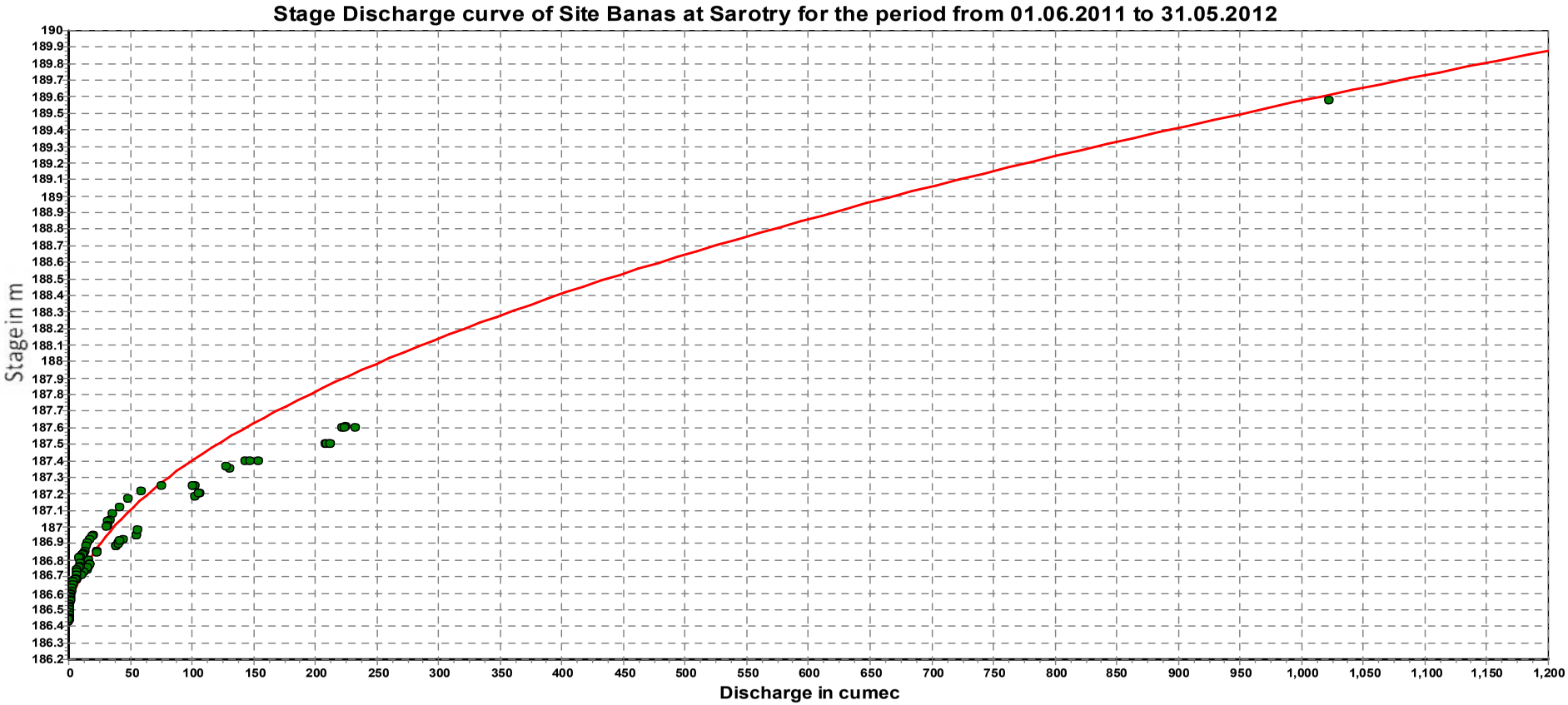
Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	186.480	0.969	186.430	0.200 *	186.390	0.000 *	186.330	0.000 *	R Dry	0.000	R Dry	0.000
2	186.480	0.943	186.430	0.200 *	186.380	0.000 *	186.330	0.000 *	R Dry	0.000	R Dry	0.000
3	186.480	0.942	186.430	0.200 *	186.380	0.000 *	186.330	0.000 *	R Dry	0.000	R Dry	0.000
4	186.470	0.700 *	186.430	0.200 *	186.380	0.000 *	186.330	0.000 *	R Dry	0.000	R Dry	0.000
5	186.460	0.822	186.430	0.200 *	186.380	0.000 *	186.320	0.000 *	R Dry	0.000	R Dry	0.000
6	186.460	0.600 *	186.430	0.200 *	186.380	0.000 *	186.320	0.000 *	R Dry	0.000	R Dry	0.000
7	186.460	0.833	186.430	0.200 *	186.380	0.000 *	186.320	0.000 *	R Dry	0.000	R Dry	0.000
8	186.465	0.839	186.430	0.200 *	186.380	0.000 *	186.320	0.000 *	R Dry	0.000	R Dry	0.000
9	186.450	0.625	186.430	0.200 *	186.380	0.000 *	186.320	0.000 *	R Dry	0.000	R Dry	0.000
10	186.450	0.591	186.430	0.200 *	186.370	0.000 *	186.320	0.000 *	R Dry	0.000	R Dry	0.000
11	186.450	0.500 *	186.430	0.200 *	186.370	0.000 *	186.320	0.000 *	R Dry	0.000	R Dry	0.000
12	186.440	0.550	186.430	0.200 *	186.370	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
13	186.440	0.524	186.430	0.200 *	186.360	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
14	186.440	0.497	186.430	0.200 *	186.360	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
15	186.445	0.539	186.430	0.200 *	186.360	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
16	186.440	0.510	186.420	0.100 *	186.360	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
17	186.430	0.436	186.420	0.100 *	186.350	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
18	186.430	0.200 *	186.420	0.100 *	186.350	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
19	186.430	0.415	186.420	0.100 *	186.350	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
20	186.430	0.419	186.420	0.100 *	186.350	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
21	186.430	0.406	186.400	0.000 *	186.350	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
22	186.430	0.389	186.400	0.000 *	186.340	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
23	186.430	0.387	186.400	0.000 *	186.340	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
24	186.430	0.407	186.400	0.000 *	186.340	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
25	186.430	0.200 *	186.390	0.000 *	186.340	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
26	186.440	0.436	186.390	0.000 *	186.340	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
27	186.440	0.395	186.390	0.000 *	186.330	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
28	186.440	0.319	186.390	0.000 *	186.330	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
29	186.430	0.269	186.390	0.000 *	186.330	0.000 *	R Dry	0.000	R Dry	0.000	R Dry	0.000
30	186.430	0.200	186.390	0.000 *			R Dry	0.000	R Dry	0.000	R Dry	0.000
31	186.430	0.200	186.390	0.000 *			R Dry	0.000			R Dry	0.000
Ten-Daily Mean												
I Ten-Daily	186.465	0.786	186.430	0.200	186.380	0.000	186.324	0.000		0.000		0.000
II Ten-Daily	186.437	0.459	186.425	0.150	186.358	0.000	186.320	0.000		0.000		0.000
III Ten-Daily	186.433	0.328	186.394	0.000	186.338	0.000		0.000		0.000		0.000
Monthly												
Min.	186.430	0.200	186.390	0.000	186.330	0.000	186.320	0.000		0.000		0.000
Max.	186.480	0.969	186.430	0.200	186.390	0.000	186.330	0.000		0.000		0.000
Mean	186.445	0.518	186.415	0.113	186.359	0	186.324	0		0		0

Peak Computed Discharge = 34.30 cumecs on 02/10/2011 Corres. Water Level :186.98 m

Lowest Computed Discharge = 0.000 cumecs on 21/01/2012 Corres. Water Level :186.4 m

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

Note:Missing values ignored while arriving at Annual Runoff



Procedure : Standard

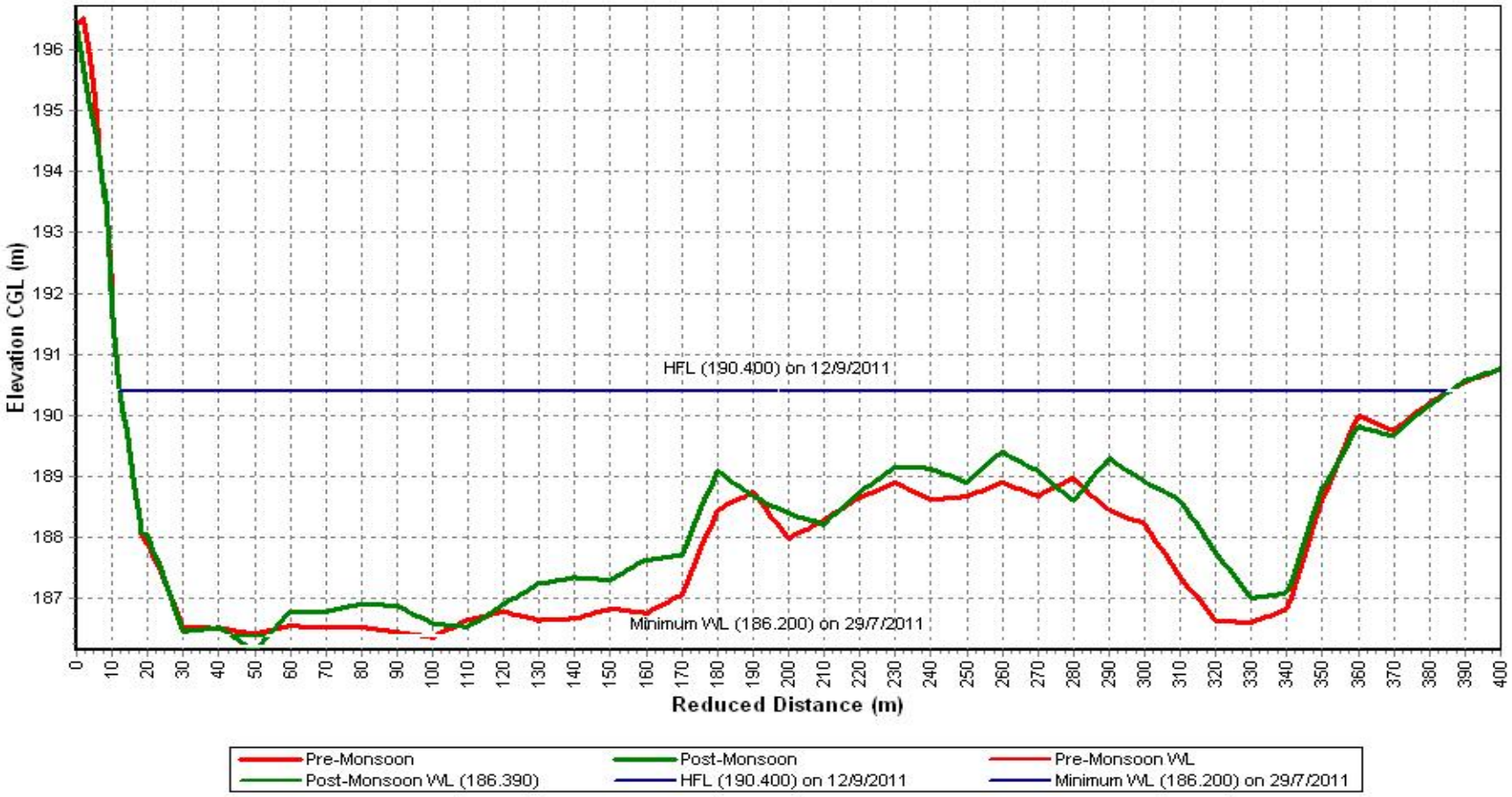
Equation type: Power

Q = c (h+a)^b, a = -186.38, b = 2.016, c = 96.058

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Banas at Sarotry (01 02 02 003)
Local River : Banas

Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur

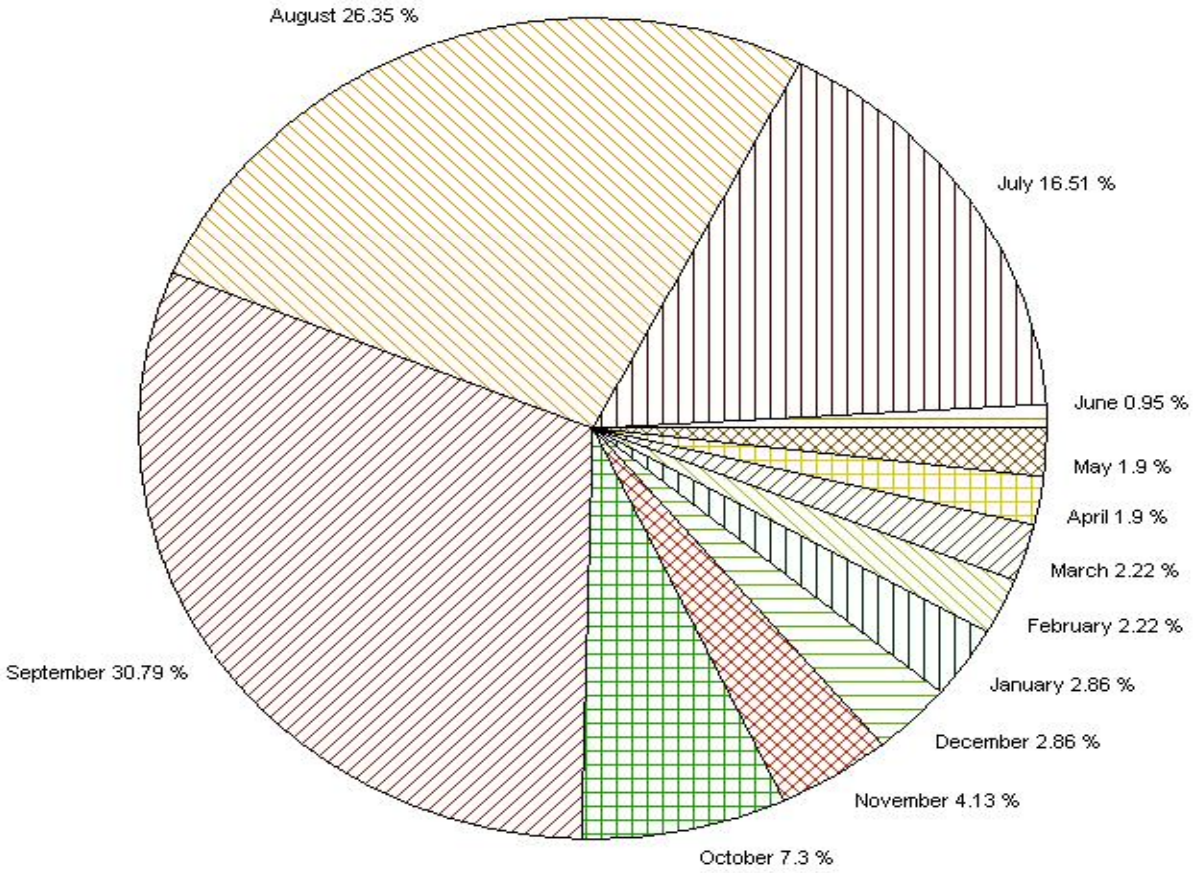


Historic Flood Level-194.310m on 1.09.1973

Monthly Average Runoff based on period : 1989-2011

Station Name : Banas at Sarotry (01 02 02 003)
Local River : Banas

Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur

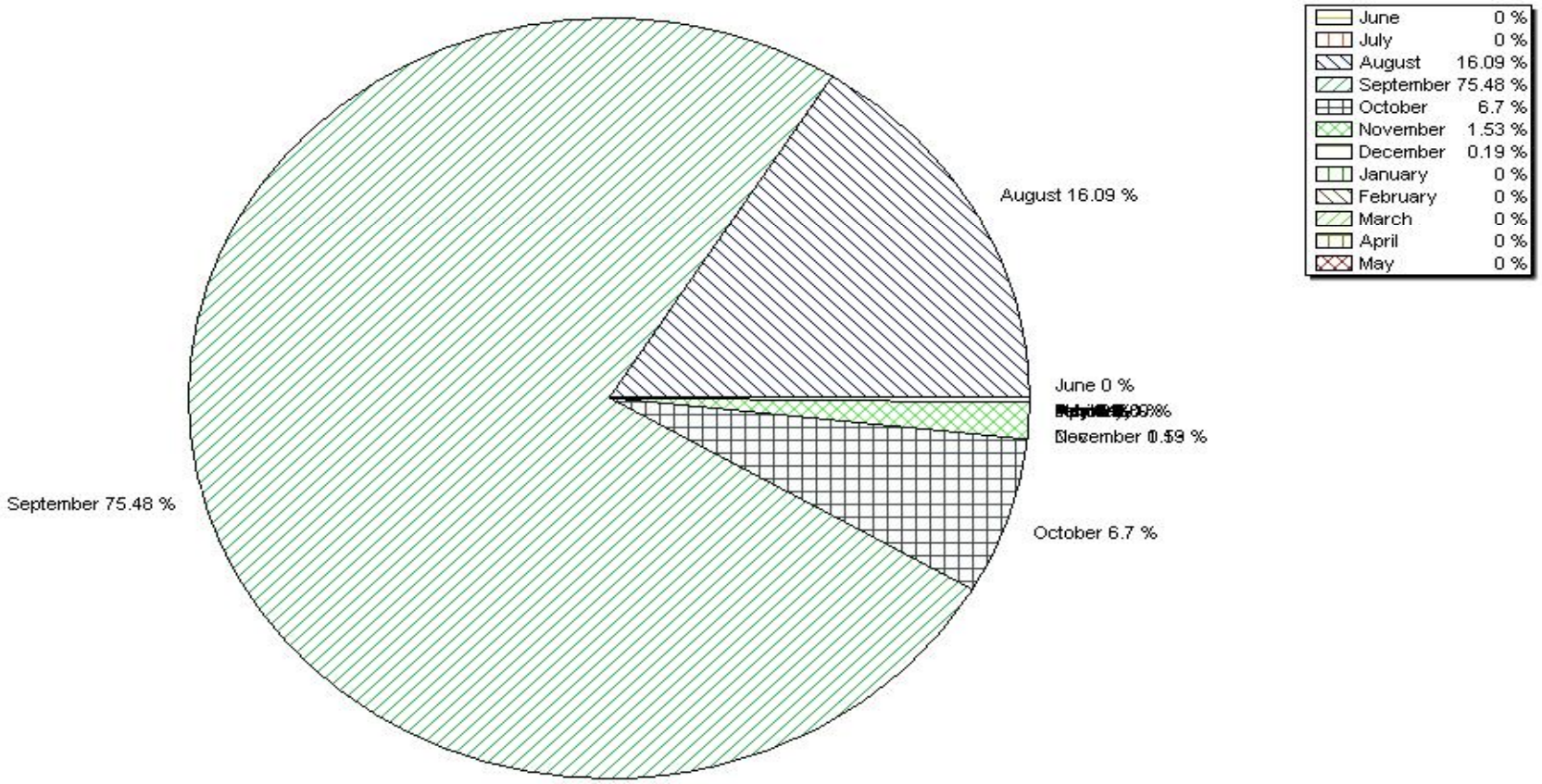


June	0.95 %
July	16.51 %
August	26.35 %
September	30.79 %
October	7.3 %
November	4.13 %
December	2.86 %
January	2.86 %
February	2.22 %
March	2.22 %
April	1.9 %
May	1.9 %

Monthly Runoff for the Year : 2011-2012

Station Name : Banas at Sarotry (01 02 02 003)
Local River : Banas

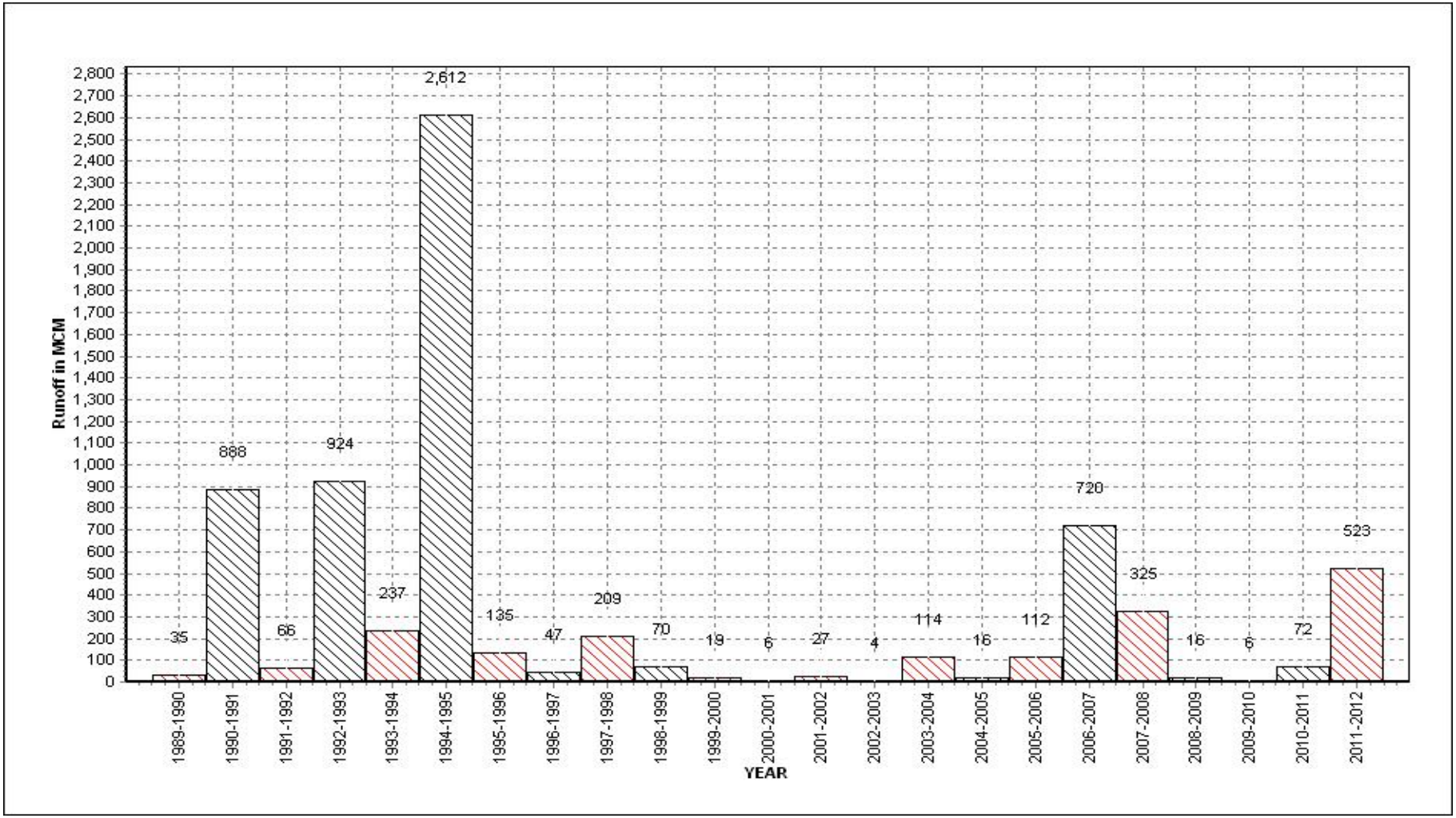
Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur



Annual Runoff Values for the period: 1989 - 2012

Station Name : Banas at Sarotry (01 02 02 003)
Local River : Banas

Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur



Note: Missing values have not been considered while arriving at Annual Runoff

Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Banas at Sarotry (01 02 02 003) **Division : Mahi Division, Gandhinagar**

Local River : Banas **Sub-Division : B.L.Sub Divn, Palanpur**

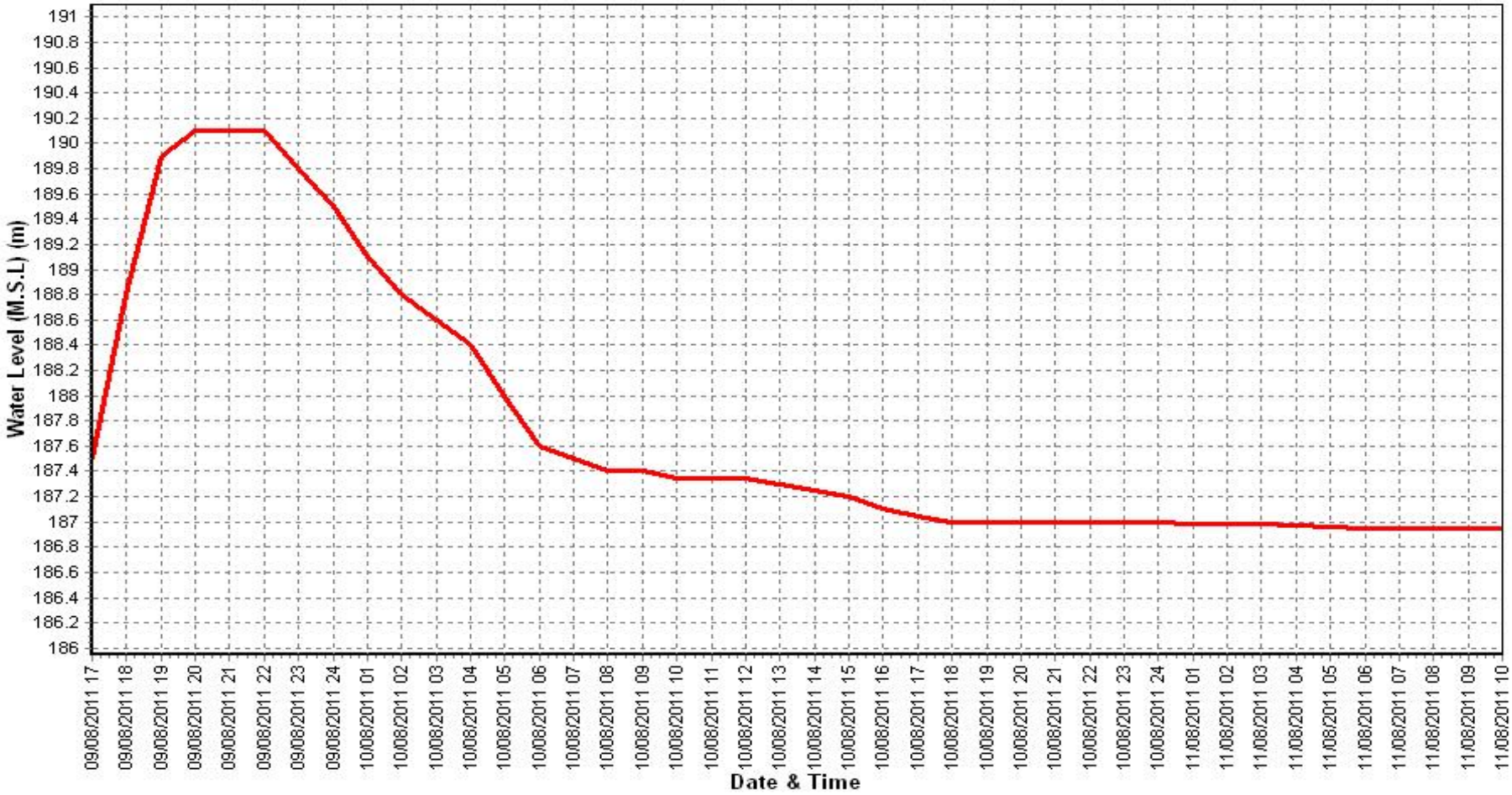


Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Banas at Sarotry (01 02 02 003) **Division : Mahi Division, Gandhinagar**

Local River : Banas **Sub-Division : B.L.Sub Divn, Palanpur**

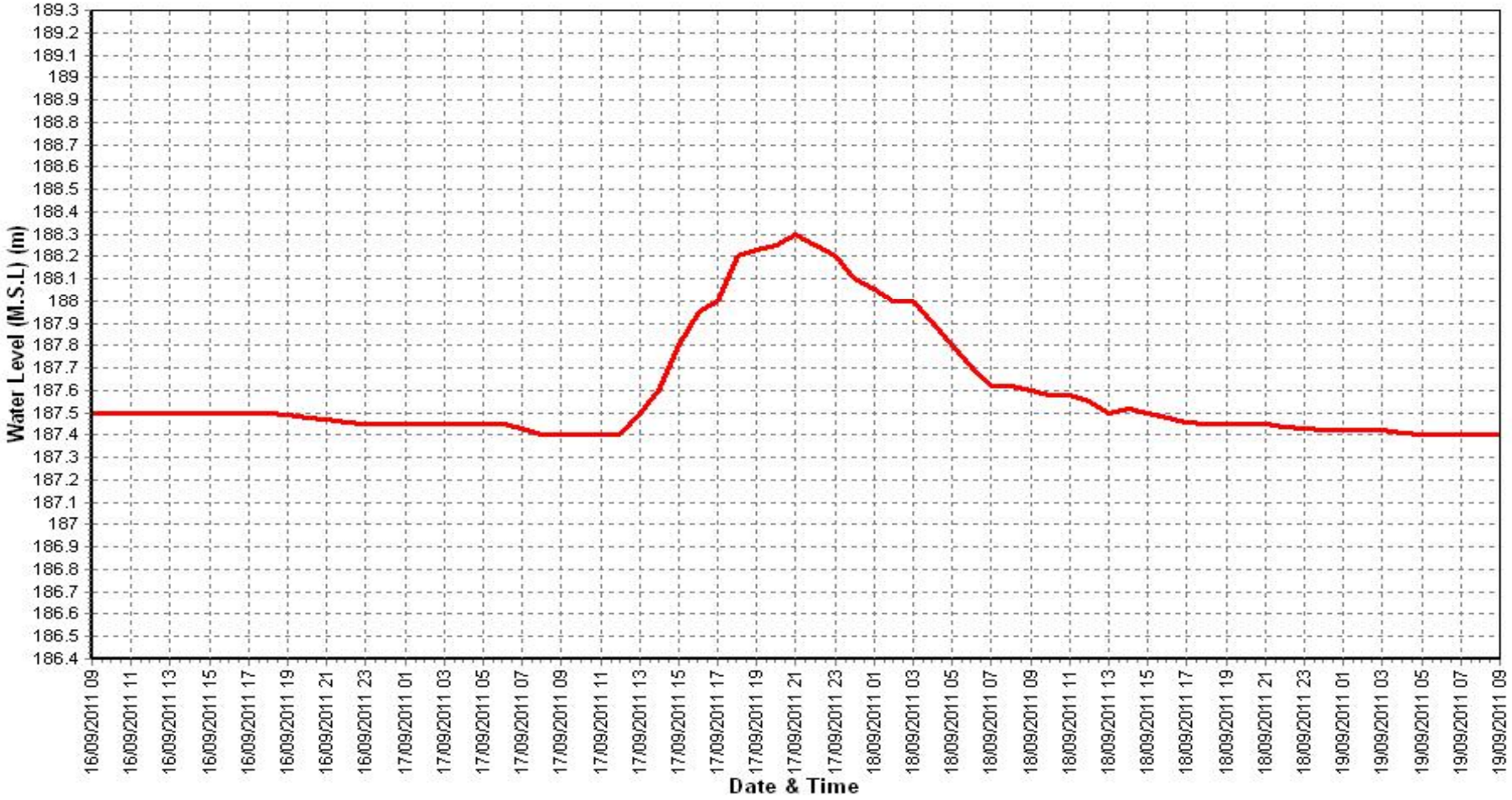


Time Span: 72 Hrs

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Banas at Sarotry (01 02 02 003) **Division : Mahi Division, Gandhinagar**

Local River : Banas **Sub-Division : B.L.Sub Divn. Palanpur**



Time Span: 72 Hrs

HISTORY SHEET

			Water Year	**:**	**2011-2012**
Site	**:**	**Banas at Abu Road**	**Code**	**:**	**01 02 02 002**
State	:	Rajasthan	District		Sirohi
Basin	:	WFR of Kach.-Saur. & Luni	Independent River	:	Banas
Tributary	:	-	Sub Tributary	:	
Sub-Sub Trib	:		Local River	:	Banas
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	B.L.Sub Divn, Palanpur
Drainage Are	:	1600 Sq. Km.	Bank	:	Right
Latitude	:	24°29'38" N	Longitude	:	72°47'30" E
Zero of Gau	:	254.85 (m.s.l)	10/05/1978	-	
		Opening Date	Closing Date		
Gauge	:	10/05/1978			
Discharge	:	01/06/1990			
Sediment	:	--			
Water Quali	:	01/07/1988			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1989-1990	53.42	255.918	26/08/1989	0.000	River Dry	25/01/1990
1990-1991	526.9	257.712	05/08/1990	0.000	River Dry	05/06/1990
1991-1992	38.71	256.890	26/07/1991	0.000	River Dry	26/01/1992
1992-1993	1164	258.397	08/09/1992	0.000	River Dry	25/06/1992
1993-1994	170.4	256.519	18/07/1993	0.000	River Dry	07/05/1994
1994-1995	1030	257.490	20/08/1994	0.000	River Dry	12/06/1994
1995-1996	327.0	256.450	25/07/1995	0.000	River Dry	26/01/1996
1996-1997	56.52	255.870	29/07/1996	0.000	River Dry	04/12/1996
1997-1998	96.00	256.150	02/08/1997	0.000	River Dry	27/01/1998
1998-1999	93.00	255.900	17/10/1998	0.000	River Dry	25/01/1999
1999-2000	34.55	255.265	22/06/1999	0.000	River Dry	03/02/2000
2000-2001	32.29	255.725	16/07/2000	0.000	River Dry	25/01/2001
2001-2002	46.77	255.675	04/07/2001	0.000	River Dry	05/12/2001
2002-2003	4.243	254.785	09/08/2002	0.000	River Dry	25/01/2003
2003-2004	72.55	255.590	29/07/2003	0.000	254.360	27/10/2003
2004-2005	20.38	255.000	02/08/2004	0.000	River Dry	30/05/2005
2005-2006	149.5	255.670	19/09/2005	0.000	River Dry	01/06/2005
2006-2007	585.8	256.985	20/08/2006	0.000	River Dry	01/06/2006
2007-2008	471.3	256.650	04/07/2007	0.000	253.780	01/06/2007
2008-2009	13.92	254.640	14/08/2008	0.000	River Dry	01/06/2008
2009-2010	11.57	254.640	14/08/2008	0.000	River Dry	01/06/2009
2010-2011	40.87	254.600	13/09/2010	0.000	River Dry	01/06/2010
2011-2012	338.2	258.200	09/08/2011	0.000	253.500	26/05/2012

Stage-Discharge Data for the period 2011 - 2012

Station Name : Banas at Abu Road (01 02 02 002) **Division : Mahi Division, Gandhinagar**

Local River : Banas **Sub-Division : B.L.Sub Divn, Palanpur**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	R Dry	0.000	R Dry	0.000	253.760	1.090 *	254.590	15.26	254.430	18.89	253.950	2.278
2	R Dry	0.000	R Dry	0.000	253.750	1.010 *	254.850	21.06	254.390	17.67	253.940	2.130
3	R Dry	0.000	R Dry	0.000	253.740	0.930 *	254.630	19.91 #	254.390	12.35 *	253.930	1.987
4	R Dry	0.000	R Dry	0.000	253.740	0.930 *	254.500	14.99	254.380	16.39	253.925	1.919
5	R Dry	0.000	R Dry	0.000	253.730	0.860 *	255.500	92.49	254.360	15.44	253.915	1.791
6	R Dry	0.000	R Dry	0.000	253.730	0.860 *	255.300	58.35	254.350	12.08 *	253.910	2.650 *
7	R Dry	0.000	R Dry	0.000	253.720	0.790 *	255.400	73.82	254.330	10.96	253.900	2.530 *
8	R Dry	0.000	R Dry	0.000	253.720	0.790 *	255.600	110.3 #	254.280	10.22	253.880	1.685
9	R Dry	0.000	R Dry	0.000	258.200	338.2	255.475	84.54	254.270	9.260 *	253.860	1.312
10	R Dry	0.000	R Dry	0.000	254.975	37.04	255.120	37.87	254.260	8.691	253.850	1.940 *
11	R Dry	0.000	254.800	18.08 #	254.770	24.48	257.200	215.4 *	254.230	8.221	253.840	1.233
12	R Dry	0.000	R Dry	0.000	254.690	15.42	257.500	215.4 #	254.200	7.140	253.830	1.183
13	R Dry	0.000	R Dry	0.000	254.765	24.39	256.025	252.0	254.170	6.336	253.820	1.630 *
14	R Dry	0.000	R Dry	0.000	254.700	25.08	255.550	94.55	254.150	7.345	253.810	1.113
15	R Dry	0.000	R Dry	0.000	254.450	12.62	255.250	64.12	254.150	7.019	253.800	1.007
16	R Dry	0.000	254.850	18.98	255.825	100.9	255.175	40.87	254.140	6.410 *	253.790	0.961
17	R Dry	0.000	253.780	1.260 *	255.075	39.58	255.120	50.00	254.150	6.129	253.780	1.003
18	R Dry	0.000	253.935	1.428	254.500	29.58	255.300	68.67	254.130	6.033	253.770	0.911
19	R Dry	0.000	253.850	0.971	254.450	13.01	255.150	52.94	254.120	5.805	253.760	0.845
20	R Dry	0.000	253.720	0.790 *	254.350	16.99	255.110	39.69	254.095	4.920	253.750	1.010 *
21	R Dry	0.000	253.710	0.720 *	254.260	14.64	255.000	32.94	254.050	4.401	253.740	0.840
22	R Dry	0.000	253.700	0.660 *	254.290	9.536	254.890	30.80	254.040	4.043	253.730	0.795
23	R Dry	0.000	253.680	0.540 *	254.120	8.755	254.700	21.76	254.030	4.410 *	253.720	0.746
24	R Dry	0.000	253.680	0.540 *	254.130	8.385	254.660	17.38	254.025	3.676	253.710	0.705
25	R Dry	0.000	253.680	0.540 *	254.150	7.039	254.615	15.83	254.020	3.587	253.700	0.665
26	R Dry	0.000	253.670	0.480 #	254.125	9.746	254.600	18.86 #	254.010	4.080 *	253.690	0.628
27	R Dry	0.000	253.670	0.480 *	254.150	7.868	254.580	14.93	254.000	3.211	253.690	0.590 *
28	R Dry	0.000	254.125	1.972	254.140	7.398	254.570	14.30	253.990	3.172	253.770	0.971
29	R Dry	0.000	254.100	1.556 #	254.175	10.94	254.560	13.25	253.980	2.857	253.770	0.972
30	R Dry	0.000	253.840	1.840 *	254.900	21.03	254.475	21.05	253.970	3.470 *	253.750	0.852
31			253.780	1.260 *	254.800	19.20			253.960	2.540		
Ten-Daily Mean												
I Ten-Daily		0.000		0.000	254.306	38.25	255.097	52.86	254.344	13.20	253.906	2.022
II Ten-Daily		0.000	254.156	4.151	254.757	30.21	255.738	109.4	254.153	6.536	253.795	1.090
III Ten-Daily		0.000	253.785	0.962	254.295	11.32	254.665	20.11	254.007	3.586	253.727	0.777
Monthly												
Min.		0.000	253.670	0.000	253.720	0.790	254.475	13.25	253.960	2.540	253.690	0.590
Max.		0.000	254.850	18.98	258.200	338.2	257.500	252.0	254.430	18.89	253.950	2.650
Mean		0	253.916	1.681	254.448	26.1	255.167	60.77	254.163	7.638	253.809	1.296

Annual Runoff in MCM = 257 Annual Runoff in mm = 161

Peak Observed Discharge = 338.2 cumecs on 09/08/2011 Corres. Water Level :258.2 m

Lowest Observed Discharge = 0.000 cumecs on 01/06/2011

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Banas at Abu Road (01 02 02 002) **Division : Mahi Division, Gandhinagar**

Local River : Banas **Sub-Division : B.L.Sub Divn, Palanpur**

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	253.730	0.782	253.580	0.120 *	253.520	0.000 *	253.510	0.000 *	253.100	0.000 *	253.500	0.000
2	253.730	0.722	253.580	0.120 *	253.520	0.000 *	253.510	0.000 *	253.100	0.000 *	253.500	0.000
3	253.710	0.689	253.580	0.120 *	253.520	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
4	253.690	0.590 *	253.580	0.120 *	253.520	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
5	253.680	0.586	253.570	0.090 *	253.520	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
6	253.680	0.540 *	253.570	0.090 *	253.520	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
7	253.660	0.669	253.560	0.060 *	253.520	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
8	253.650	0.536	253.560	0.060 *	253.520	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
9	253.640	0.398	253.560	0.060 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
10	253.620	0.341	253.550	0.050 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
11	253.630	0.290 *	253.550	0.050 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
12	253.590	0.311	253.550	0.050 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
13	253.580	0.120 #	253.550	0.050 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
14	253.570	0.090 #	253.540	0.040 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
15	253.630	0.415	253.540	0.040 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
16	253.650	0.465	253.540	0.040 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
17	253.650	0.468	253.540	0.040 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
18	253.650	0.380 *	253.540	0.040 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
19	253.640	0.426	253.540	0.040 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
20	253.630	0.416	253.530	0.020 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
21	253.630	0.318	253.530	0.020 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
22	253.630	0.313	253.530	0.020 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
23	253.620	0.308	253.530	0.020 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
24	253.620	0.298	253.520	0.000 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
25	253.610	0.210 *	253.520	0.000 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
26	253.600	0.274	253.520	0.000 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
27	253.650	0.249	253.520	0.000 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
28	253.590	0.150 *	253.520	0.000 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
29	253.590	0.150 *	253.520	0.000 *	253.510	0.000 *	253.510	0.000 *	253.500	0.000 *	253.500	0.000
30	253.590	0.150 *	253.520	0.000 *			253.510	0.000 *	253.500	0.000 *	253.500	0.000
31	253.590	0.150 *	253.520	0.000 *			253.510	0.000 *			253.500	0.000
Ten-Daily Mean												
I Ten-Daily	253.679	0.585	253.569	0.089	253.518	0.000	253.510	0.000	253.420	0.000	253.500	0.000
II Ten-Daily	253.622	0.338	253.542	0.041	253.510	0.000	253.510	0.000	253.500	0.000	253.500	0.000
III Ten-Daily	253.611	0.234	253.523	0.005	253.510	0.000	253.510	0.000	253.500	0.000	253.500	0.000
Monthly												
Min.	253.570	0.090	253.520	0.000	253.510	0.000	253.510	0.000	253.100	0.000	253.500	0.000
Max.	253.730	0.782	253.580	0.120	253.520	0.000	253.510	0.000	253.500	0.000	253.500	0.000
Mean	253.636	0.381	253.544	0.044	253.513	0	253.510	0	253.473	0	253.500	0

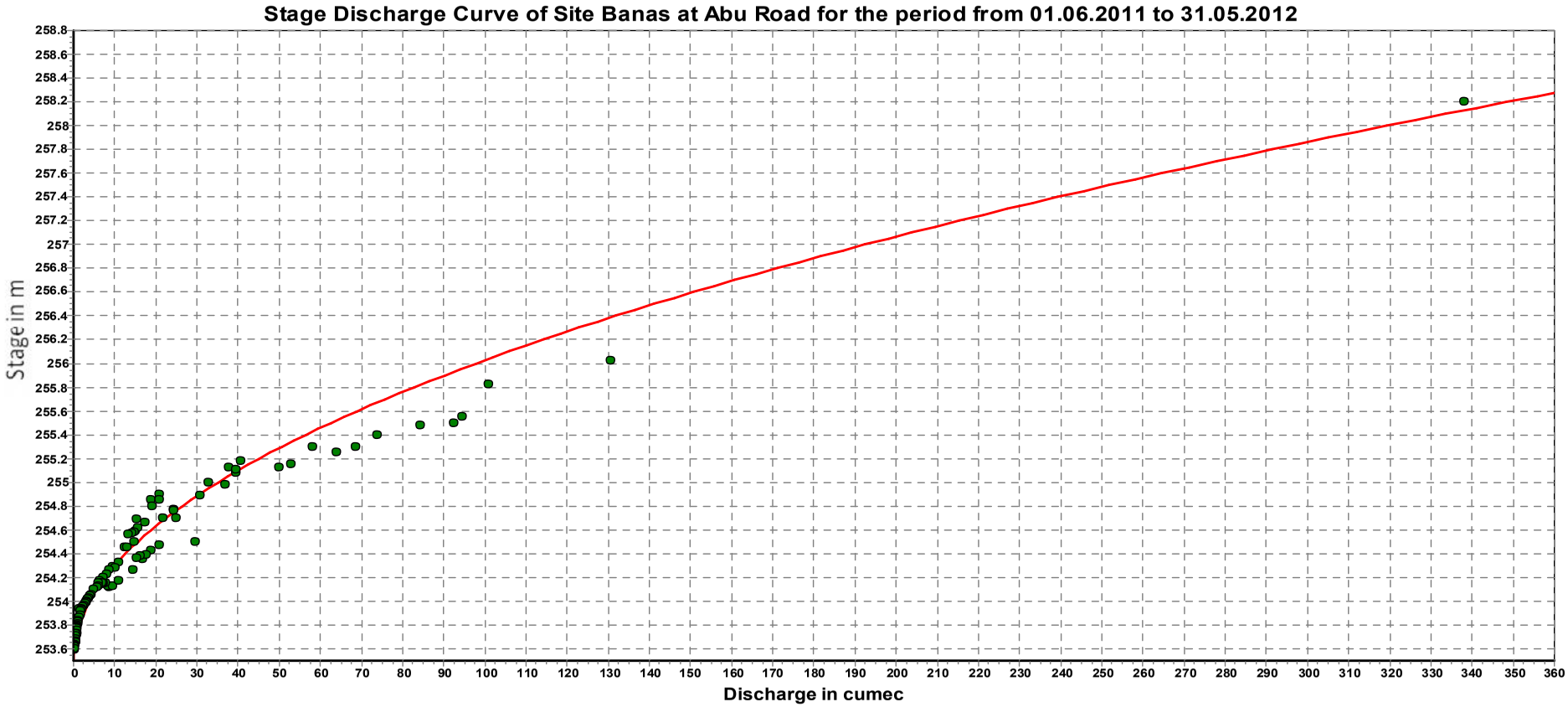
Peak Computed Discharge = 215.4 cumecs on 11/09/2011 Corres. Water Level :257.2 m

Lowest Computed Discharge = 0.000 cumecs on 24/01/2012 Corres. Water Level :253.52 m

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff



Procedure : Standard

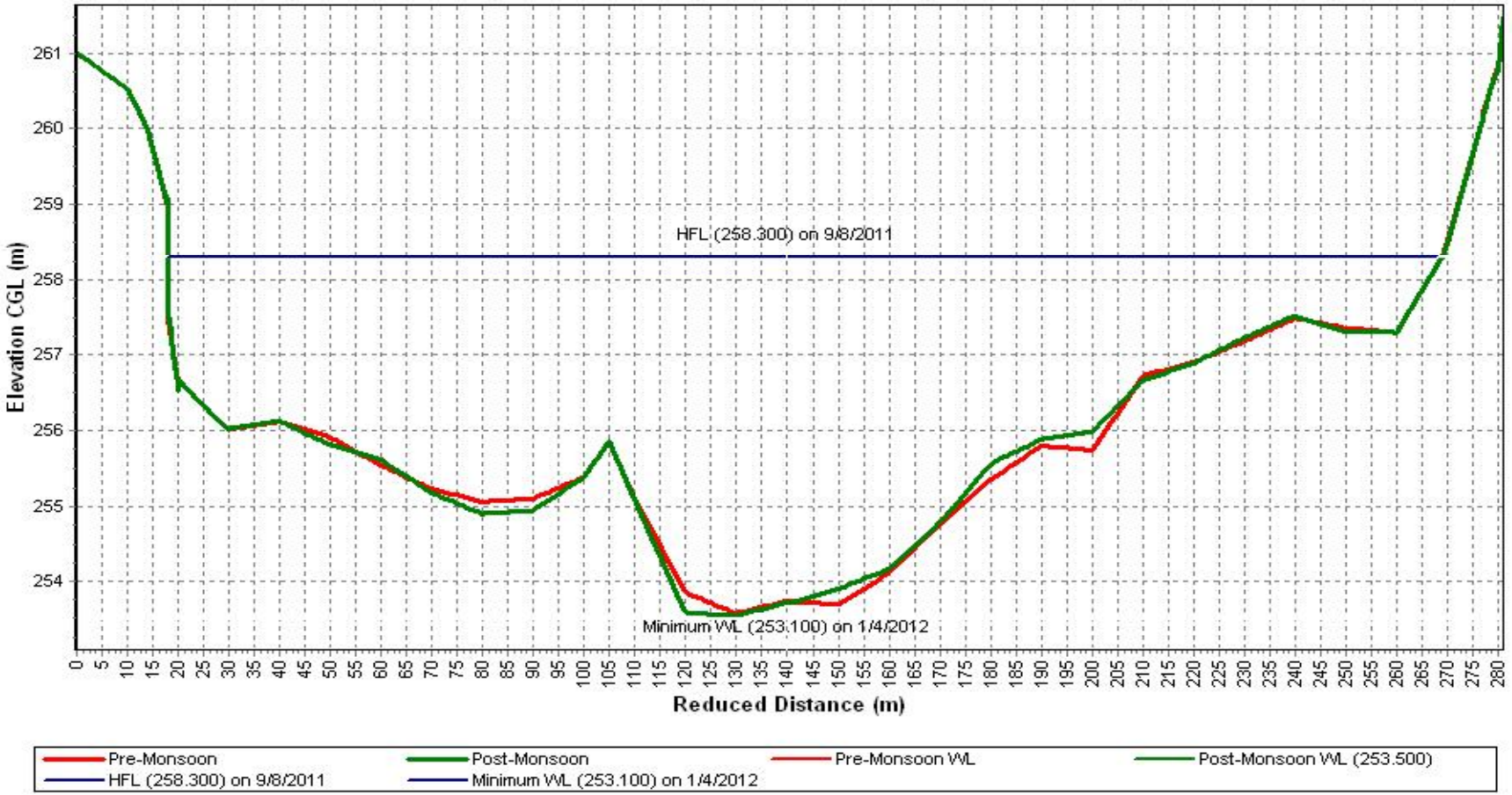
Equation type: Power

Q = c (h+a)^b, a = -253.49, b = 2.018, c = 15.282

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Banas at Abu Road (01 02 02 002)
Local River : Banas

Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur

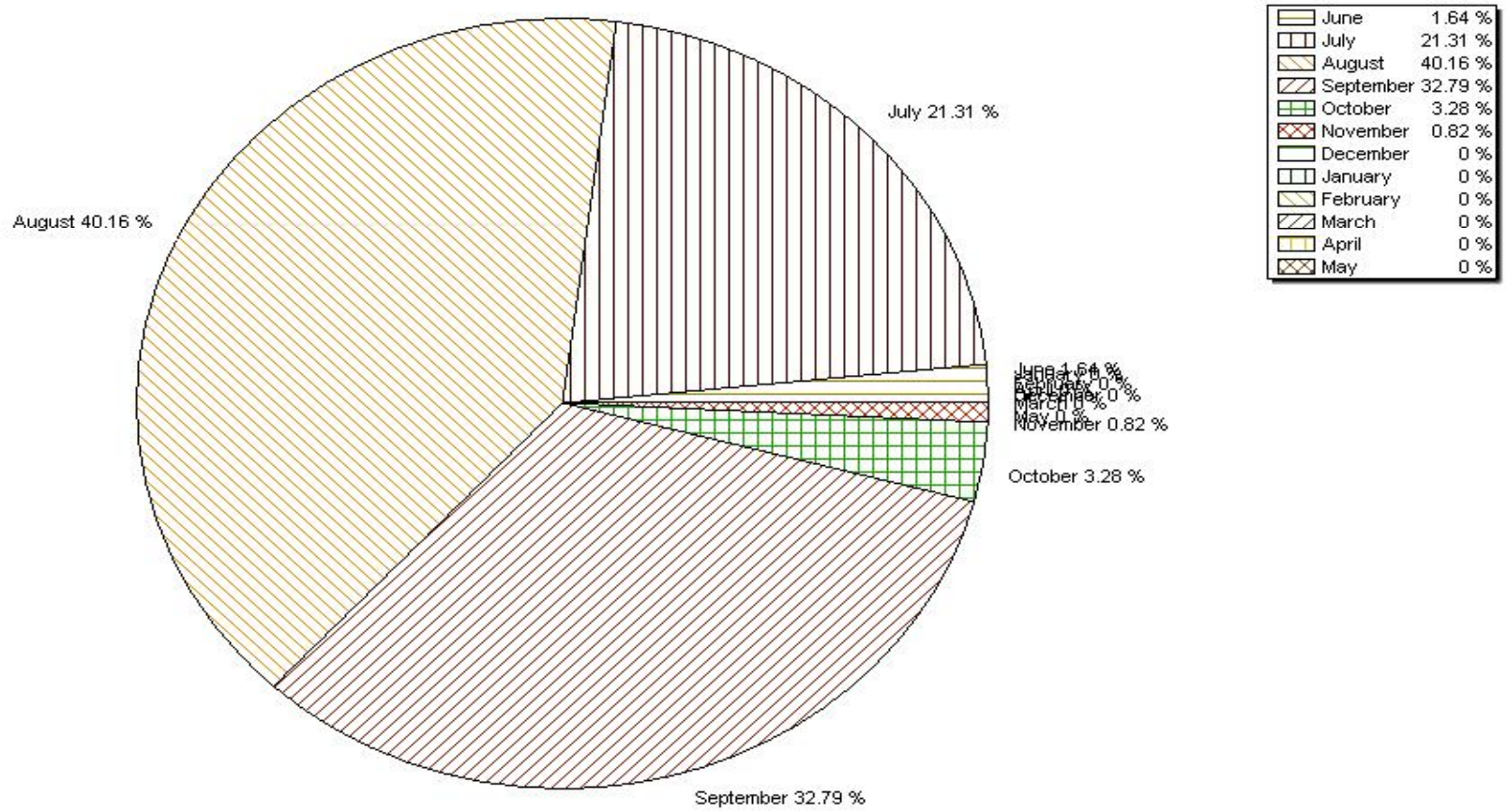


Historic Flood Level -265.400m on 31.08.1973

Monthly Average Runoff based on period : 1989-2011

Station Name : Banas at Abu Road (01 02 02 002)
Local River : Banas

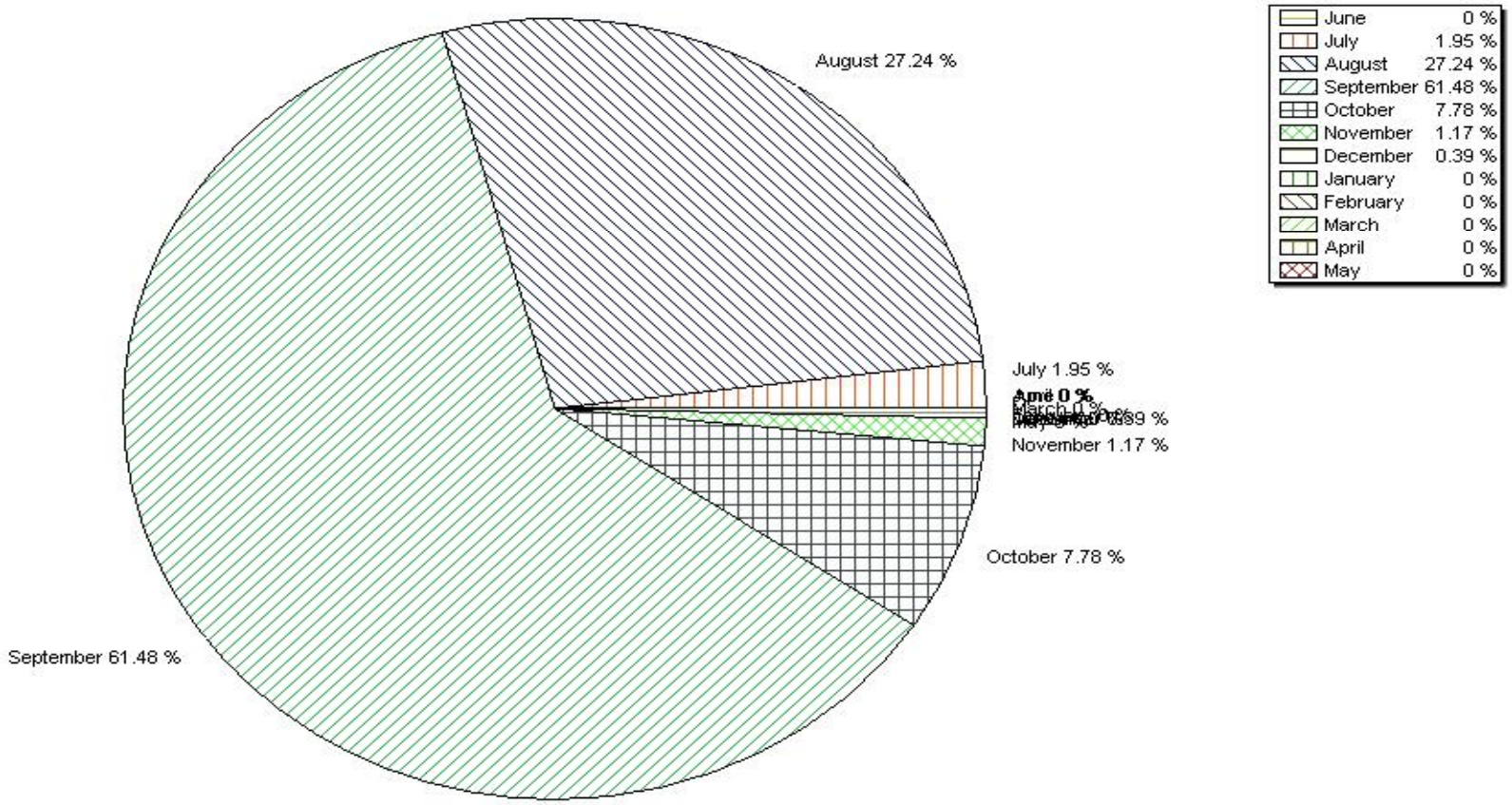
Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur



Monthly Runoff for the Year : 2011-2012

Station Name : Banas at Abu Road (01 02 02 002)
Local River : Banas

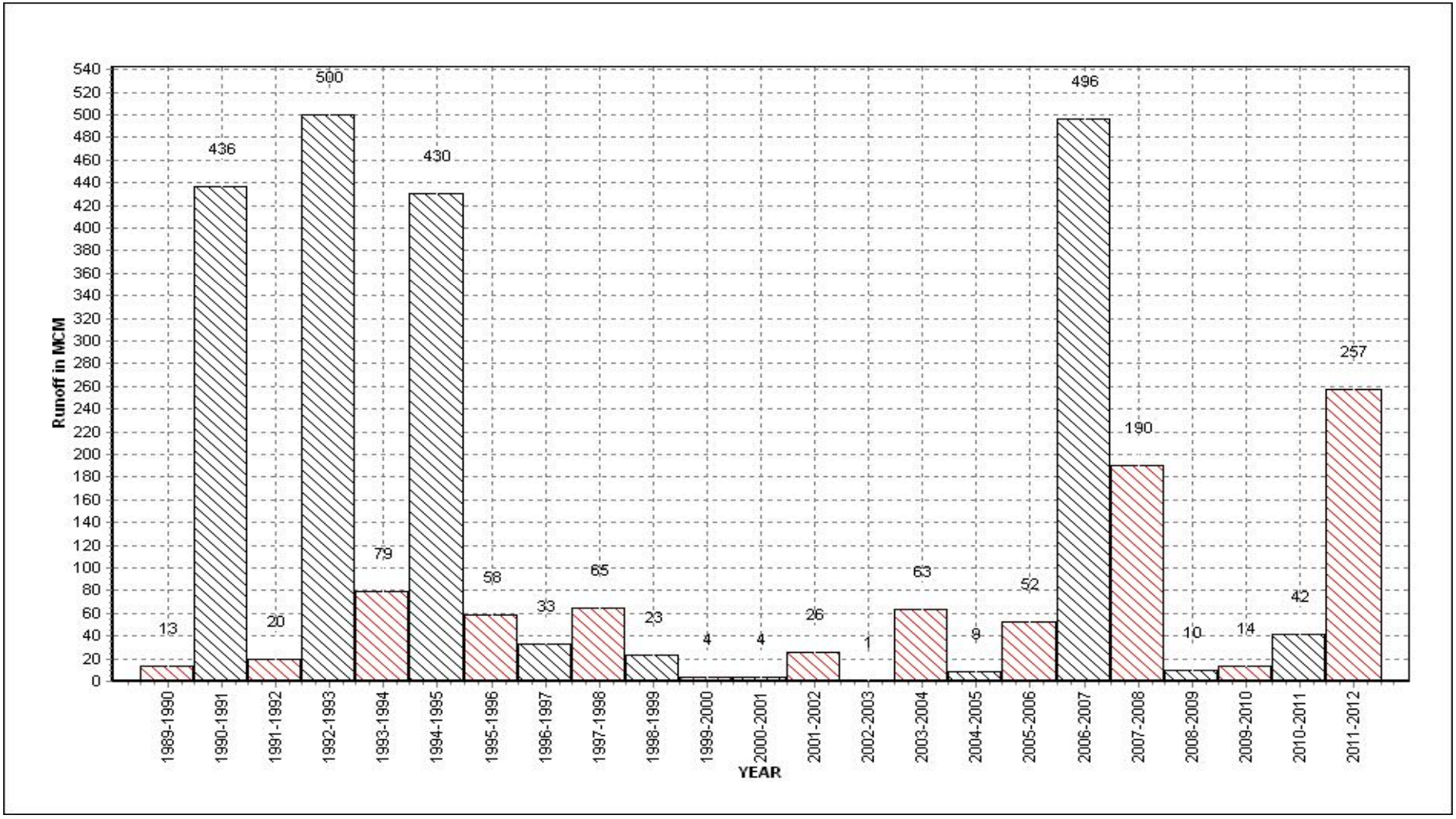
Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur



Annual Runoff Values for the period: 1989 - 2012

Station Name : Banas at Abu Road (01 02 02 002)
Local River : Banas

Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur

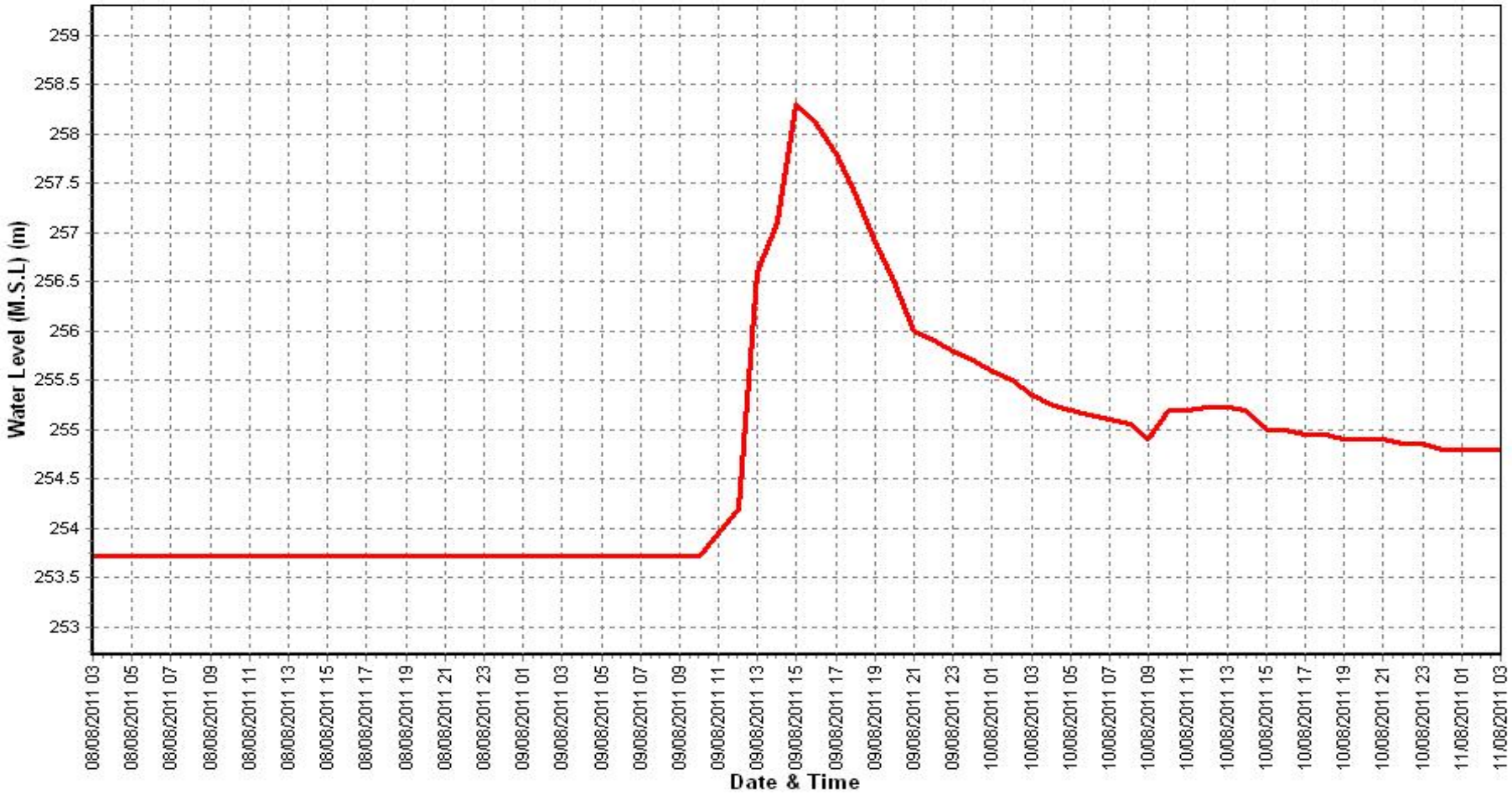


Note: Missing values have not been considered while arriving at Annual Runoff

Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Banas at Abu Road (01 02 02 002) **Division : Mahi Division, Gandhinagar**

Local River : Banas **Sub-Division : B.L.Sub Divn, Palanpur**



Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Banas at Abu Road (01 02 02 002) **Division : Mahi Division, Gandhinagar**

Local River : Banas **Sub-Division : B.L.Sub Divn, Palanpur**

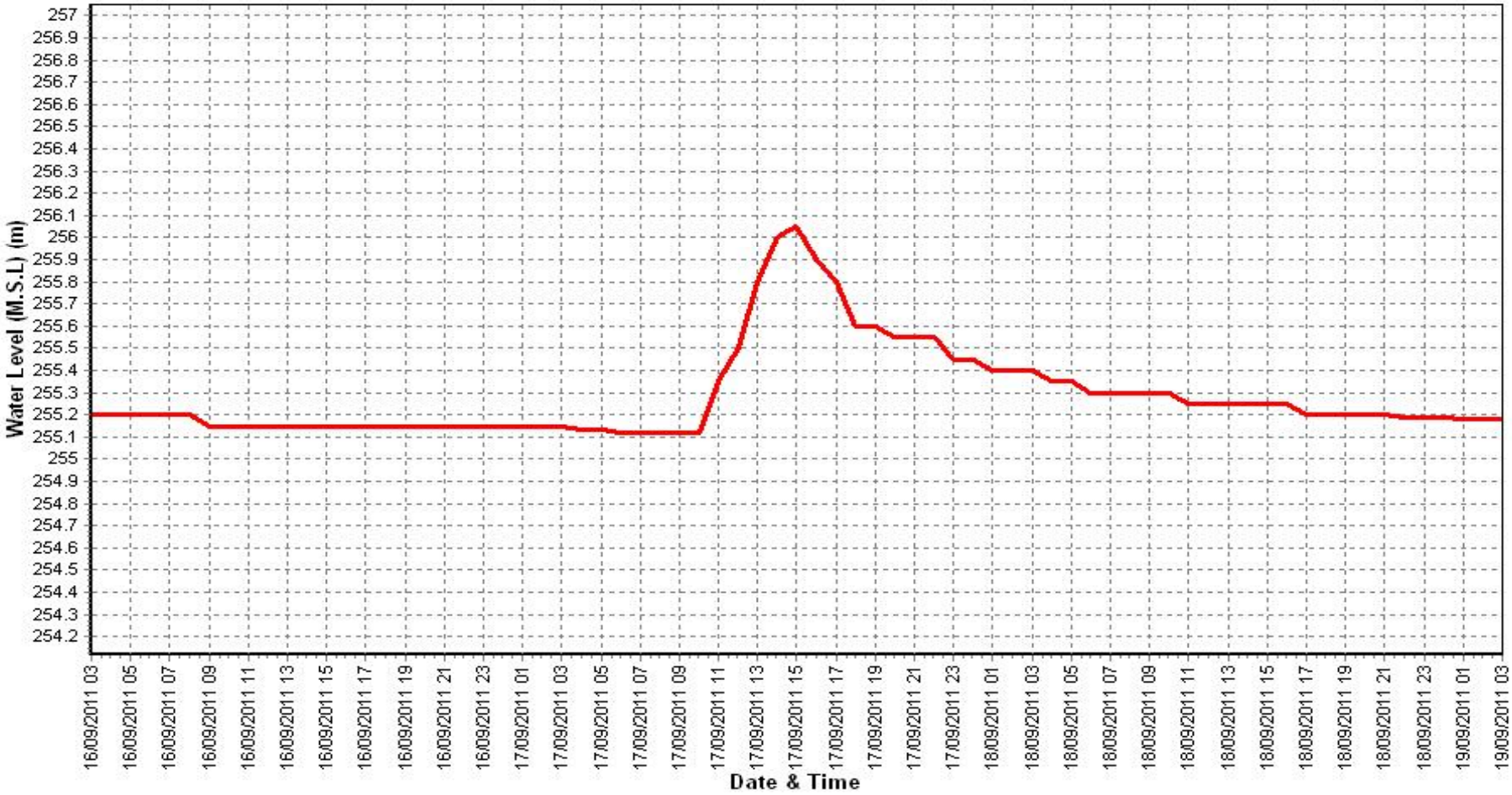


Time Span: 72 Hrs

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Banas at Abu Road (01 02 02 002) **Division : Mahi Division, Gandhinagar**

Local River : Banas **Sub-Division : B.L.Sub Divn, Palanpur**



Time Span: 72 Hrs

HISTORY SHEET

			Water Year	**:**	**2011-2012**
Site	**:**	**Shetrunji at Lowara**	**Code**	**:**	**01 02 09 001**
State	:	Gujarat	District		Bhavnagar
Basin	:	WFR of Kach.-Saur. & Luni	Independent River	:	Shetrunji
Tributary	:	Shetrunji	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Shetrunji
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	Sabarmati Sub Divn., Ahmedabad
Drainage Area	:	3953 Sq. Km.	Bank	:	Left
Latitude	:	21°26'36" N	Longitude	:	71°33'42" E
Zero of Gauge (m)	:	56 (m.s.l)	01/02/1991	-	-
		Opening Date	Closing Date		
Gauge	:	29/11/1970			
Discharge	:	29/11/1970			
Sediment	:	29/11/1970			
Water Quality	:	29/11/1970			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1971-1972	660.0	61.740	01/09/1971	0.000	57.240	15/06/1971
1972-1973	0.000	57.325	24/06/1972	0.000	River Dry	20/01/1973
1973-1974	620.0	62.980	27/09/1973	0.000	River Dry	10/05/1974
1974-1975	587.4	62.150	06/07/1974	0.000	River Dry	25/01/1975
1975-1976	169.7	60.350	02/08/1975	0.000	River Dry	29/01/1976
1976-1977	151.9	60.410	18/07/1976	0.000	River Dry	21/06/1976
1977-1978	352.1	61.400	03/09/1977	0.000	River Dry	09/04/1978
1978-1979	76.40	58.553	30/08/1978	0.000	River Dry	12/06/1978
1979-1980	710.0	65.225	11/08/1979	0.000	57.040	10/02/1980
1980-1981	610.0	64.150	03/07/1980	0.000	River Dry	23/01/1981
1981-1982	472.0	62.800	24/07/1981	0.000	River Dry	22/05/1982
1982-1983	880.0	66.930	09/11/1982	0.000	River Dry	07/04/1983
1983-1984	932.0	66.630	20/07/1983	0.000	River Dry	19/06/1983
1984-1985	76.50	58.455	15/09/1984	0.000	River Dry	21/03/1985
1985-1986	82.40	58.635	19/07/1985	0.000	River Dry	12/01/1986
1986-1987	615.0	62.110	25/06/1986	0.000	River Dry	30/12/1986
1987-1988	167.9	59.450	21/08/1987	0.000	River Dry	31/12/1987
1988-1989	870.0	64.020	28/07/1988	0.000	River Dry	05/12/1988
1989-1990	900.0	62.930	24/07/1989	0.000	River Dry	11/03/1990
1990-1991	407.1	61.630	17/08/1990	0.000	River Dry	25/04/1991
1991-1992	446.2	59.660	28/07/1991	0.000	River Dry	16/12/1991
1992-1993	268.4	59.550	04/09/1992	0.000	River Dry	04/02/1993
1993-1994	476.2	61.360	25/09/1993	0.000	River Dry	01/12/1993
1994-1995	722.7	62.298	31/08/1994	0.000	56.690	12/02/1995
1995-1996	185.9	59.110	02/09/1995	0.000	River Dry	08/04/1996
1996-1997	442.0	62.600	20/06/1996	0.000	River Dry	05/03/1997
1997-1998	77.00	58.440	04/07/1997	0.000	River Dry	24/11/1997
1998-1999	546.0	63.000	28/08/1998	0.000	River Dry	25/01/1999
1999-2000	84.00	58.100	03/10/1999	0.000	River Dry	13/01/2000
2000-2001	5.500	57.025	24/08/2000	0.000	River Dry	25/01/2001
2001-2002	602.0	60.425	17/06/2001	0.000	River Dry	25/01/2002

contd/-

HISTORY SHEET

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
2002-2003	2075	64.080	29/06/2002	0.000	River Dry	25/01/2003
2003-2004	554.9	60.240	07/08/2003	0.000	River Dry	02/02/2004
2004-2005	1010	61.440	06/08/2004	0.000	River Dry	11/02/2005
2005-2006	2441	64.350	29/06/2005	0.000	River Dry	01/06/2005
2006-2007	880.9	60.800	30/07/2006	0.000	River Dry	01/06/2006
2007-2008	809.4	60.900	26/09/2007	0.000	River Dry	01/06/2007
2008-2009	1027	61.120	29/07/2008	0.000	River Dry	01/06/2008
2009-2010	417	60.150	18/07/2009	0.000	River Dry	01/06/2009
2010-2011	713.5	60.300	01/09/2010	0.000	River Dry	01/06/2010
2011-2012	854.8	61.380	18/07/2011	0.000	River Dry	08/07/2011

Stage-Discharge Data for the period 2011 - 2012

Station Name : Shetrunji at Lowara (01 02 09 001) **Division : Mahi Division, Gandhinagar**

Local River : Shetrunji **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	R Dry	0.000	R Dry	0.000	58.780	207.6 #	57.350	48.36	56.900	9.660	56.610	0.797
2	R Dry	0.000	R Dry	0.000	58.060	68.91	57.240	37.01	56.880	8.610 *	56.600	0.883
3	R Dry	0.000	R Dry	0.000	57.410	24.68	57.650	71.63	56.880	6.726	56.600	0.899
4	R Dry	0.000	R Dry	0.000	57.330	21.52	60.050	458.9 *	56.870	5.872	56.590	0.858
5	R Dry	0.000	R Dry	0.000	57.080	14.37	57.850	103.7	56.870	5.972	56.590	0.876
6	R Dry	0.000	R Dry	0.000	57.040	12.79	57.340	46.78	56.860	7.830 *	56.590	0.750 *
7	R Dry	0.000	R Dry	0.000	57.020	14.94 *	57.950	126.5	56.760	3.163	56.590	0.750 *
8	R Dry	0.000	R Dry	0.000	56.920	10.26 *	57.775	92.27	56.750	2.504	56.580	0.683
9	R Dry	0.000	56.860	7.334	56.900	7.652	57.515	60.57	56.740	3.870 *	56.570	0.644
10	R Dry	0.000	56.670	2.140 *	56.820	5.057	57.215	35.04	56.720	2.104	56.570	0.500 *
11	R Dry	0.000	56.890	8.315	56.800	4.978	57.480	45.96 *	56.700	2.020	56.570	0.637
12	R Dry	0.000	57.330	45.20	56.830	5.334	57.450	54.98	56.690	1.594	56.570	0.581
13	R Dry	0.000	56.720	2.979	56.810	4.850	58.000	131.5	56.680	4.340	56.570	0.440 *
14	R Dry	0.000	56.580	1.210	56.810	6.030 *	57.590	67.48	56.680	1.515	56.565	0.568
15	R Dry	0.000	56.850	6.862	56.850	7.460 *	58.170	154.8	56.670	1.432	56.565	0.563
16	R Dry	0.000	56.560	0.953	57.160	32.93	57.325	44.69	56.660	1.930 *	56.560	0.532
17	R Dry	0.000	59.500	339.4 *	57.105	14.92	57.210	34.02	56.650	1.139	56.560	0.527
18	R Dry	0.000	61.380	854.8	57.030	12.05	57.220	26.58 *	56.650	1.108	56.560	0.551
19	R Dry	0.000	58.180	120.2 #	56.940	9.355	57.250	38.25	56.750	2.535	56.560	0.549
20	R Dry	0.000	57.530	29.55	56.920	6.379	57.170	33.31	56.700	1.957	56.560	0.390 *
21	R Dry	0.000	56.900	7.898	57.300	32.04 *	57.070	24.45	56.650	1.175	56.560	0.340 *
22	R Dry	0.000	56.740	3.176	57.240	27.90 *	57.050	23.40	56.640	1.114	56.555	0.484
23	R Dry	0.000	56.640	1.714	57.940	118.3	57.230	35.93	56.640	1.540 *	56.550	0.000 *
24	R Dry	0.000	56.620	1.190 *	57.350	47.79	57.050	23.62	56.630	1.070	56.550	0.000 *
25	R Dry	0.000	58.675	107.7	57.080	26.61	57.270	29.94 *	56.620	0.993	56.550	0.000 *
26	R Dry	0.000	59.040	136.0	57.130	33.70	57.135	30.68	56.620	1.190 *	56.550	0.000 *
27	R Dry	0.000	57.080	14.38	57.100	28.98	57.050	23.75	56.610	1.030 *	56.550	0.000 *
28	R Dry	0.000	58.000	56.52	58.110	111.4 *	57.030	22.53	56.610	1.030 *	56.550	0.000 *
29	R Dry	0.000	57.040	12.85	58.640	199.5	56.950	9.854	56.610	1.030 *	56.550	0.000 *
30	R Dry	0.000	57.780	48.06	61.020	700.3	56.840	7.888	56.610	1.030 *	56.550	0.000 *
31	R Dry	0.000	57.850	81.35 *	58.000	98.18 *			56.610	0.787		
Ten-Daily Mean												
I Ten-Daily			56.765	4.737	57.336	38.78	57.793	108.1	56.823	5.631	56.589	0.764
II Ten-Daily			57.752	140.9	56.925	10.43	57.486	63.17	56.683	1.957	56.564	0.534
III Ten-Daily			57.488	42.80	57.901	129.5	57.067	23.20	56.623	1.090	56.551	0.082
Monthly												
Min.			56.560	0.953	56.800	4.850	56.840	7.888	56.610	0.787	56.550	0.000
Max.			61.380	854.8	61.020	700.3	60.050	458.9	56.900	9.660	56.610	0.899
Mean			57.540	82.16	57.404	61.83	57.449	64.82	56.707	2.834	56.568	0.46

Annual Runoff in MCM = 506 Annual Runoff in mm = 128

Peak Observed Discharge = 854.8 cumecs on 18/07/2011 Corres. Water Level :61.38 m

Lowest Observed Discharge = 0.484 cumecs on 22/11/2011 Corres. Water Level :56.555 m

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Shetrunji at Lowara (01 02 09 001) **Division : Mahi Division, Gandhinagar**

Local River : Shetrunji **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	56.550	0.000 *	56.510	0.000 *	56.370	0.000 *	56.315	0.000 *	56.260	0.000 *	56.220	0.000 *
2	56.550	0.000 *	56.510	0.000 *	56.370	0.000 *	56.315	0.000 *	56.260	0.000 *	56.220	0.000 *
3	56.550	0.000 *	56.500	0.000 *	56.370	0.000 *	56.310	0.000 *	56.250	0.000 *	56.220	0.000 *
4	56.550	0.000 *	56.500	0.000 *	56.370	0.000 *	56.310	0.000 *	56.250	0.000 *	56.215	0.000 *
5	56.550	0.000 *	56.500	0.000 *	56.370	0.000 *	56.310	0.000 *	56.250	0.000 *	56.215	0.000 *
6	56.550	0.000 *	56.500	0.000 *	56.370	0.000 *	56.310	0.000 *	56.245	0.000 *	56.210	0.000 *
7	56.550	0.000 *	56.490	0.000 *	56.360	0.000 *	56.310	0.000 *	56.245	0.000 *	56.210	0.000 *
8	56.550	0.000 *	56.490	0.000 *	56.360	0.000 *	56.310	0.000 *	56.245	0.000 *	56.210	0.000 *
9	56.540	0.000 *	56.490	0.000 *	56.355	0.000 *	56.300	0.000 *	56.245	0.000 *	56.210	0.000 *
10	56.540	0.000 *	56.480	0.000 *	56.350	0.000 *	56.300	0.000 *	56.240	0.000 *	56.210	0.000 *
11	56.540	0.000 *	56.410	0.000 *	56.350	0.000 *	56.300	0.000 *	56.240	0.000 *	56.210	0.000 *
12	56.540	0.000 *	56.410	0.000 *	56.340	0.000 *	56.290	0.000 *	56.230	0.000 *	56.210	0.000 *
13	56.540	0.000 *	56.410	0.000 *	56.340	0.000 *	56.290	0.000 *	56.230	0.000 *	56.210	0.000 *
14	56.540	0.000 *	56.410	0.000 *	56.340	0.000 *	56.290	0.000 *	56.230	0.000 *	56.210	0.000 *
15	56.530	0.000 *	56.410	0.000 *	56.340	0.000 *	56.280	0.000 *	56.230	0.000 *	56.210	0.000 *
16	56.530	0.000 *	56.410	0.000 *	56.340	0.000 *	56.280	0.000 *	56.230	0.000 *	56.205	0.000 *
17	56.530	0.000 *	56.400	0.000 *	56.340	0.000 *	56.280	0.000 *	56.230	0.000 *	56.205	0.000 *
18	56.530	0.000 *	56.400	0.000 *	56.340	0.000 *	56.280	0.000 *	56.230	0.000 *	56.205	0.000 *
19	56.530	0.000 *	56.400	0.000 *	56.340	0.000 *	56.280	0.000 *	56.230	0.000 *	56.205	0.000 *
20	56.520	0.000 *	56.400	0.000 *	56.330	0.000 *	56.280	0.000 *	56.230	0.000 *	56.205	0.000 *
21	56.520	0.000 *	56.400	0.000 *	56.330	0.000 *	56.280	0.000 *	56.230	0.000 *	56.205	0.000 *
22	56.520	0.000 *	56.390	0.000 *	56.330	0.000 *	56.280	0.000 *	56.230	0.000 *	56.200	0.000 *
23	56.520	0.000 *	56.390	0.000 *	56.325	0.000 *	56.275	0.000 *	56.230	0.000 *	56.200	0.000 *
24	56.520	0.000 *	56.390	0.000 *	56.325	0.000 *	56.275	0.000 *	56.230	0.000 *	56.200	0.000 *
25	56.520	0.000 *	56.390	0.000 *	56.325	0.000 *	56.270	0.000 *	56.225	0.000 *	56.200	0.000 *
26	56.520	0.000 *	56.390	0.000 *	56.320	0.000 *	56.270	0.000 *	56.225	0.000 *	56.200	0.000 *
27	56.515	0.000 *	56.390	0.000 *	56.320	0.000 *	56.265	0.000 *	56.225	0.000 *	56.190	0.000 *
28	56.515	0.000 *	56.390	0.000 *	56.320	0.000 *	56.265	0.000 *	56.220	0.000 *	56.180	0.000 *
29	56.515	0.000 *	56.390	0.000 *	56.315	0.000 *	56.260	0.000 *	56.220	0.000 *	56.180	0.000 *
30	56.510	0.000 *	56.380	0.000 *			56.260	0.000 *	56.220	0.000 *	56.180	0.000 *
31	56.510	0.000 *	56.380	0.000 *			56.260	0.000 *			56.180	0.000 *
Ten-Daily Mean												
I Ten-Daily	56.548	0.000	56.497	0.000	56.365	0.000	56.309	0.000	56.249	0.000	56.214	
II Ten-Daily	56.533	0.000	56.406	0.000	56.340	0.000	56.285	0.000	56.231	0.000	56.208	
III Ten-Daily	56.517	0.000	56.389	0.000	56.323	0.000	56.269	0.000	56.226	0.000	56.194	
Monthly												
Min.	56.510	0.000	56.380	0.000	56.315	0.000	56.260	0.000	56.220	0.000	56.180	
Max.	56.550	0.000	56.510	0.000	56.370	0.000	56.315	0.000	56.260	0.000	56.220	
Mean	56.532	0	56.429	0	56.343	0	56.287	0	56.235	0	56.205	

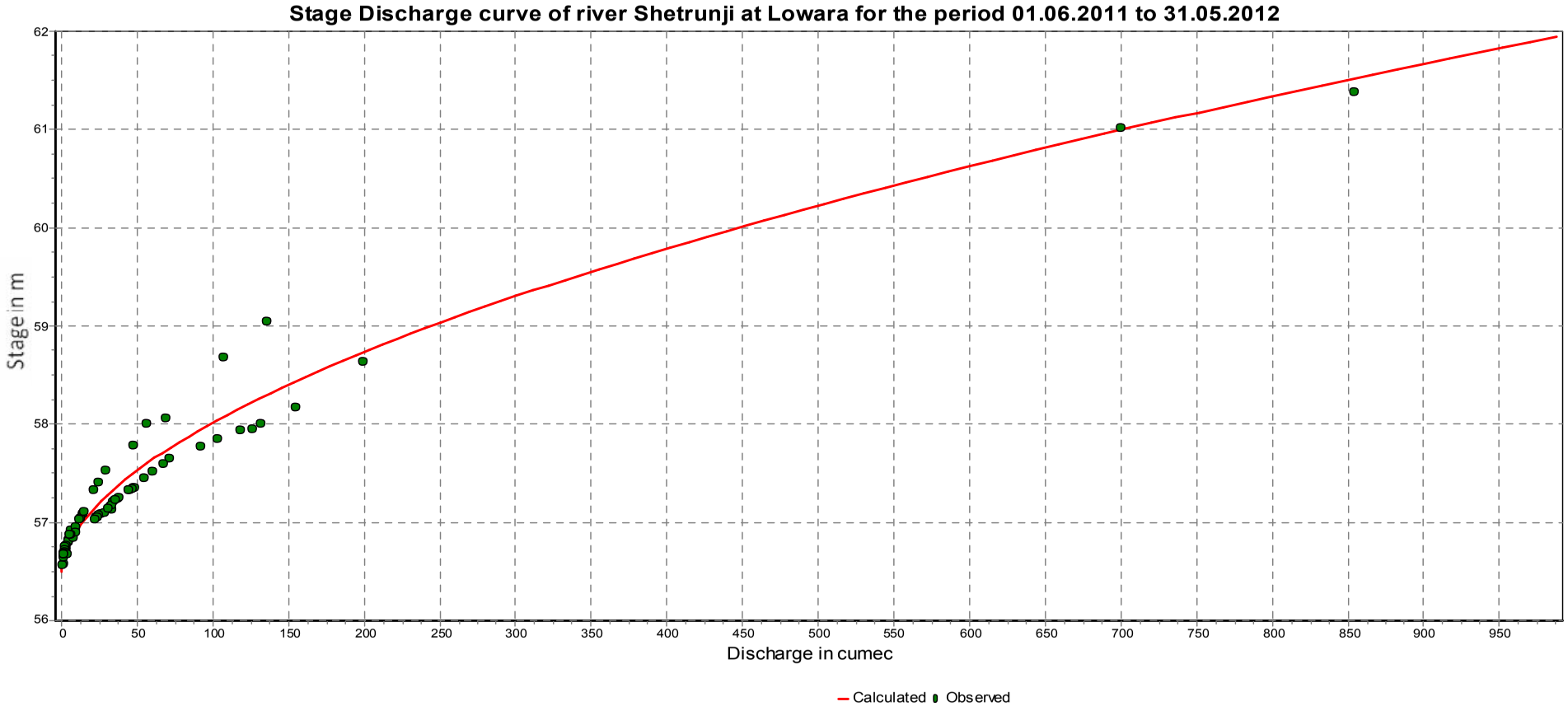
Peak Computed Discharge = 458.9 cumecs on 04/09/2011 Corres. Water Level :60.05 m

Lowest Computed Discharge = 0.000 cumecs on 23/11/2011 Corres. Water Level :56.55 m

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff



Procedure : Standard

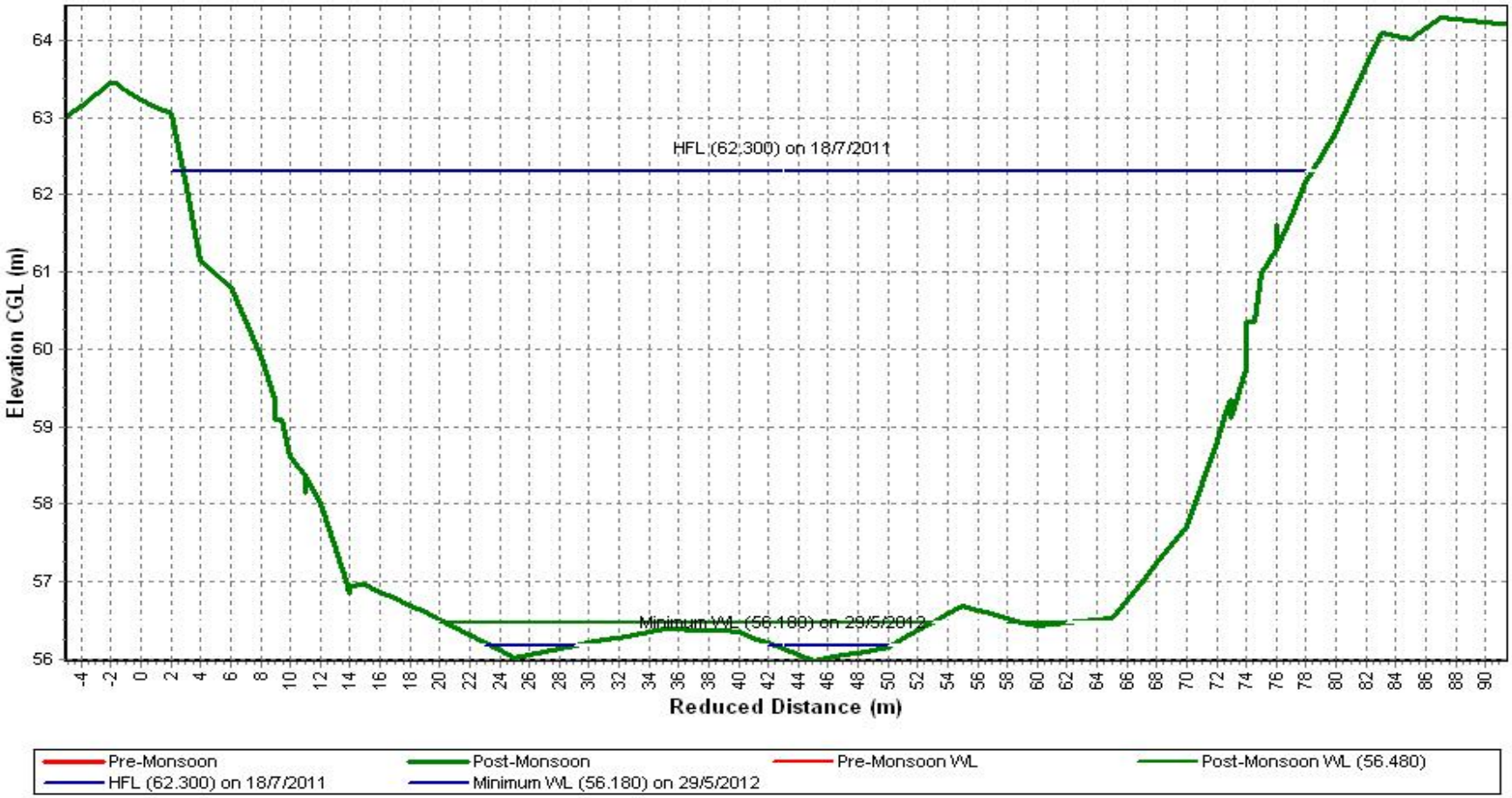
Equation type: Power

Q = c (h+a)^b, a = -56.49, b = 1.798, c =46.799

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Shetrunji at Lowara (01 02 09 001)
Local River : Shetrunji

Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad

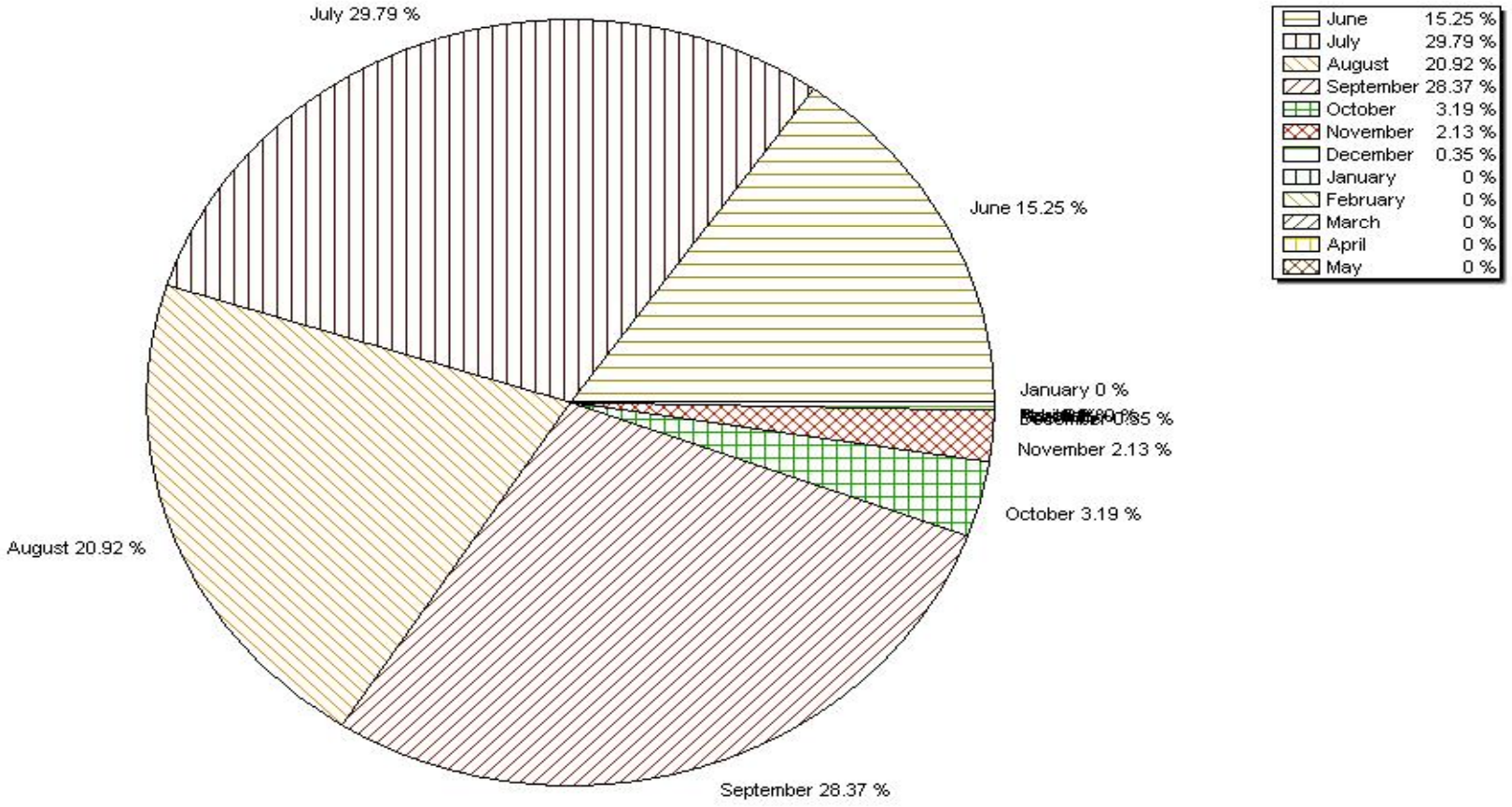


Historic Flood Level-66.93 m on 09.11.1982 at 0800hrs

Monthly Average Runoff based on period : 1971-2011

Station Name : Shetrunji at Lowara (01 02 09 001)
Local River : Shetrunji

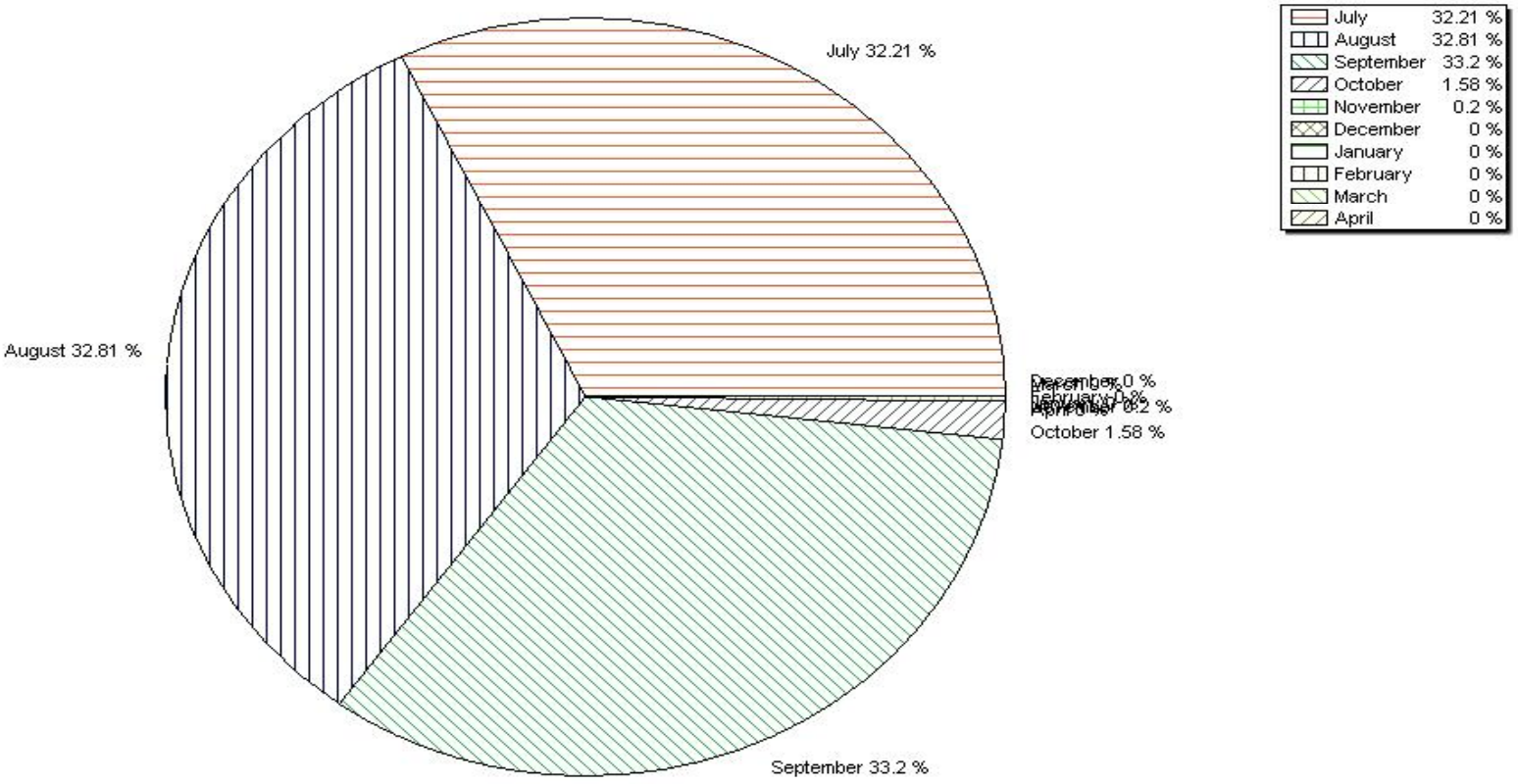
Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad



Monthly Runoff for the Year : 2011-2012

Station Name : Shetrunji at Lowara (01 02 09 001)
Local River : Shetrunji

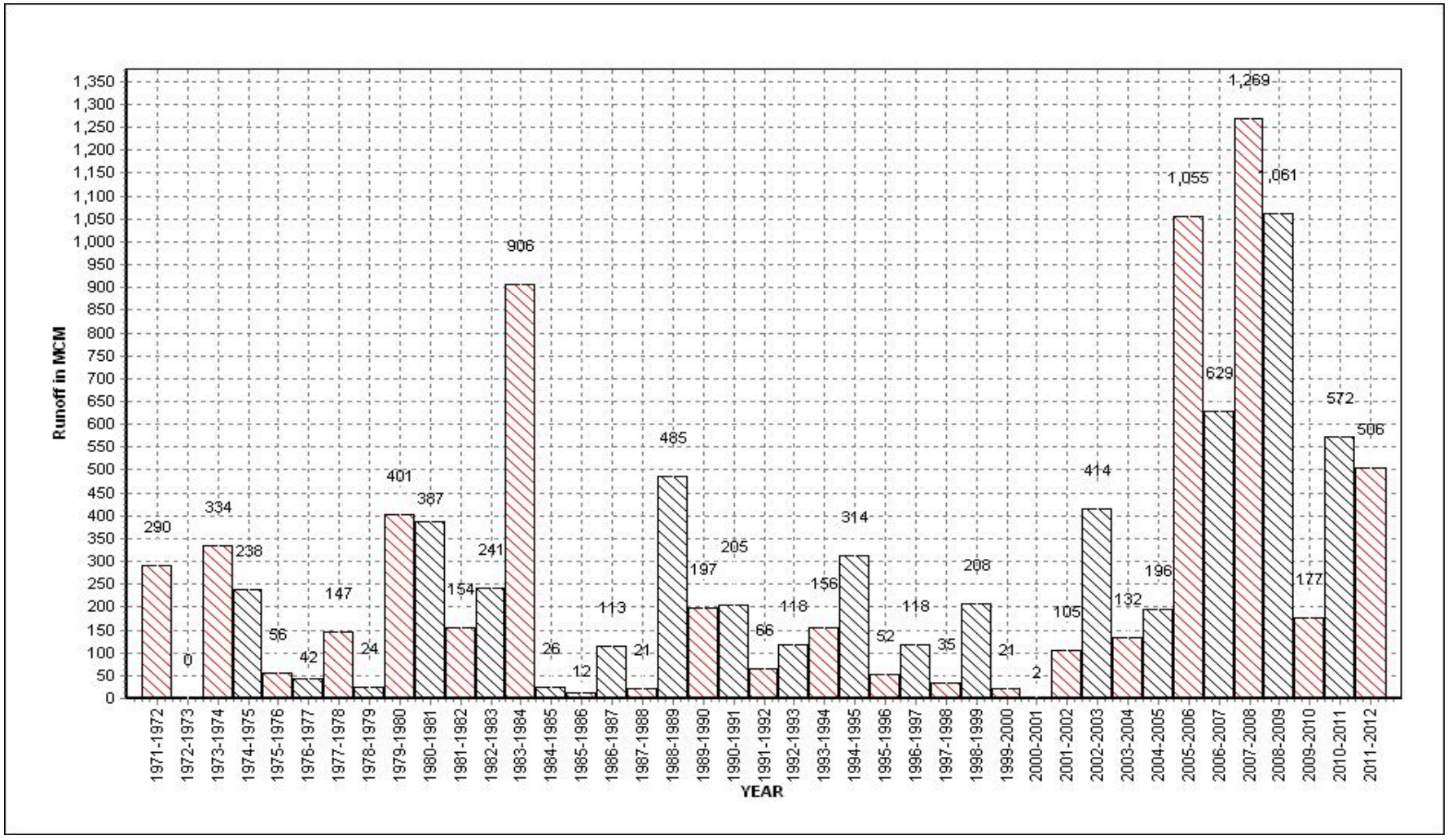
Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad



Annual Runoff Values for the period: 1971 - 2012

Station Name : Shetrunji at Lowara (01 02 09 001)
Local River : Shetrunji

Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad



Note: Missing values have not been considered while arriving at Annual Runoff

Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Shetrunji at Lowara (01 02 09 001) **Division : Mahi Division, Gandhinagar**

Local River : Shetrunji **Sub-Division : Sabarmati Sub Divn., Ahmedabad**



Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Shetrunji at Lowara (01 02 09 001) **Division : Mahi Division, Gandhinagar**

Local River : Shetrunji **Sub-Division : Sabarmati Sub Divn., Ahmedabad**



Time Span: 72 Hrs

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Shetrunji at Lowara (01 02 09 001) **Division : Mahi Division, Gandhinagar**

Local River : Shetrunji **Sub-Division : Sabarmati Sub Divn., Ahmedabad**



Time Span: 72 Hrs

HISTORY SHEET

			Water Year	**:**	**2011-2012**
Site	**:**	**Bhadar at Ganod**	**Code**	**:**	**01 02 07 001**
State	:	Gujarat	District		Rajkot
Basin	:	WFR of Kach.-Saur. & Luni	Independent River	:	Bhadar
Tributary	:	Bhadar	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Bhadar
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	Sabarmati Sub Divn., Ahmedabad
Drainage Area	:	6266 Sq. Km.	Bank	:	Right
Latitude	:	21°39'53" N	Longitude	:	70°10'52" E
Zero of Gauge (m)	:	26 (m.s.l)	14/11/1970	-	
		Opening Date	Closing Date		
Gauge	:	14/11/1970			
Discharge	:	14/11/1970			
Sediment	:	07/07/1973			
Water Quality	:	01/07/1973			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1971-1972	841.8	30.430	31/08/1971	0.000	26.820	24/05/1972
1972-1973	1230	31.600	30/06/1972	0.000	River Dry	21/11/1972
1973-1974	362.0	29.030	10/07/1973	0.000	River Dry	25/01/1974
1974-1975	229.3	28.300	30/09/1974	0.000	River Dry	25/01/1975
1975-1976	244.5	28.625	12/07/1975	0.000	River Dry	04/02/1976
1976-1977	1048	31.080	16/07/1976	0.000	River Dry	05/06/1976
1977-1978	526.0	30.400	04/09/1977	0.000	River Dry	06/06/1977
1978-1979	210.5	28.965	30/08/1978	0.000	River Dry	27/04/1979
1979-1980	4098	33.330	11/08/1979	0.000	River Dry	25/07/1979
1980-1981	2977	33.320	04/07/1980	0.000	26.405	19/04/1981
1981-1982	926.2	29.860	11/07/1981	0.000	River Dry	18/06/1981
1982-1983	380.0	29.400	09/11/1982	0.000	River Dry	28/06/1982
1983-1984	2750	34.100	22/06/1983	0.000	River Dry	14/05/1984
1984-1985	2315	32.110	14/09/1984	0.000	River Dry	28/04/1985
1985-1986	47.70	27.060	19/07/1985	0.000	River Dry	25/01/1986
1986-1987	192.3	27.630	08/08/1986	0.000	River Dry	25/01/1987
1987-1988	29.91	26.845	20/11/1987	0.000	River Dry	09/05/1988
1988-1989	4160	33.120	27/07/1988	0.000	River Dry	11/03/1989
1989-1990	751.5	29.125	25/07/1989	0.000	River Dry	05/02/1990
1990-1991	1016	30.190	18/08/1990	0.000	River Dry	25/01/1991
1991-1992	382.0	28.345	28/07/1991	0.000	River Dry	26/01/1992
1992-1993	699.3	31.500	30/07/1992	0.000	River Dry	04/12/1992
1993-1994	174.5	27.680	10/07/1993	0.000	River Dry	21/11/1993
1994-1995	2594	33.030	14/07/1994	0.000	River Dry	07/02/1995
1995-1996	70.52	27.190	31/07/1995	0.000	River Dry	26/01/1996
1996-1997	3526	33.000	20/06/1996	0.000	River Dry	25/01/1997
1997-1998	248.0	28.460	13/09/1997	0.000	River Dry	25/01/1998
1998-1999	75.40	27.410	29/06/1998	0.000	River Dry	14/01/1999
1999-2000	48.20	27.275	14/07/1999	0.000	River Dry	26/01/2000
2000-2001	36.79	26.960	26/08/2000	0.000	River Dry	25/01/2001
2001-2002	654.2	28.995	05/07/2001	0.000	River Dry	29/01/2002

contd/-

HISTORY SHEET

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
2002-2003	734.0	30.095	29/06/2002	0.000	River Dry	16/06/2002
2003-2004	263.2	27.900	07/08/2003	0.000	River Dry	02/02/2004
2004-2005	75.36	27.007	11/08/2004	0.000	River Dry	30/03/2005
2005-2006	455.7	28.580	12/09/2005	0.000	River Dry	01/06/2005
2006-2007	2728	31.810	30/07/2006	0.000	River Dry	01/06/2006
2007-2008	3474	33.295	08/08/2007	0.000	River Dry	01/06/2007
2008-2009	1902	32.160	16/09/2008	0.000	River Dry	01/06/2008
2009-2010	1102	29.600	24/07/2009	0.000	River Dry	01/06/2009
2010-2011	1932	30.850	01/09/2010	0.000	River Dry	01/06/2010
2011-2012	97.6	26.010	13/09/2011	0.000	River Dry	22/06/2011

Stage-Discharge Data for the period 2011 - 2012

Station Name : Bhadar at Ganod (01 02 07 001) **Division : Mahi Division, Gandhinagar**

Local River : Bhadar **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	R Dry	0.000	24.360	34.98 *	25.180	64.66 *	25.250	67.34 #	24.500	37.77	24.010	37.77 *
2	R Dry	0.000	24.340	34.31 *	25.500	77.08 *	25.220	66.19 #	24.400	36.35 *	24.010	37.77 *
3	R Dry	0.000	24.310	33.29 *	25.250	67.34 *	25.250	67.34 #	24.480	35.52	24.010	37.77 *
4	R Dry	0.000	24.295	32.79 *	25.170	64.28 *	26.640	124.3 *	24.430	32.53	24.010	37.77 *
5	R Dry	0.000	24.290	32.62 *	24.990	57.49 *	25.740	94.47	24.385	29.89	24.000	37.77 *
6	R Dry	0.000	24.280	32.29 *	24.980	57.12 *	27.950	183.0 *	24.780	49.76 *	R Dry	0.000
7	R Dry	0.000	24.265	31.79 *	24.950	56.00 *	26.690	126.4 *	24.390	32.12	R Dry	0.000
8	R Dry	0.000	24.840	51.95 *	24.975	56.93 *	26.500	118.2 *	24.240	29.41	R Dry	0.000
9	R Dry	0.000	24.910	54.52 *	24.880	53.41 *	25.950	87.56	24.240	30.96 *	R Dry	0.000
10	R Dry	0.000	24.985	57.30 *	24.880	53.41 *	25.670	85.00	24.260	34.64	R Dry	0.000
11	R Dry	0.000	24.060	25.09 *	24.845	52.13 *	25.540	78.66 *	24.200	29.63 #	R Dry	0.000
12	R Dry	0.000	24.950	56.00 *	25.120	62.38 *	25.595	76.49	24.290	37.84	R Dry	0.000
13	R Dry	0.000	24.980	57.12 *	25.190	65.04 *	26.010	97.60	24.220	30.29 #	R Dry	0.000
14	R Dry	0.000	24.780	49.76 *	25.280	68.49 *	25.700	87.21	24.180	28.98 #	R Dry	0.000
15	R Dry	0.000	24.570	42.25 *	25.220	66.19 *	25.540	75.77	24.160	34.18	R Dry	0.000
16	R Dry	0.000	24.530	40.85 *	25.200	65.42 *	25.530	76.17	24.140	32.50	R Dry	0.000
17	R Dry	0.000	24.535	41.02 *	25.270	68.11 *	25.790	88.40	24.140	27.67 *	R Dry	0.000
18	R Dry	0.000	24.790	50.12 *	25.160	63.90 *	25.580	80.24 *	24.130	30.33	R Dry	0.000
19	R Dry	0.000	24.920	54.89 *	25.130	62.76 *	25.250	67.34 #	24.120	27.56	R Dry	0.000
20	R Dry	0.000	25.070	60.49 *	25.140	63.14 *	25.480	74.00	24.110	25.99	R Dry	0.000
21	R Dry	0.000	24.730	47.95 *	25.230	66.57 *	25.180	66.83	24.100	24.94	R Dry	0.000
22	R Dry	0.000	24.670	45.80 *	25.130	62.76 *	25.185	70.38	24.070	23.36	R Dry	0.000
23	24.820	51.22 *	24.625	44.19 *	25.130	62.76 #	25.100	68.82	24.050	24.78 *	R Dry	0.000
24	24.780	49.76 *	24.570	42.25 *	25.230	74.35	24.930	51.80	24.040	24.46 *	R Dry	0.000
25	24.690	46.51 *	24.545	41.37 *	25.220	69.41	25.015	58.42 *	24.020	23.82 *	R Dry	0.000
26	24.630	44.37 *	25.100	61.62 *	25.200	66.90	24.990	54.44	24.010	23.51 *	R Dry	0.000
27	24.550	41.55 *	24.860	52.68 *	25.250	78.24	24.905	49.93	24.010	23.51 *	R Dry	0.000
28	24.460	38.41 *	24.775	49.58 *	25.140	63.14 *	24.900	46.03	24.010	23.51 *	R Dry	0.000
29	24.420	37.03 *	24.725	47.77 *	25.230	77.40	25.075	56.46	24.010	23.51 *	R Dry	0.000
30	24.380	35.67 *	24.660	45.44 *	26.550	120.4 *	24.610	43.33	24.010	23.51 *	R Dry	0.000
31			25.040	59.36 *	25.450	75.11 *			24.010	23.51 *		
Ten-Daily Mean												
I Ten-Daily			24.487	39.58	25.076	60.77	26.086	102.0	24.411	34.90	24.008	37.77
II Ten-Daily			24.719	47.76	25.156	63.76	25.602	80.19	24.169	30.50		
III Ten-Daily	24.591	43.07	24.755	48.91	25.342	74.27	24.989	56.64	24.031	23.86		
Monthly												
Min.	24.380	35.67	24.060	25.09	24.845	52.13	24.610	43.33	24.010	23.36	24.000	37.77
Max.	24.820	51.22	25.100	61.62	26.550	120.4	27.950	183.0	24.780	49.76	24.010	37.77
Mean	24.591	43.07	24.657	45.53	25.196	66.53	25.559	79.61	24.198	29.56	24.008	37.77

Annual Runoff in MCM = 632 Annual Runoff in mm = 101

Peak Observed Discharge = 97.60 cumecs on 13/09/2011 Corres. Water Level :26.01 m

Lowest Observed Discharge = 23.36 cumecs on 22/10/2011 Corres. Water Level :24.07 m

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Bhadar at Ganod (01 02 07 001) **Division : Mahi Division, Gandhinagar**

Local River : Bhadar **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
2	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
3	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
4	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
5	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
6	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
7	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
8	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
9	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
10	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
11	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
12	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
13	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
14	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
15	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
16	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
17	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
18	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
19	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
20	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
21	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
22	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
23	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
24	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
25	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
26	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
27	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
28	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
29	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000	R Dry	0.000
30	R Dry	0.000	R Dry	0.000			R Dry	0.000	R Dry	0.000	R Dry	0.000
31	R Dry	0.000	R Dry	0.000			R Dry	0.000			R Dry	0.000
Ten-Daily Mean												
I Ten-Daily		0.000		0.000		0.000		0.000		0.000		0.000
II Ten-Daily		0.000		0.000		0.000		0.000		0.000		0.000
III Ten-Daily		0.000		0.000		0.000		0.000		0.000		0.000
Monthly												
Min.		0.000		0.000		0.000		0.000		0.000		0.000
Max.		0.000		0.000		0.000		0.000		0.000		0.000
Mean		0.000		0.000		0.000		0.000		0.000		0.000

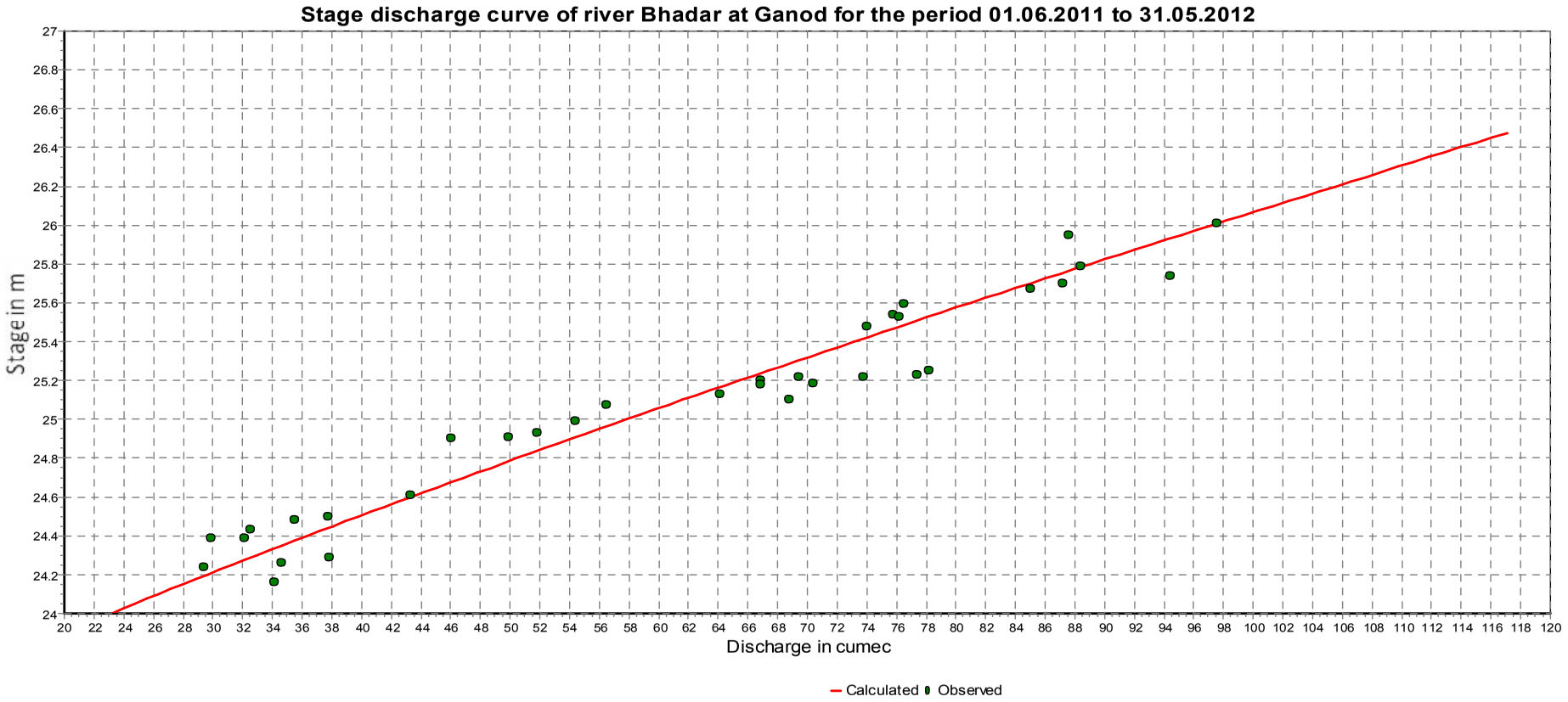
Peak Computed Discharge = 183.0 cumecs on 06/09/2011 Corres. Water Level :27.95 m

Lowest Computed Discharge = 23.51 cumecs on 26/10/2011 Corres. Water Level :24.01 m

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff



Procedure : Standard

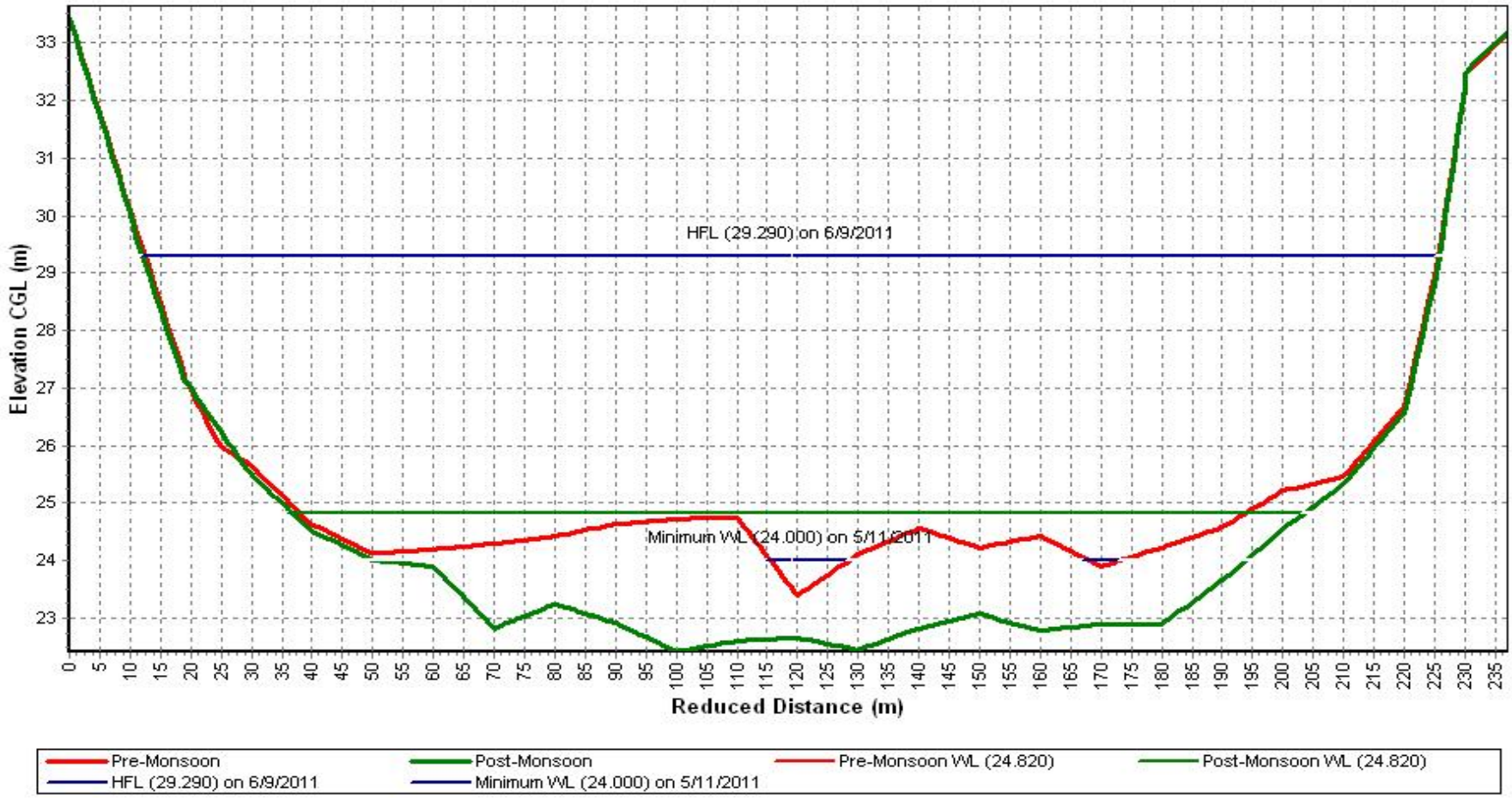
Equation type: Power

Q = c (h+a)^b, a = -23.09, b = 1.233, c = 26.055

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Bhadar at Ganod (01 02 07 001)
Local River : Bhadar

Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad

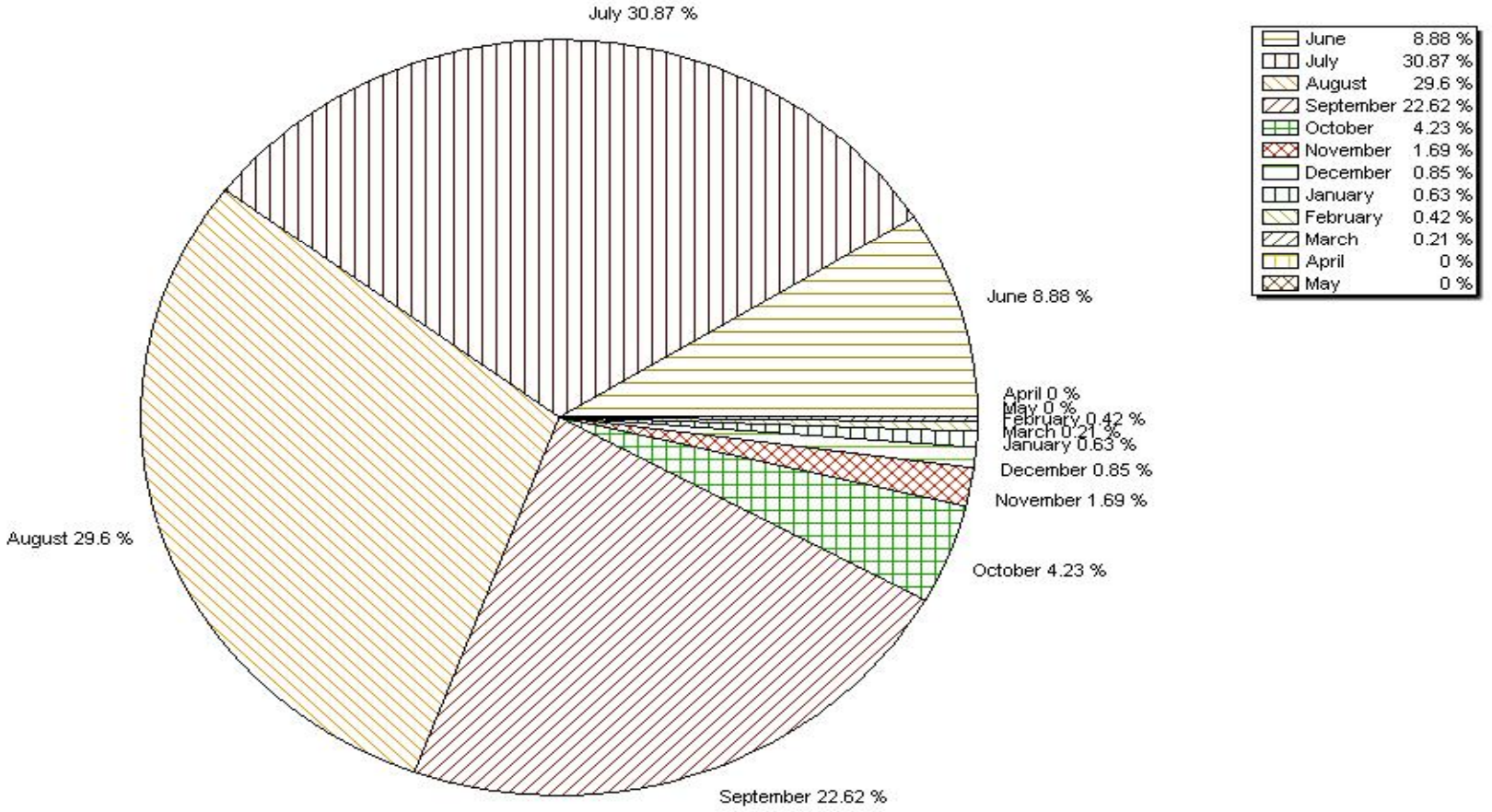


Historic Flood Level-34.100m on 22.06.1983 at 0800 hrs

Monthly Average Runoff based on period : 1971-2011

Station Name : Bhadar at Ganod (01 02 07 001)
Local River : Bhadar

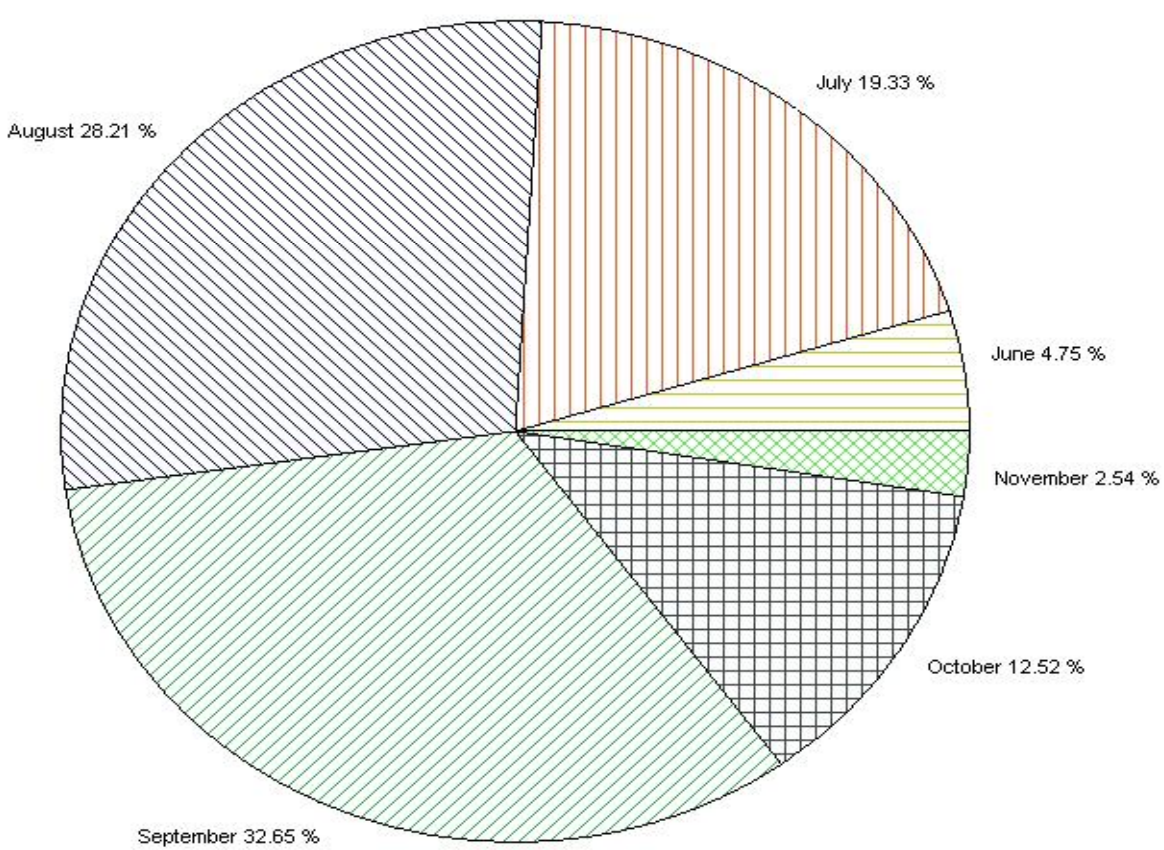
Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad



Monthly Runoff for the Year : 2011-2012

Station Name : Bhadar at Ganod (01 02 07 001)
Local River : Bhadar

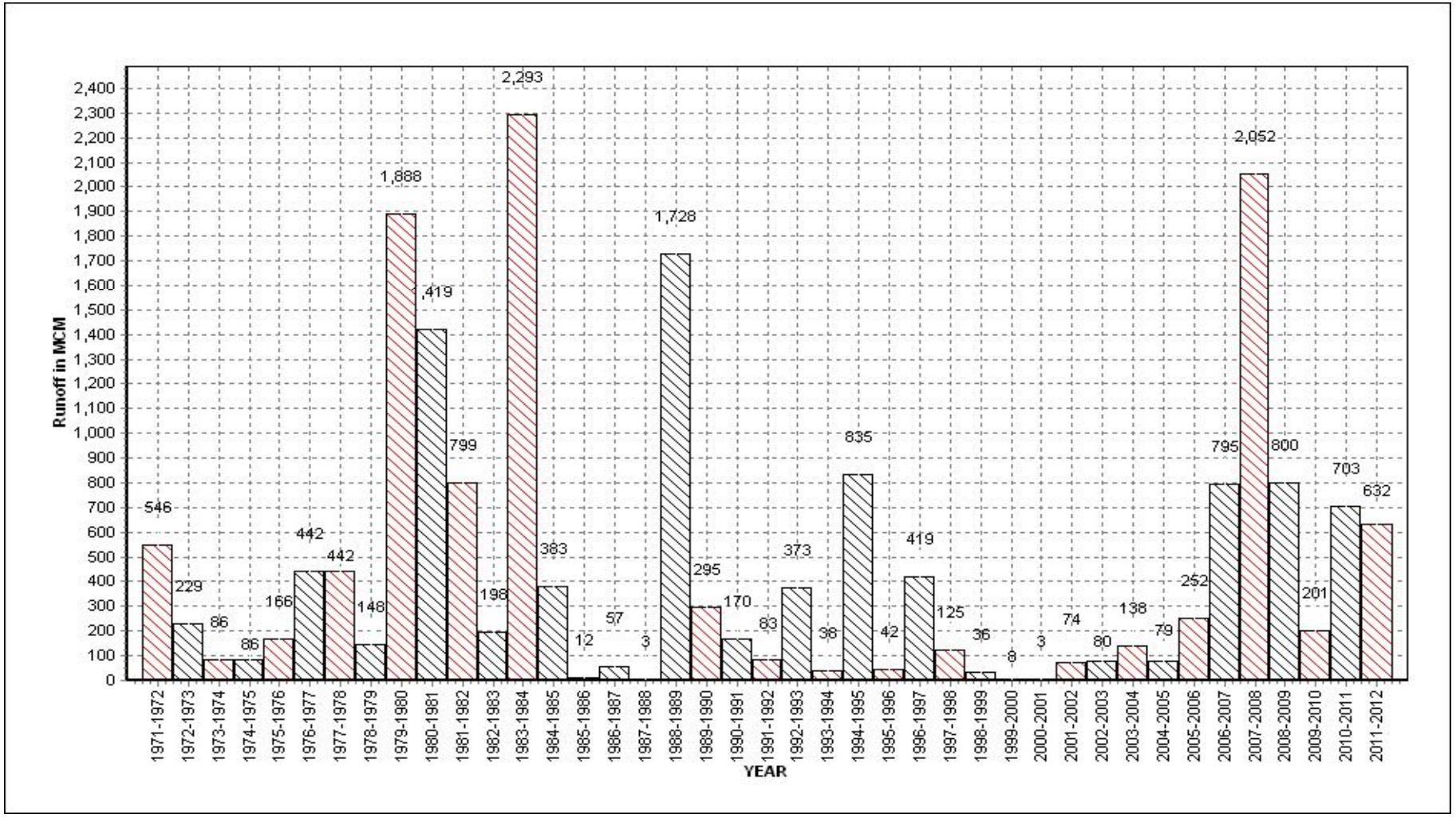
Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad



Annual Runoff Values for the period: 1971 - 2012

Station Name : Bhadar at Ganod (01 02 07 001)
Local River : Bhadar

Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad

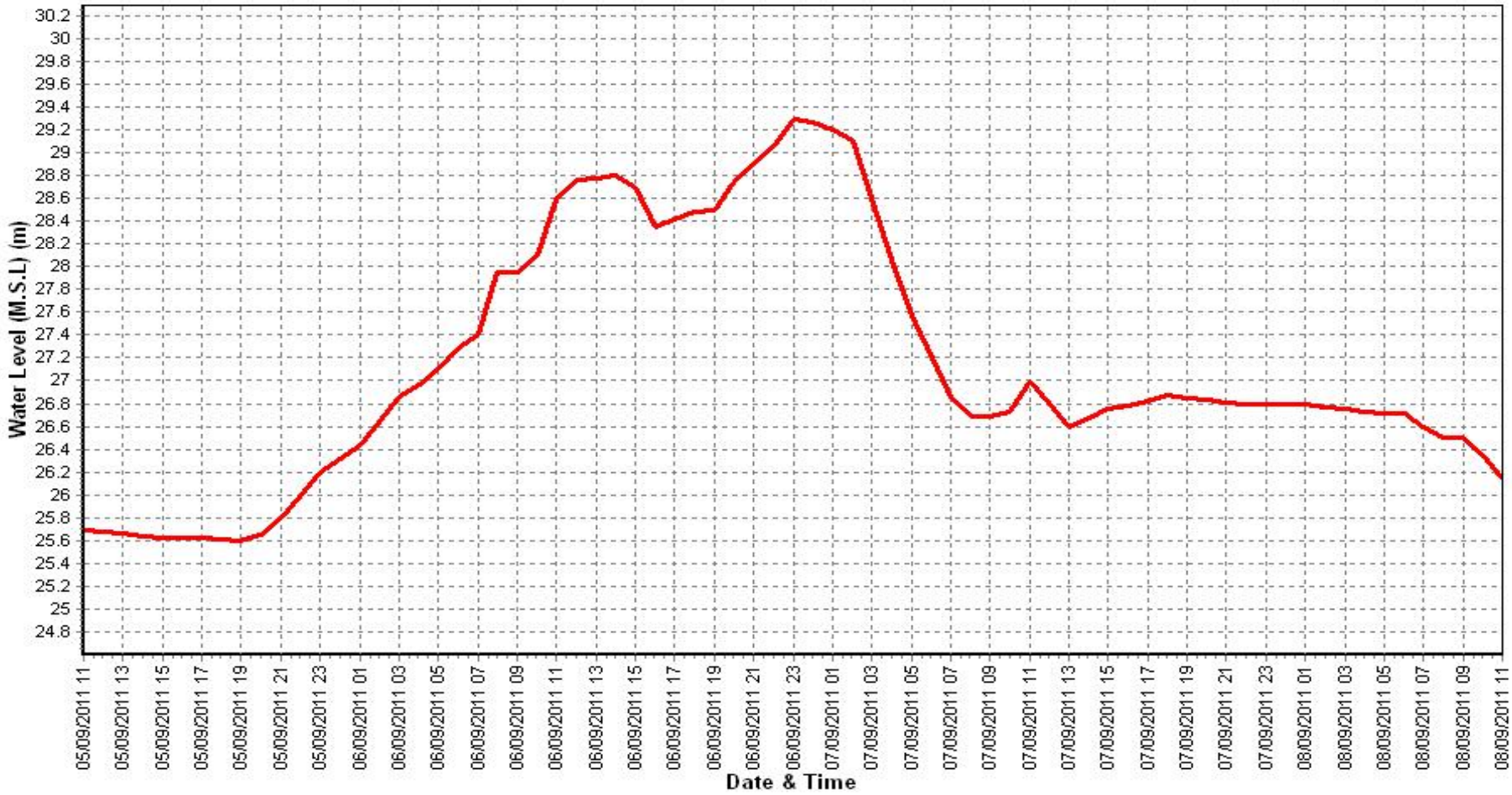


Note: Missing values have not been considered while arriving at Annual Runoff

Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Bhadar at Ganod (01 02 07 001) **Division : Mahi Division, Gandhinagar**

Local River : Bhadar **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

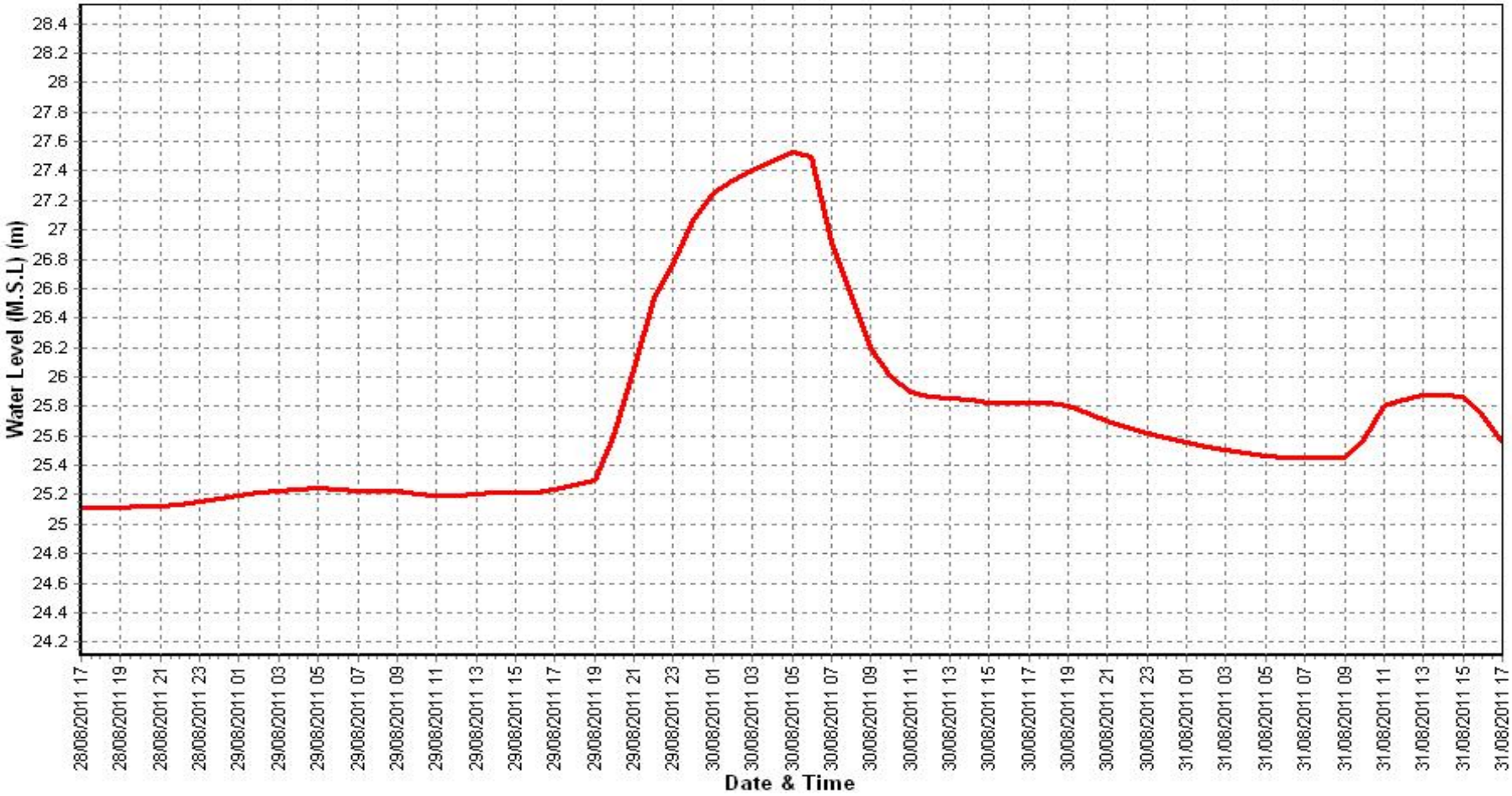


Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Bhadar at Ganod (01 02 07 001) **Division : Mahi Division, Gandhinagar**

Local River : Bhadar **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

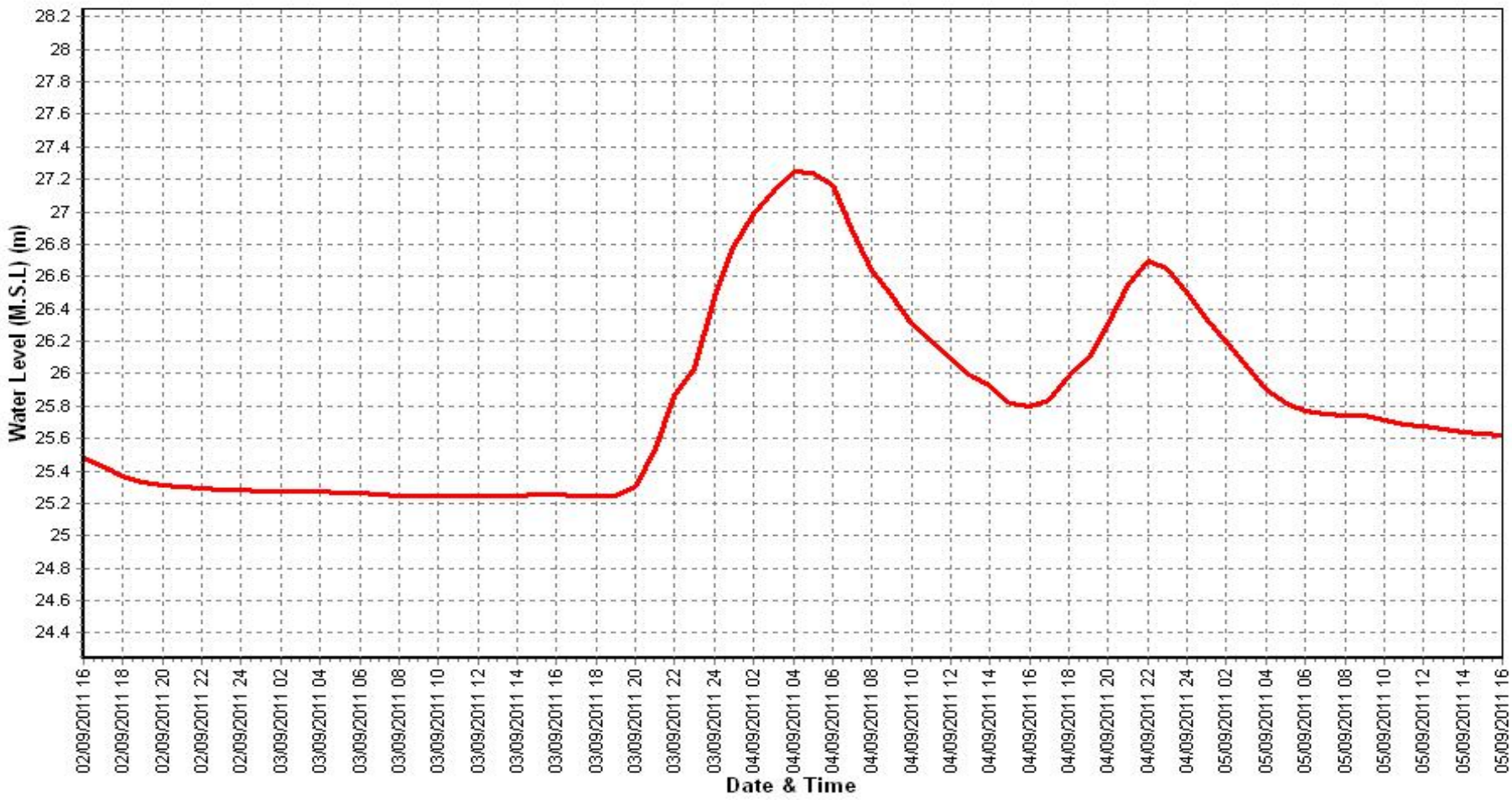


Time Span: 72 Hrs

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Bhadar at Ganod (01 02 07 001) **Division : Mahi Division, Gandhinagar**

Local River : Bhadar **Sub-Division : Sabarmati Sub Divn., Ahmedabad**



Time Span: 72 Hrs

HISTORY SHEET

			Water Year	**:**	**2011-2012**
Site	**:**	**Machhu at Gungan**	**Code**	**:**	**01 02 03 001**
State	:	Gujarat	District		Rajkot
Basin	:	WFR of Kach.-Saur. & Luni	Independent River	:	Machhu
Tributary	:	Machhu	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Machhu
Division	:	Mahi Division, Gandhinagar	Sub-Division	:	Sabarmati Sub Divn., Ahmedabad
Drainage Area	:	2137 Sq. Km.	Bank	:	Right
Latitude	:	22°57'42" N	Longitude	:	70°45'52" E
Zero of Gauge (m)	:	8 (m.s.l)	13/09/1970	-	
		Opening Date	Closing Date		
Gauge	:	13/09/1970			
Discharge	:	09/12/1970			
Sediment	:	--			
Water Quality	:	--			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1971-1972	956.3	11.590	17/07/1971	0.000	River Dry	31/12/1971
1972-1973	47.02	9.585	08/07/1972	0.000	River Dry	25/01/1973
1973-1974	River Dry					
1974-1975	River Dry					
1975-1976	279.4	10.645	15/07/1975	0.000	8.425	17/12/1975
1976-1977	1805	14.075	30/08/1976	0.000	River Dry	03/06/1976
1977-1978	726.0	13.120	27/07/1977	0.000	9.335	19/05/1978
1978-1979	95.70	10.670	31/08/1978	0.000	9.485	13/06/1978
1979-1980	79.00	10.375	28/06/1979	0.000	River Dry	25/08/1979
1980-1981	1645	15.700	28/06/1980	0.000	River Dry	04/05/1981
1981-1982	628.1	12.180	11/08/1981	0.000	9.570	05/04/1982
1982-1983	750.8	12.410	24/07/1982	0.000	9.660	20/12/1982
1983-1984	1498	13.850	08/08/1983	0.000	River Dry	17/12/1983
1984-1985	475.3	11.645	14/09/1984	0.000	River Dry	17/12/1984
1985-1986	160.7	10.965	17/07/1985	0.000	River Dry	21/11/1985
1986-1987	407.7	11.760	09/08/1986	0.000	River Dry	07/01/1987
1987-1988	80.98	10.530	16/07/1987	0.000	River Dry	07/02/1988
1988-1989	2681	15.973	28/07/1988	0.000	River Dry	08/11/1988
1989-1990	1781	13.850	25/07/1989	0.000	River Dry	25/11/1989
1990-1991	195.4	10.765	25/08/1990	0.000	River Dry	01/08/1990
1991-1992	9.854	10.070	20/07/1991	0.000	River Dry	26/01/1992
1992-1993	131.6	10.950	31/07/1992	0.000	8.925	30/01/1993
1993-1994	5.395	10.250	10/07/1993	0.000	River Dry	25/01/1994
1994-1995	1657	13.880	15/07/1994	0.000	9.520	06/04/1995
1995-1996	96.96	10.790	26/07/1995	0.000	9.130	26/01/1996
1996-1997	179.0	11.180	21/06/1996	0.000	River Dry	25/01/1997
1997-1998	990.0	16.000	24/06/1997	0.000	9.590	10/11/1997
1998-1999	50.09	11.125	17/10/1998	0.000	9.160	17/12/1998
1999-2000	3.300	9.980	13/10/1999	0.000	8.710	26/01/2000
2000-2001	50.00	11.005	15/07/2000	0.000	8.260	25/01/2001
2001-2002	20.16	10.290	11/07/2001	0.000	River Dry	27/01/2002

contd.\-

HISTORY SHEET

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
2002-2003	70.80	10.625	28/06/2002	0.000	River Dry	22/05/2003
2003-2004	70.16	11.135	24/07/2003	0.000	8.575	23/12/2003
2004-2005	76.00	11.765	11/08/2004	0.000	8.545	25/01/2005
2005-2006	394.0	12.910	20/09/2005	0.000	River Dry	01/06/2005
2006-2007	531.2	12.810	31/07/2006	0.000	River Dry	01/06/2006
2007-2008	1524	12.875	09/08/2007	0.000	9.350	01/06/2008
2008-2009	1689	14.975	18/09/2008	0.000	9.800	02/09/2008
2009-2010	13.48	10.520	31/08/2009	0.000	9.275	01/12/2009
2010-2011	1699	14.720	30/08/2010	0.000	9.190	01/10/2010
2011-2012	58.8	11.750	13/08/2011	0.000	9.560	30/05/2012

Stage-Discharge Data for the period 2011 - 2012

Station Name : Machhu at Gungan (01 02 03 001) **Division : Mahi Division, Gandhinagar**

Local River : Machhu **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	9.675	0.000 *	9.665	0.000 *	10.205	2.000 *	10.735	56.56	10.140	0.000 *	9.725	0.000 *
2	9.675	0.000 *	9.665	0.000 *	10.910	71.23 #	10.730	54.82	10.120	0.000 *	9.720	0.000 *
3	9.675	0.000 *	9.665	0.000 *	10.760	58.83	11.740	260.8	10.105	0.000 *	9.720	0.000 *
4	9.675	0.000 *	9.665	0.000 *	10.590	36.42	10.780	52.45 *	10.075	0.000 *	9.715	0.000 *
5	9.675	0.000 *	9.665	0.000 *	10.575	33.77	11.200	109.1	10.060	0.000 *	9.715	0.000 *
6	9.675	0.000 *	9.665	0.000 *	10.480	13.11	10.730	54.51	10.020	0.000 *	9.715	0.000 *
7	9.675	0.000 *	9.660	0.000 *	10.455	16.83 *	10.860	69.30	9.965	0.000 *	9.715	0.000 *
8	9.675	0.000 *	9.705	0.000 *	10.360	10.71	10.950	77.49 #	9.900	0.000 *	9.715	0.000 *
9	9.675	0.000 *	9.780	0.000 *	10.380	7.834	10.710	59.36	9.800	0.000 *	9.715	0.000 *
10	9.675	0.000 *	9.855	0.000 *	10.380	9.111	10.770	63.20	9.785	0.000 *	9.715	0.000 *
11	9.670	0.000 *	11.565	183.0	10.830	70.05	10.630	33.92 *	9.780	0.000 *	9.715	0.000 *
12	9.670	0.000 *	11.080	97.11	11.350	136.7	10.680	51.51	9.760	0.000 *	9.710	0.000 *
13	9.670	0.000 *	10.380	11.11 #	11.750	273.9	11.415	157.4	9.740	0.000 *	9.710	0.000 *
14	9.670	0.000 *	10.330	5.223	11.180	117.8 *	11.300	137.7	9.735	0.000 *	9.710	0.000 *
15	9.670	0.000 *	10.250	3.941	11.800	260.5 *	11.700	251.2	9.730	0.000 *	9.710	0.000 *
16	9.670	0.000 *	10.190	2.455	11.640	239.3	11.040	92.41 #	9.730	0.000 *	9.710	0.000 *
17	9.670	0.000 *	10.185	1.380 *	11.140	104.9	10.800	64.00	9.730	0.000 *	9.710	0.000 *
18	9.665	0.000 *	10.230	3.737	10.680	50.66	10.750	48.47 *	9.730	0.000 *	9.710	0.000 *
19	9.665	0.000 *	16.505	2650 *	10.750	55.05	10.690	44.53	9.730	0.000 *	9.710	0.000 *
20	9.665	0.000 *	11.150	103.6	10.700	51.64	10.550	16.81	9.725	0.000 *	9.710	0.000 *
21	9.665	0.000 *	10.420	10.08	10.640	35.05 *	10.520	14.81	9.725	0.000 *	9.710	0.000 *
22	9.665	0.000 *	10.285	3.885	10.920	72.77 *	10.510	19.31	9.725	0.000 *	9.710	0.000 *
23	9.665	0.000 *	10.230	3.334	10.500	14.79	10.470	10.26	9.725	0.000 *	9.710	0.000 *
24	9.665	0.000 *	10.210	2.170 *	10.680	50.44	10.460	10.07	9.725	0.000 *	9.710	0.000 *
25	9.665	0.000 *	10.200	3.348	10.700	51.08	10.360	9.430 *	9.725	0.000 *	9.710	0.000 *
26	9.665	0.000 *	10.275	4.880 #	10.630	45.82	10.290	4.932	9.725	0.000 *	9.705	0.000 *
27	9.665	0.000 *	10.620	38.52	10.625	44.18	10.400	8.368	9.725	0.000 *	9.700	0.000 *
28	9.665	0.000 *	10.470	13.85	10.580	28.52 *	10.420	14.03 *	9.725	0.000 *	9.690	0.000 *
29	9.665	0.000 *	10.370	8.381	10.640	47.46	10.280	5.130 *	9.725	0.000 *	9.690	0.000 *
30	9.665	0.000 *	10.250	3.835	11.525	177.3	10.270	4.640 *	9.725	0.000 *	9.690	0.000 *
31			10.260	4.180 *	11.270	135.5 *			9.725	0.000 *		
Ten-Daily Mean												
I Ten-Daily	9.675	0.000	9.699	0.000	10.509	25.98	10.920	85.76	9.997	0.000	9.717	0.000
II Ten-Daily	9.668	0.000	11.187	306.2	11.182	136.0	10.956	89.79	9.739	0.000	9.710	0.000
III Ten-Daily	9.665	0.000	10.326	8.769	10.792	63.90	10.398	10.10	9.725	0.000	9.703	0.000
Monthly												
Min.	9.665	0.000	9.660	0.000	10.205	2.000	10.270	4.640	9.725	0.000	9.690	0.000
Max.	9.675	0.000	16.505	2650	11.800	273.9	11.740	260.8	10.140	0.000	9.725	0.000
Mean	9.670	0	10.401	101.9	10.827	74.94	10.758	61.88	9.817	0	9.710	0

Annual Runoff in MCM = 634 Annual Runoff in mm = 297

Peak Observed Discharge = 273.9 cumecs on 13/08/2011 Corres. Water Level :11.75 m

Lowest Observed Discharge = 2.455 cumecs on 16/07/2011 Corres. Water Level :10.19 m

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Machhu at Gungan (01 02 03 001) **Division : Mahi Division, Gandhinagar**

Local River : Machhu **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	9.685	0.000 *	9.675	0.000 *	9.705	0.000 *	9.730	0.000 *	9.725	0.000 *	9.650	0.000 *
2	9.685	0.000 *	9.680	0.000 *	9.705	0.000 *	9.730	0.000 *	9.725	0.000 *	9.645	0.000 *
3	9.680	0.000 *	9.685	0.000 *	9.705	0.000 *	9.730	0.000 *	9.725	0.000 *	9.640	0.000 *
4	9.680	0.000 *	9.690	0.000 *	9.705	0.000 *	9.730	0.000 *	9.720	0.000 *	9.635	0.000 *
5	9.680	0.000 *	9.695	0.000 *	9.705	0.000 *	9.730	0.000 *	9.720	0.000 *	9.630	0.000 *
6	9.680	0.000 *	9.695	0.000 *	9.705	0.000 *	9.730	0.000 *	9.720	0.000 *	9.625	0.000 *
7	9.680	0.000 *	9.700	0.000 *	9.705	0.000 *	9.730	0.000 *	9.715	0.000 *	9.620	0.000 *
8	9.680	0.000 *	9.700	0.000 *	9.705	0.000 *	9.730	0.000 *	9.715	0.000 *	9.615	0.000 *
9	9.675	0.000 *	9.700	0.000 *	9.705	0.000 *	9.730	0.000 *	9.715	0.000 *	9.610	0.000 *
10	9.675	0.000 *	9.700	0.000 *	9.705	0.000 *	9.730	0.000 *	9.715	0.000 *	9.610	0.000 *
11	9.675	0.000 *	9.700	0.000 *	9.705	0.000 *	9.730	0.000 *	9.710	0.000 *	9.610	0.000 *
12	9.675	0.000 *	9.700	0.000 *	9.705	0.000 *	9.730	0.000 *	9.710	0.000 *	9.605	0.000 *
13	9.675	0.000 *	9.700	0.000 *	9.705	0.000 *	9.730	0.000 *	9.705	0.000 *	9.605	0.000 *
14	9.675	0.000 *	9.700	0.000 *	9.705	0.000 *	9.730	0.000 *	9.705	0.000 *	9.600	0.000 *
15	9.675	0.000 *	9.700	0.000 *	9.705	0.000 *	9.730	0.000 *	9.705	0.000 *	9.600	0.000 *
16	9.675	0.000 *	9.700	0.000 *	9.705	0.000 *	9.730	0.000 *	9.700	0.000 *	9.595	0.000 *
17	9.675	0.000 *	9.700	0.000 *	9.705	0.000 *	9.730	0.000 *	9.700	0.000 *	9.595	0.000 *
18	9.675	0.000 *	9.700	0.000 *	9.705	0.000 *	9.730	0.000 *	9.695	0.000 *	9.590	0.000 *
19	9.675	0.000 *	9.700	0.000 *	9.705	0.000 *	9.730	0.000 *	9.695	0.000 *	9.590	0.000 *
20	9.675	0.000 *	9.700	0.000 *	9.705	0.000 *	9.730	0.000 *	9.690	0.000 *	9.590	0.000 *
21	9.675	0.000 *	9.700	0.000 *	9.705	0.000 *	9.730	0.000 *	9.685	0.000 *	9.590	0.000 *
22	9.675	0.000 *	9.700	0.000 *	9.705	0.000 *	9.730	0.000 *	9.685	0.000 *	9.585	0.000 *
23	9.675	0.000 *	9.700	0.000 *	9.705	0.000 *	9.730	0.000 *	9.685	0.000 *	9.585	0.000 *
24	9.675	0.000 *	9.700	0.000 *	9.710	0.000 *	9.730	0.000 *	9.675	0.000 *	9.580	0.000 *
25	9.675	0.000 *	9.700	0.000 *	9.710	0.000 *	9.730	0.000 *	9.675	0.000 *	9.580	0.000 *
26	9.675	0.000 *	9.700	0.000 *	9.715	0.000 *	9.730	0.000 *	9.670	0.000 *	9.575	0.000 *
27	9.675	0.000 *	9.705	0.000 *	9.720	0.000 *	9.730	0.000 *	9.670	0.000 *	9.570	0.000 *
28	9.675	0.000 *	9.705	0.000 *	9.725	0.000 *	9.730	0.000 *	9.665	0.000 *	9.565	0.000 *
29	9.675	0.000 *	9.705	0.000 *	9.730	0.000 *	9.730	0.000 *	9.660	0.000 *	9.565	0.000 *
30	9.675	0.000 *	9.705	0.000 *			9.730	0.000 *	9.655	0.000 *	9.560	0.000 *
31	9.675	0.000 *	9.705	0.000 *			9.730	0.000 *			9.560	0.000 *
Ten-Daily Mean												
I Ten-Daily	9.680	0.000	9.692	0.000	9.705	0.000	9.730	0.000	9.719	0.000	9.628	0.000
II Ten-Daily	9.675	0.000	9.700	0.000	9.705	0.000	9.730	0.000	9.702	0.000	9.598	0.000
III Ten-Daily	9.675	0.000	9.702	0.000	9.714	0.000	9.730	0.000	9.672	0.000	9.574	0.000
Monthly												
Min.	9.675	0.000	9.675	0.000	9.705	0.000	9.730	0.000	9.655	0.000	9.560	0.000
Max.	9.685	0.000	9.705	0.000	9.730	0.000	9.730	0.000	9.725	0.000	9.650	0.000
Mean	9.677	0	9.698	0	9.708	0	9.730	0	9.698	0	9.599	0

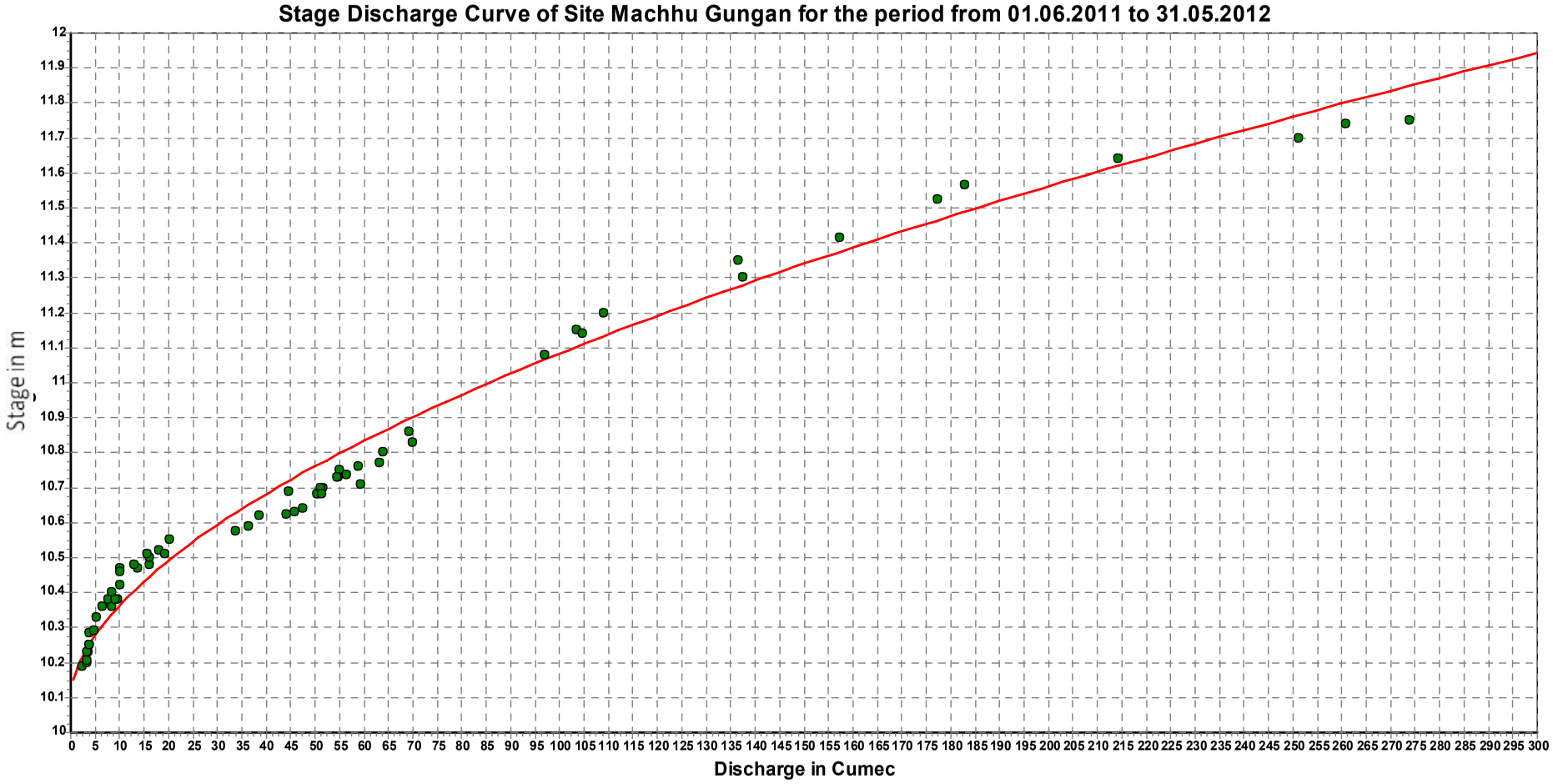
Peak Computed Discharge = 2650 cumecs on 19/07/2011 **Corres. Water Level :16.505 m**

Lowest Computed Discharge = 0.000 cumecs on 01/06/2011 **Corres. Water Level :9.675 m**

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff



Procedure : Standard

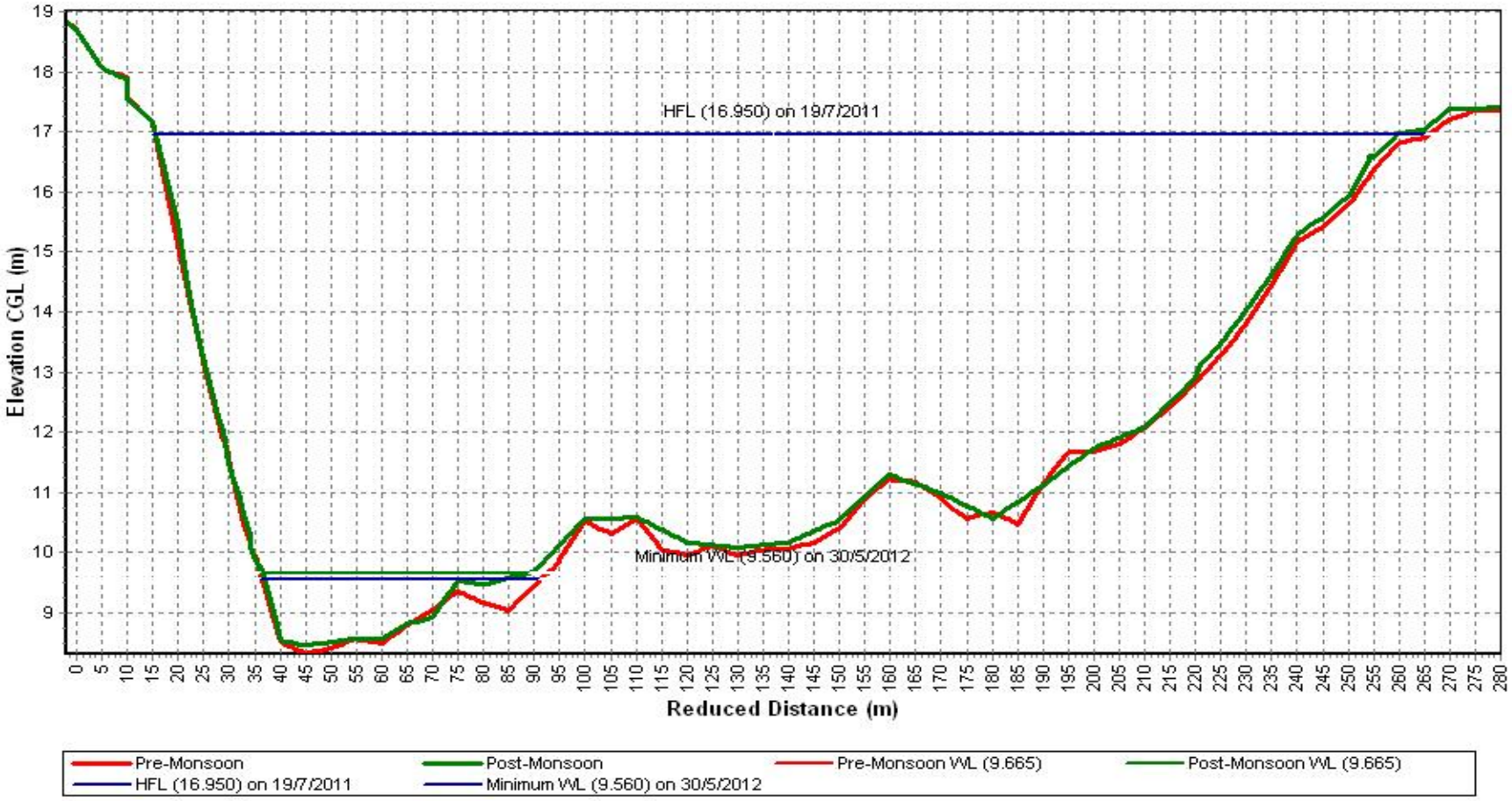
Equation type: Power

Q = c (h+a)^b, a = -10.1, b = 1.749, c = 102.968

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Machhu at Gungan (01 02 03 001)
Local River : Machhu

Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad

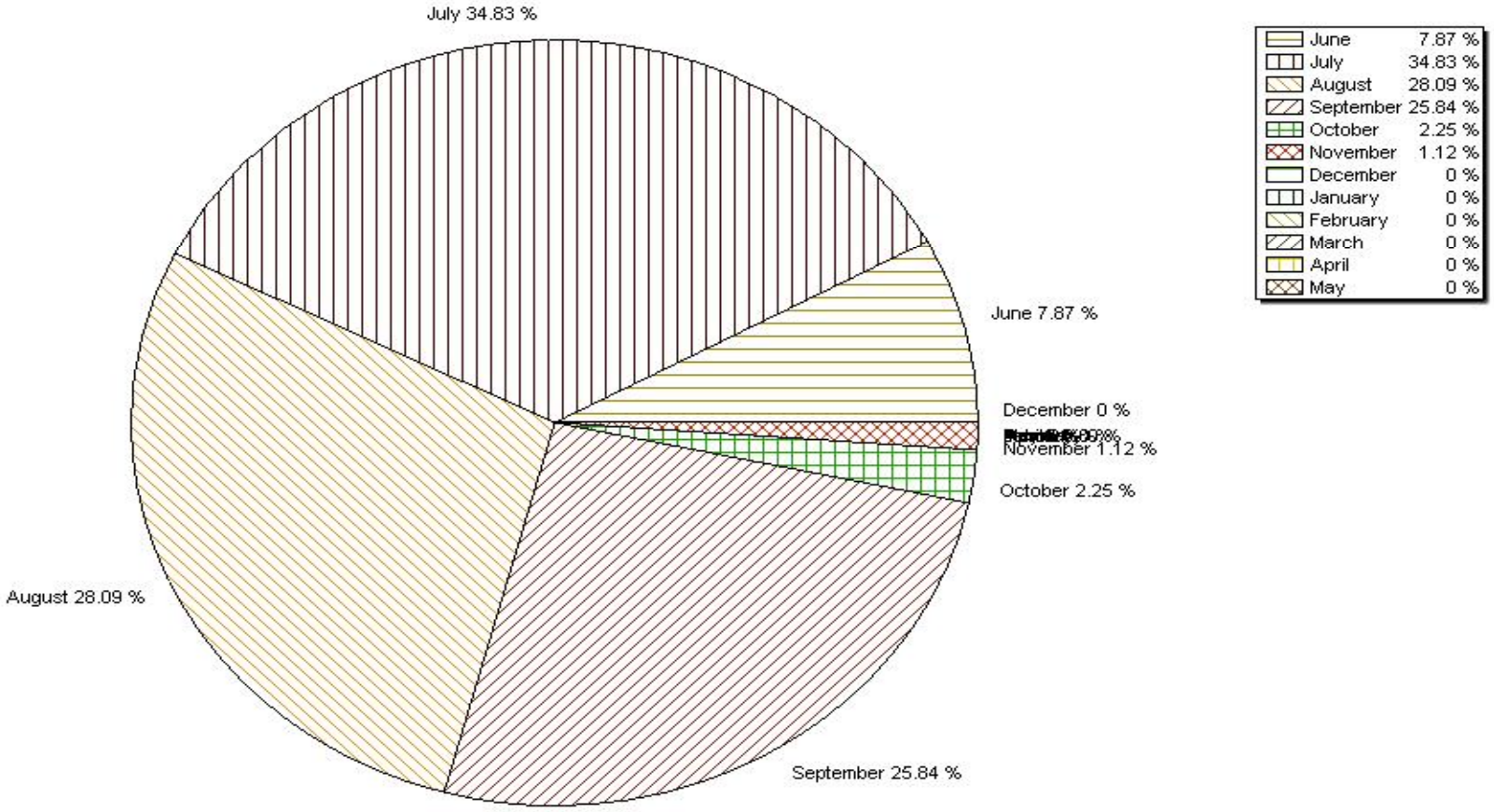


Historic Flood Level-24.595m on 11.08.1979 at 1400 hrs

Monthly Average Runoff based on period : 1971-2011

Station Name : Machhu at Gungan (01 02 03 001)
Local River : Machhu

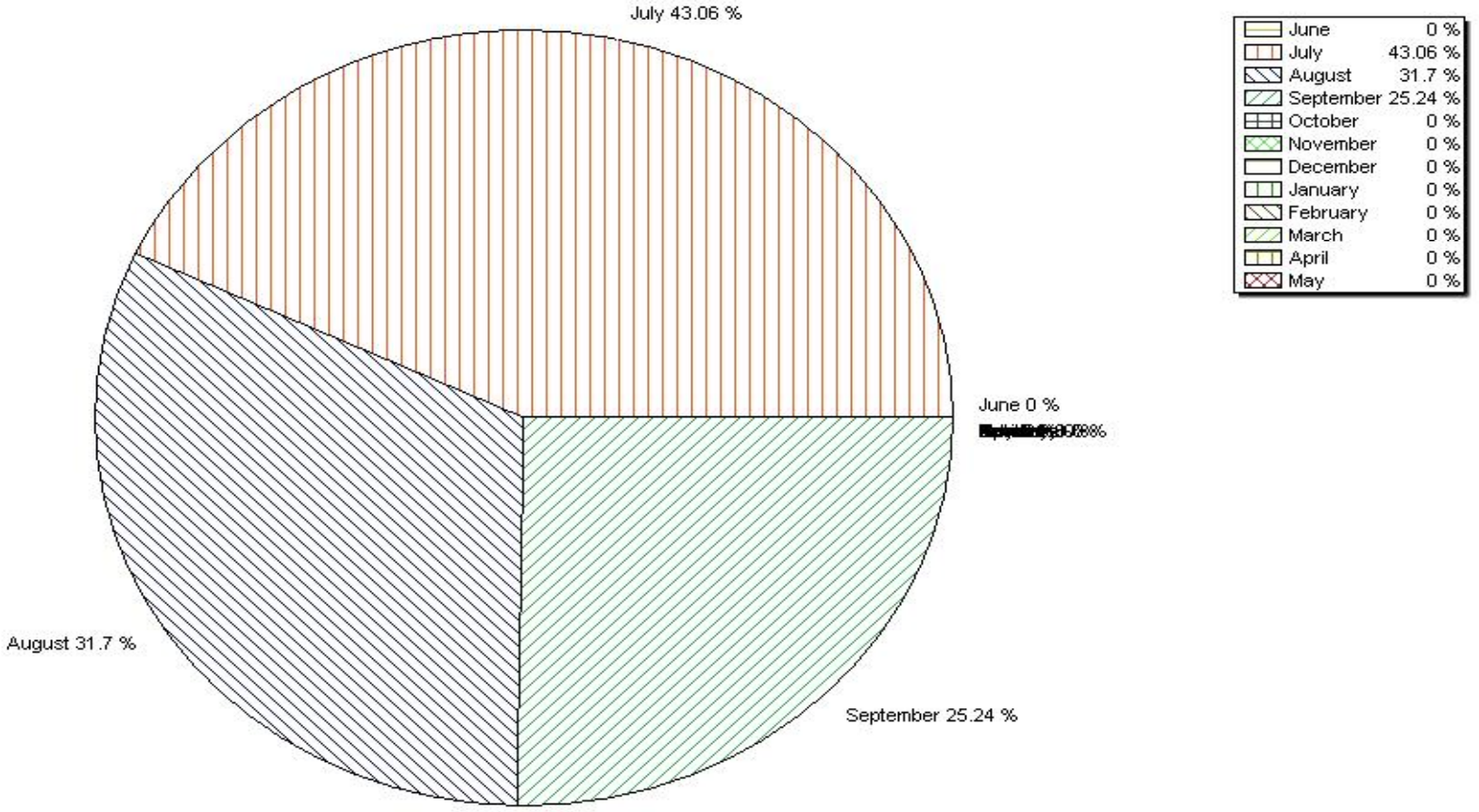
Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad



Monthly Runoff for the Year : 2011-2012

Station Name : Machhu at Gungan (01 02 03 001)
Local River : Machhu

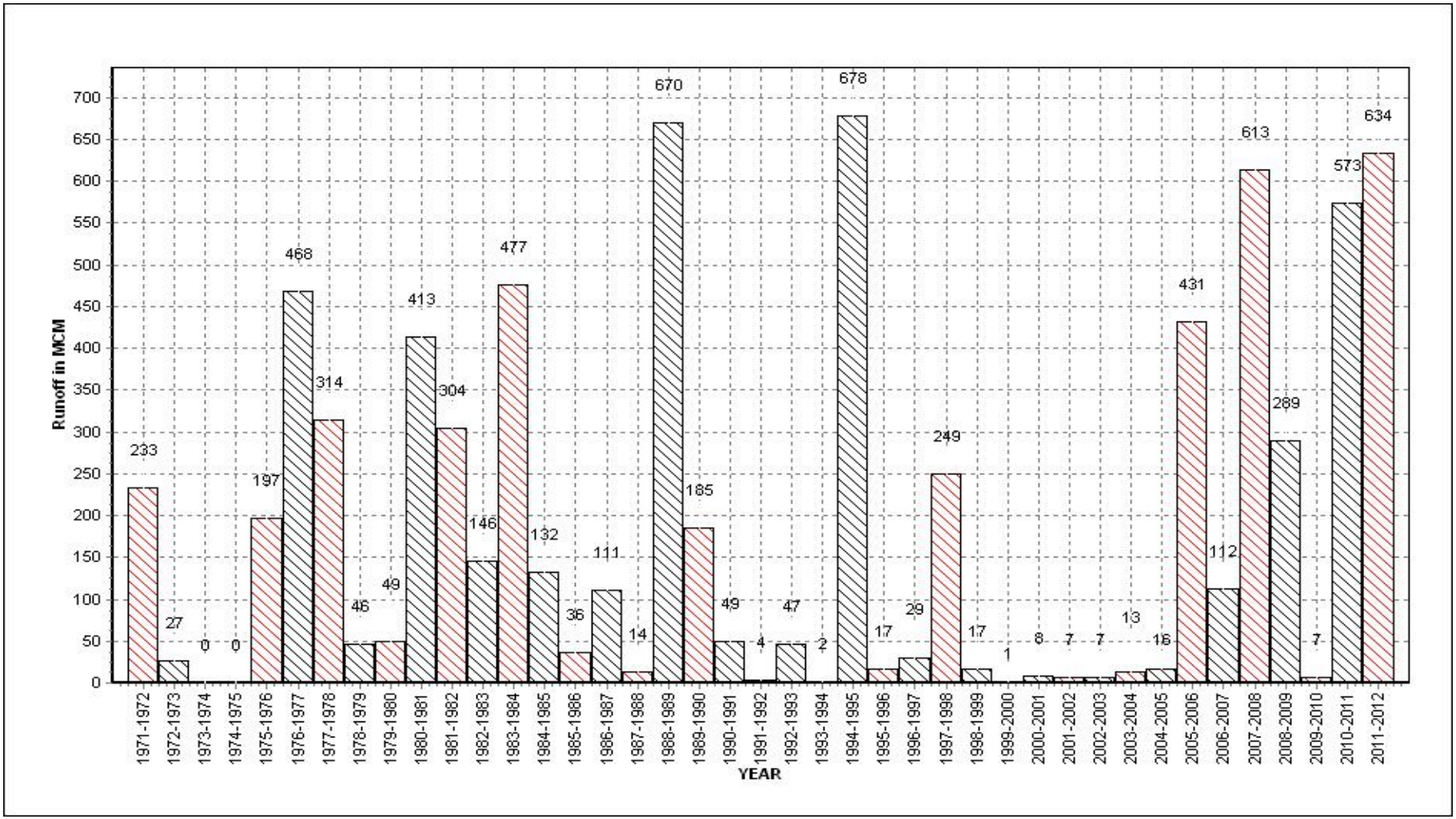
Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad



Annual Runoff Values for the period: 1971 - 2012

Station Name : Machhu at Gungan (01 02 03 001)
Local River : Machhu

Division : Mahi Division, Gandhinagar
Sub-Division : Sabarmati Sub Divn., Ahmedabad

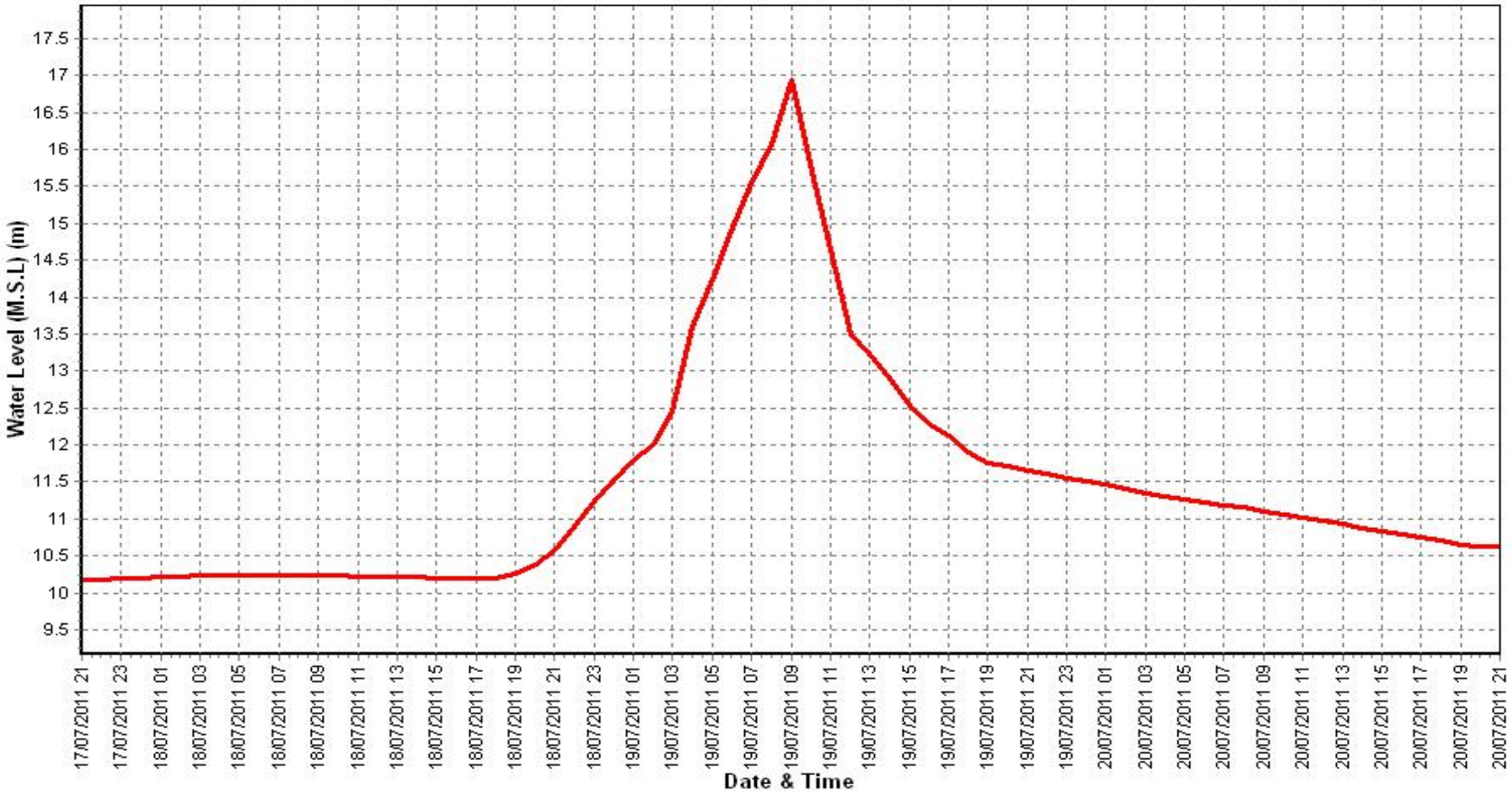


Note: Missing values have not been considered while arriving at Annual Runoff

Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Machhu at Gungan (01 02 03 001) **Division : Mahi Division, Gandhinagar**

Local River : Machhu **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

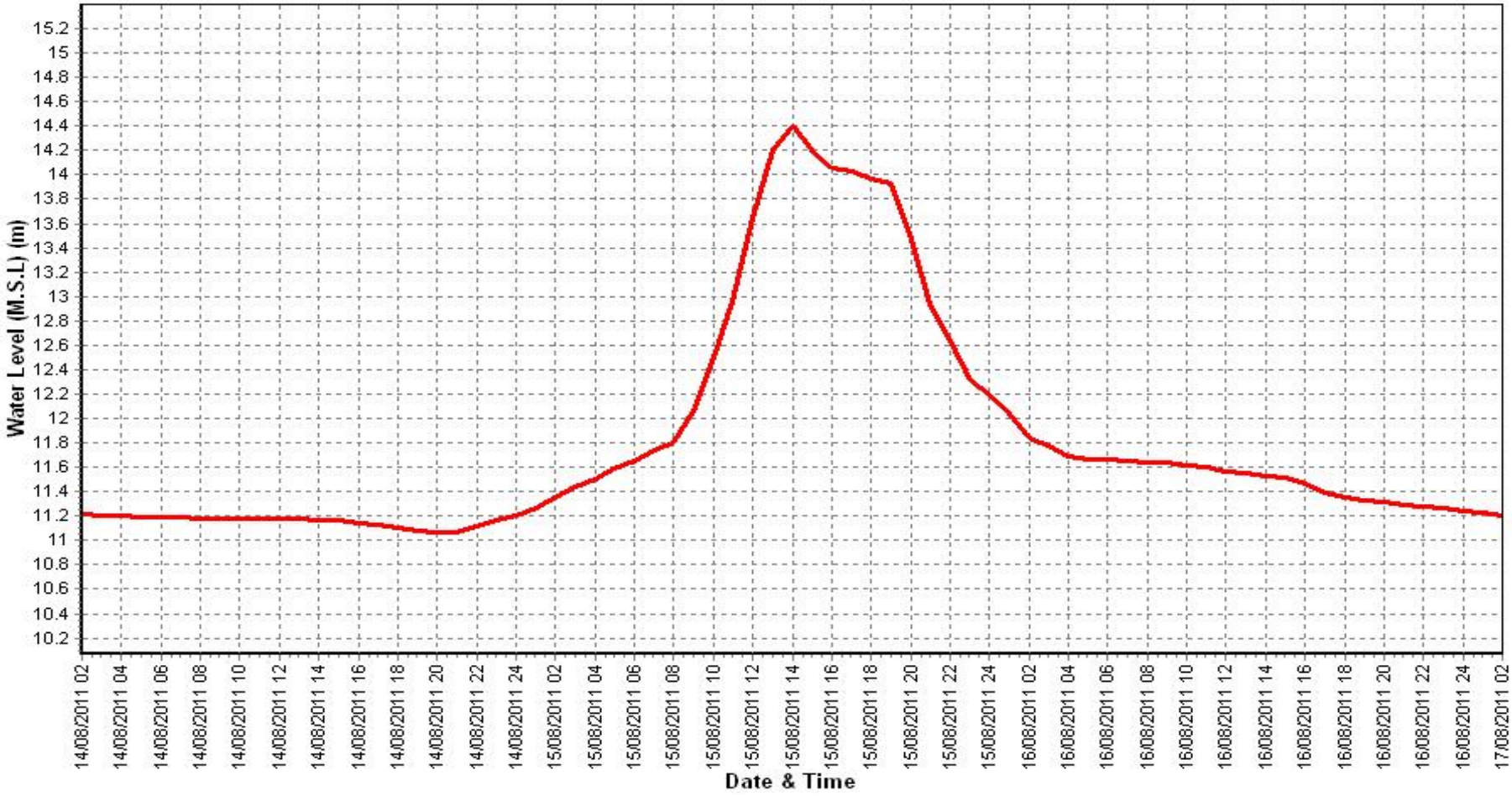


Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Machhu at Gungan (01 02 03 001) **Division : Mahi Division, Gandhinagar**

Local River : Machhu **Sub-Division : Sabarmati Sub Divn., Ahmedabad**



Time Span: 72 Hrs

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Machhu at Gungan (01 02 03 001) **Division : Mahi Division, Gandhinagar**

Local River : Machhu **Sub-Division : Sabarmati Sub Divn., Ahmedabad**



Time Span: 72 Hrs

HISTORY SHEET

Water Year : 2010-2011

Site : Rupen at Sapawada **Code : 01 02 04 001**

State : Gujarat
District : Mahesana
Basin : WFR of Kach.-Saur. & Luni
Independent River : Rupen
Tributary : -
Sub Tributary :
Sub-Sub Tributary :
Local River : Rupen
Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur
Drainage Area : 2125 Sq. Km.
Bank : Right
Latitude : 23°32'54"
Longitude : 72°00'52"

Zero of Gauge (m) : 36.65 (m.s.l) 01/08/1989 - 04/04/1997
36 (m.s.l) 05/04/1997

	Opening Date	Closing Date
Gauge	20/08/1989	
Discharge	31/08/1989	
Sediment		
Water Quality		

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1990-1991	490.6	0.000	25/08/1990	0.000	0.000	25/01/1991
1991-1992	46.45	37.650	01/08/1991	0.000	0.000	26/01/1992
1992-1993	221.2	38.315	09/09/1992	0.000	0.000	25/01/1993
1993-1994	753.1	40.715	10/07/1993	0.000	0.000	25/01/1994
1994-1995	964.3	40.900	03/08/1994	0.000	0.000	25/01/1995
1995-1996	66.52	38.100	22/07/1995	0.000	0.000	26/01/1996
1996-1997	0.000	0.000	04/10/1996	0.000	0.000	25/01/1997
1997-1998	325.0	43.000	27/06/1997	0.000	0.000	25/01/1998
1998-1999	66.50	38.700	19/09/1998	0.000	0.000	25/01/1999
1999-2000	7.725	37.600	23/06/1999	0.000	0.000	26/01/2000
2000-2001	14.17	37.700	16/07/2000	0.000	0.000	25/01/2001
2001-2002	19.58	37.800	17/06/2001	0.000	36.000	25/01/2002
2002-2003	0.000	36.000	04/10/2002	0.000	36.000	25/01/2003
2003-2004	178.0	40.050	29/07/2003	0.000	36.000	26/01/2004
2004-2005	129.0	39.800	09/08/2004	0.000	36.000	25/01/2005
2005-2006	444.5	41.475	03/08/2005	0.000	36.470	25/01/2006
2006-2007	474.0	40.250	16/08/2006	0.000	36.500	02/01/2007
2007-2008	595.1	40.750	09/08/2007	0.000	36.300	26/01/2008
2008-2009	418.2	40.000	13/08/2008	0.000	36.080	25/01/2009
2009-2010	5.436	37.000	19/03/2010	0.000	36.060	01/06/2009
2010-2011	494.2	40.000	04/08/2010	0.000	0.000	01/06/2010
2011-2012	58.8	37.760	14/09/2011	0.000	River Dry	23/06/2011

Stage-Discharge Data for the period 2011 - 2012

Station Name : Rupen at Sapawada (01 02 04 001) **Division : Mahi Division, Gandhinagar**

Local River : Rupen **Sub-Division : B.L.Sub Divn, Palanpur**

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	R Dry	0.000	R Dry	0.000	R Dry	0.000	36.600	1.170 *	36.300	0.000 *	36.200	0.000 *
2	R Dry	0.000	R Dry	0.000	R Dry	0.000	36.600	1.170 *	36.300	0.000 *	36.200	0.000 *
3	R Dry	0.000	R Dry	0.000	R Dry	0.000	36.600	1.170 *	36.300	0.000 *	36.200	0.000 *
4	R Dry	0.000	R Dry	0.000	R Dry	0.000	36.600	1.170 *	36.300	0.000 *	36.200	0.000 *
5	R Dry	0.000	R Dry	0.000	R Dry	0.000	36.750	3.261	36.300	0.000 *	36.200	0.000 *
6	R Dry	0.000	R Dry	0.000	R Dry	0.000	36.740	3.179	36.300	0.000 *	36.200	0.000 *
7	R Dry	0.000	R Dry	0.000	R Dry	0.000	36.750	3.057	36.300	0.000 *	36.200	0.000 *
8	R Dry	0.000	R Dry	0.000	R Dry	0.000	36.750	3.118	36.300	0.000 *	36.200	0.000 *
9	R Dry	0.000	R Dry	0.000	R Dry	0.000	36.750	3.168	36.300	0.000 *	36.200	0.000 *
10	R Dry	0.000	R Dry	0.000	R Dry	0.000	37.450	36.25	36.300	0.000 *	36.200	0.000 *
11	R Dry	0.000	R Dry	0.000	R Dry	0.000	37.450	32.02 #	36.300	0.000 *	36.200	0.000 *
12	R Dry	0.000	R Dry	0.000	36.100	0.000 *	37.500	38.38	36.300	0.000 *	36.200	0.000 *
13	R Dry	0.000	R Dry	0.000	36.100	0.000 *	37.450	35.79	36.300	0.000 *	36.200	0.000 *
14	R Dry	0.000	R Dry	0.000	36.200	0.000 *	37.760	58.83	36.300	0.000 *	36.200	0.000 *
15	R Dry	0.000	R Dry	0.000	36.400	0.150 *	37.400	28.46 #	36.200	0.000 *	36.200	0.000 *
16	R Dry	0.000	R Dry	0.000	37.500	35.86 #	36.400	0.150	36.200	0.000 *	36.200	0.000 *
17	R Dry	0.000	R Dry	0.000	36.700	3.551	36.400	0.150	36.200	0.000 *	36.200	0.000 *
18	R Dry	0.000	R Dry	0.000	36.500	0.500 *	36.400	0.150	36.200	0.000 *	36.200	0.000 *
19	R Dry	0.000	R Dry	0.000	36.500	0.500 *	36.300	0.000	36.200	0.000 *	36.200	0.000 *
20	R Dry	0.000	R Dry	0.000	36.400	0.150 *	36.300	0.000	36.200	0.000 *	36.200	0.000 *
21	R Dry	0.000	R Dry	0.000	36.400	0.150 *	36.300	0.000	36.200	0.000 *	36.200	0.000 *
22	R Dry	0.000	R Dry	0.000	36.750	3.353	36.300	0.000	36.200	0.000 *	36.200	0.000 *
23	R Dry	0.000	R Dry	0.000	37.100	4.653	36.900	5.132	36.200	0.000 *	36.200	0.000 *
24	R Dry	0.000	R Dry	0.000 *	36.600	1.170 *	36.900	4.968	36.200	0.000 *	36.200	0.000 *
25	R Dry	0.000	36.100	0.000 *	36.600	1.170 *	36.900	4.994	36.200	0.000 *	36.200	0.000 *
26	R Dry	0.000	36.100	0.000 *	36.600	1.170 *	37.020	7.792	36.200	0.000 *	36.200	0.000 *
27	R Dry	0.000	36.100	0.000 *	36.600	1.170 *	37.020	7.976	36.200	0.000 *	36.200	0.000 *
28	R Dry	0.000	36.100	0.000 *	36.600	1.170 *	36.620	1.126	36.200	0.000 *	36.200	0.000 *
29	R Dry	0.000	36.100	0.000 *	36.600	1.170 *	36.620	1.126	36.200	0.000 *	36.200	0.000 *
30	R Dry	0.000	36.100	0.000 *	36.500	0.500 *	36.300	0.000	36.200	0.000 *	36.200	0.000 *
31			36.100	0.000 *	36.500	0.500 *			36.200	0.000 *		
Ten-Daily Mean												
I Ten-Daily		0.000		0.000		0.000	36.759	5.671	36.300	0.000	36.200	0.000
II Ten-Daily		0.000		0.000	36.489	4.071	36.936	19.39	36.240	0.000	36.200	0.000
III Ten-Daily		0.000	36.100	0.000	36.623	1.471	36.688	3.679	36.200	0.000	36.200	0.000
Monthly												
Min.		0.000	36.100	0.000	36.100	0.000	36.300	0.000	36.200	0.000	36.200	0.000
Max.		0.000	36.100	0.000	37.500	35.86	37.760	58.83	36.300	0.000	36.200	0.000
Mean		0	36.100	0	36.563	1.835	36.794	9.785	36.245	0	36.200	0

Annual Runoff in MCM = 29 Annual Runoff in mm = 14

Peak Observed Discharge = 58.83 cumecs on 14/09/2011 Corres. Water Level :37.76 m

Lowest Observed Discharge = 0.000 cumecs on 01/06/2011

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff

Stage-Discharge Data for the period 2011 - 2012

Station Name : Rupen at Sapawada (01 02 04 001) **Division : Mahi Division, Gandhinagar**

Local River : Rupen **Sub-Division : B.L.Sub Divn, Palanpur**

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	36.200	0.000 *	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *
2	36.200	0.000 *	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *
3	36.200	0.000 *	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *
4	36.200	0.000 *	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *
5	36.200	0.000 *	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *
6	36.200	0.000 *	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *
7	36.200	0.000 *	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *
8	36.200	0.000 *	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *
9	36.200	0.000 *	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *
10	36.200	0.000 *	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *
11	36.200	0.000 *	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *
12	36.200	0.000 *	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *
13	36.200	0.000 *	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *
14	36.200	0.000 *	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *
15	36.200	0.000 *	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *
16	36.200	0.000 *	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.160	0.000 *	36.160	0.000 *
17	36.200	0.000 *	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.160	0.000 *	36.160	0.000 *
18	36.200	0.000 *	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.160	0.000 *	36.160	0.000 *
19	36.200	0.000 *	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.160	0.000 *	36.160	0.000 *
20	36.200	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *	36.160	0.000 *
21	36.200	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *	36.160	0.000 *
22	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *	36.160	0.000 *
23	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *	36.160	0.000 *
24	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *	36.100	0.000 *
25	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *	36.100	0.000 *
26	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *	R Dry	0.000
27	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *	R Dry	0.000
28	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *	R Dry	0.000
29	36.180	0.000 *	36.180	0.000 *	36.170	0.000 *	36.170	0.000 *	36.160	0.000 *	R Dry	0.000
30	36.180	0.000 *	36.180	0.000 *			36.170	0.000 *	36.160	0.000 *	R Dry	0.000
31	36.180	0.000 *	36.180	0.000 *			36.170	0.000 *			R Dry	0.000
Ten-Daily Mean												
I Ten-Daily	36.200	0.000	36.180	0.000	36.180	0.000	36.170	0.000	36.170	0.000	36.160	0.000
II Ten-Daily	36.200	0.000	36.180	0.000	36.179	0.000	36.170	0.000	36.165	0.000	36.160	0.000
III Ten-Daily	36.182	0.000	36.180	0.000	36.170	0.000	36.170	0.000	36.160	0.000	36.136	0.000
Monthly												
Min.	36.180	0.000	36.180	0.000	36.170	0.000	36.170	0.000	36.160	0.000	36.100	0.000
Max.	36.200	0.000	36.180	0.000	36.180	0.000	36.170	0.000	36.170	0.000	36.160	0.000
Mean	36.194	0	36.180	0	36.177	0	36.170	0	36.165	0	36.155	0

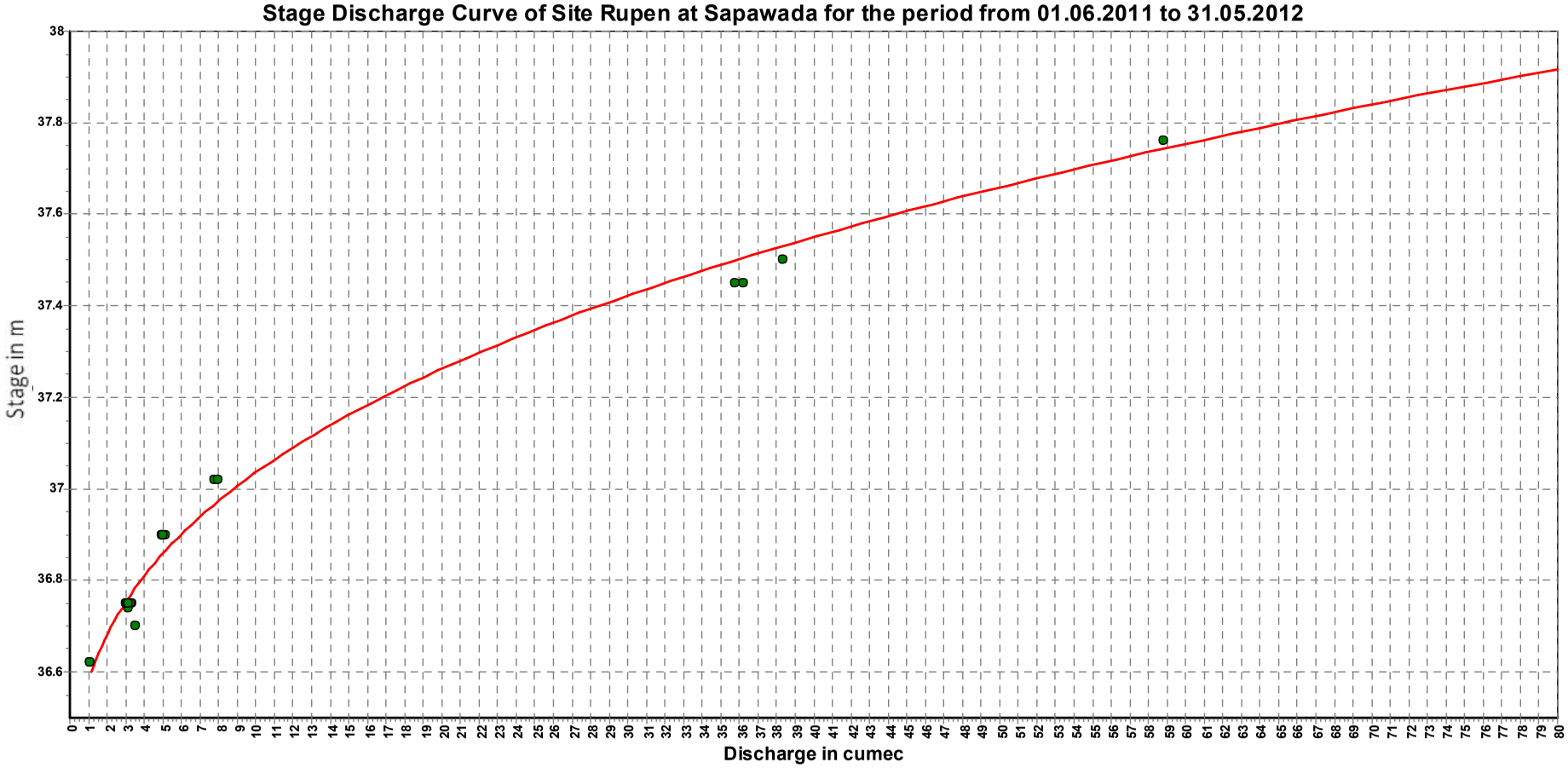
Peak Computed Discharge = 1.170 cumecs on 24/08/2011 **Corres. Water Level :36.6 m**

Lowest Computed Discharge = 0.000 cumecs on 24/07/2011

Q: Observed/Computed Discharge in cumecs WL:Corresponding Mean Water Level(m.s.l) in m *:Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note:Missing values ignored while arriving at Annual Runoff



Procedure : Standard

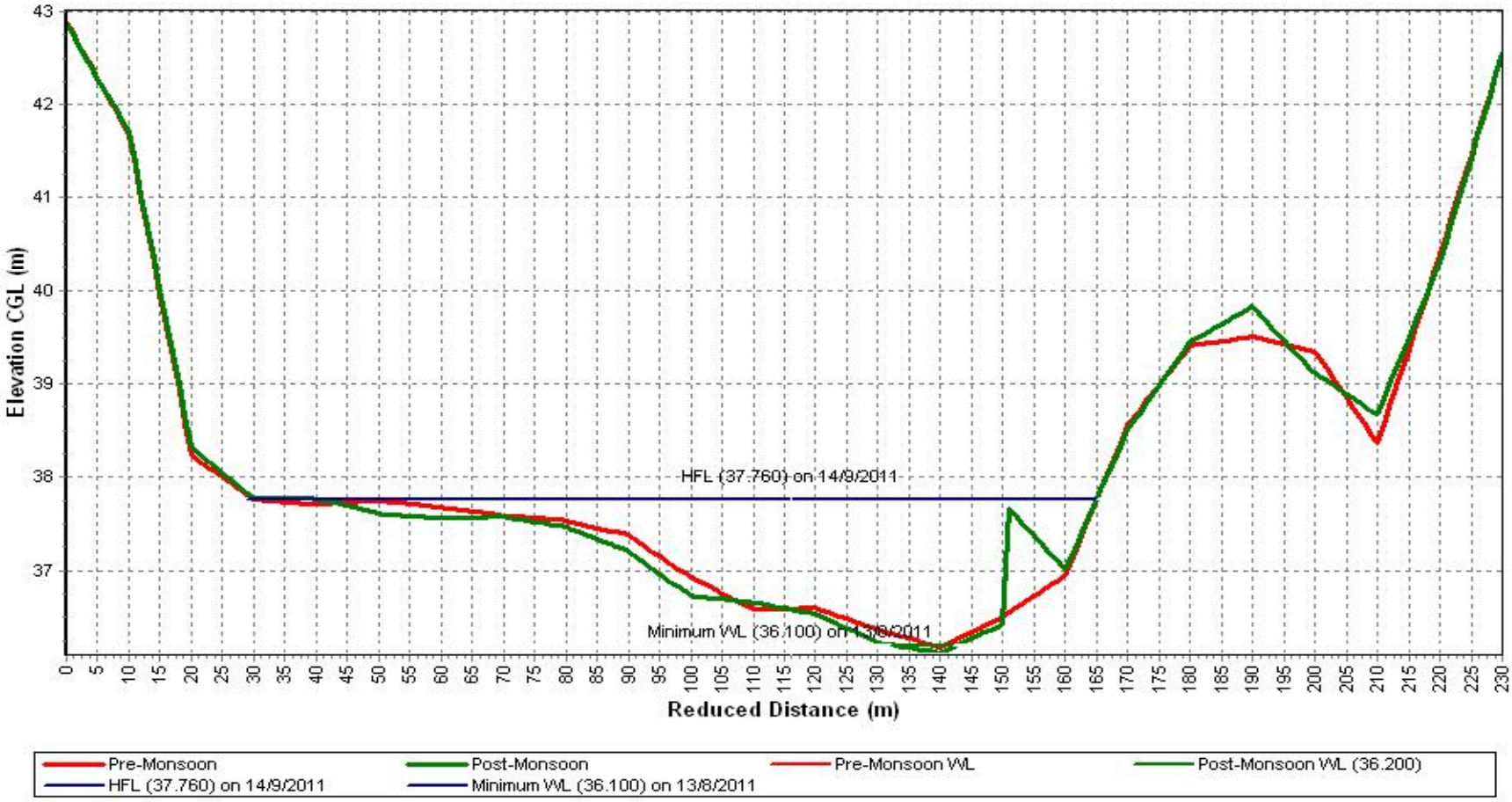
Equation type: Power

Q = c (h+a)^b, a = -36.21, b = 2.864, c = 17.294

Pre-Monsoon & Post-Monsoon X-Section for Water Year : 2011-2012

Station Name : Rupen at Sapawada (01 02 04 001)
Local River : Rupen

Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur

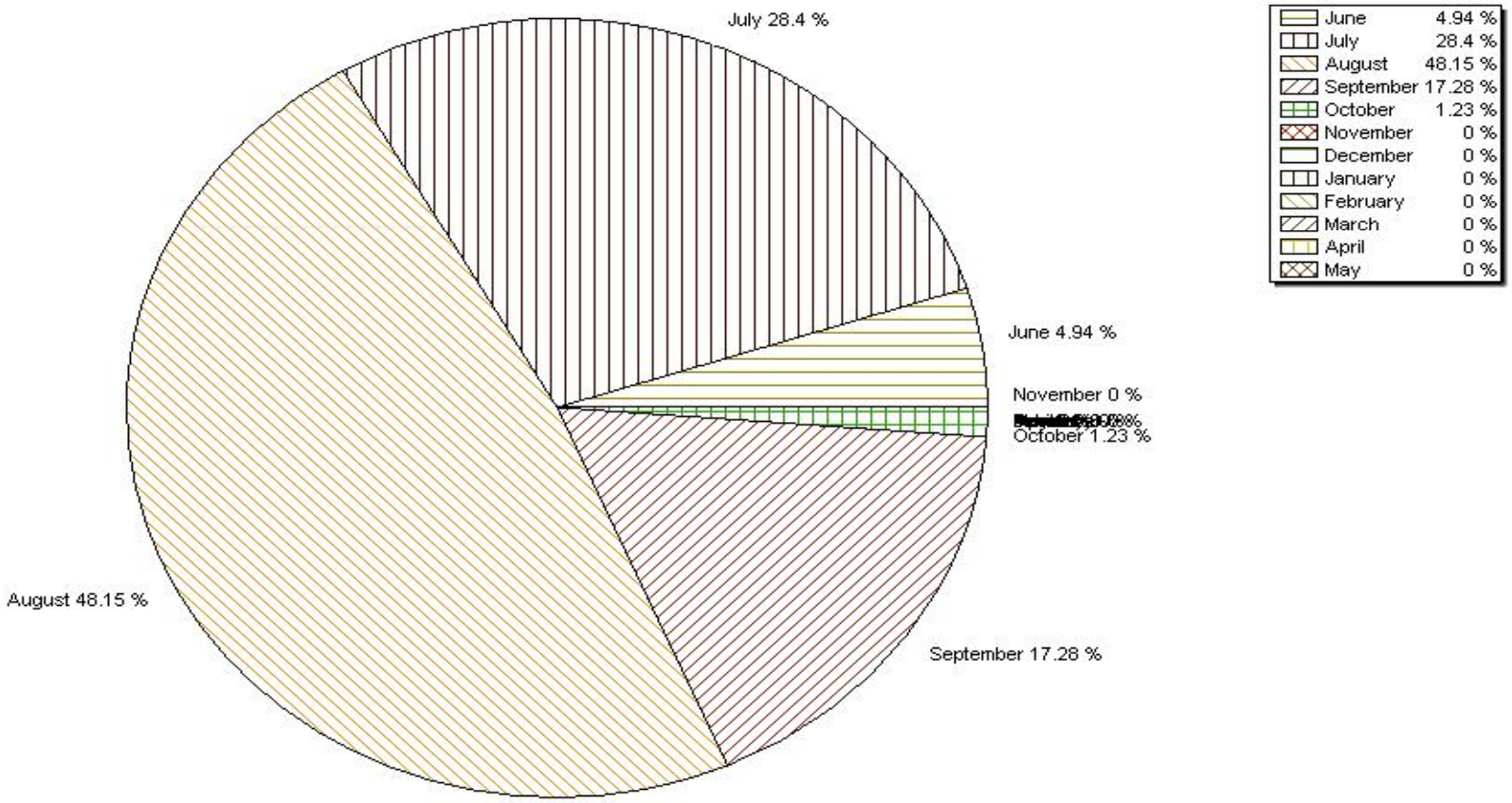


Historical Flood Level-43.0m on 27.08.1997 at 0800hrs

Monthly Average Runoff based on period : 1990-2011

Station Name : Rupen at Sapawada (01 02 04 001)
Local River : Rupen

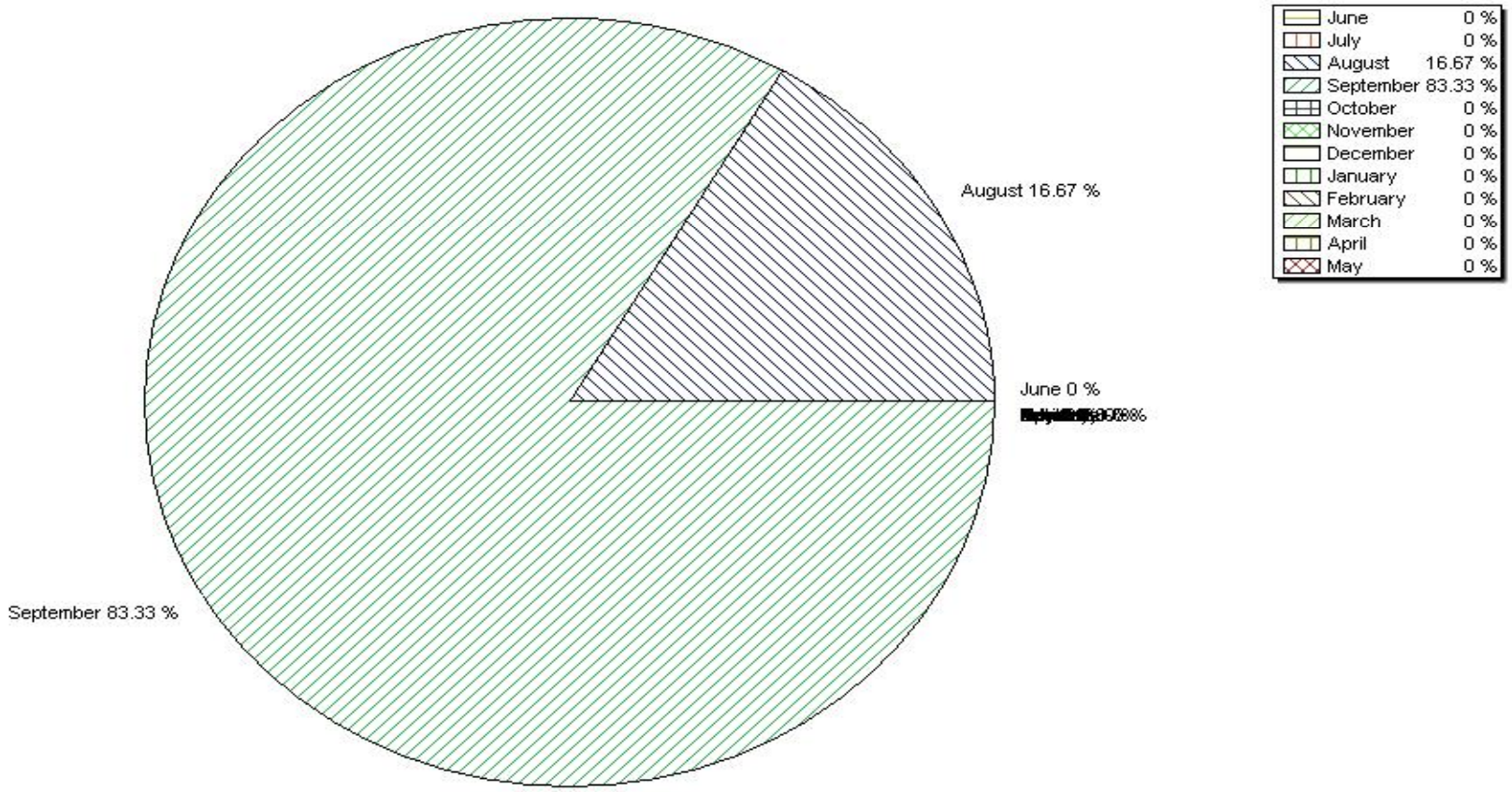
Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur



Monthly Runoff for the Year : 2011-2012

Station Name : Rupen at Sapawada (01 02 04 001)
Local River : Rupen

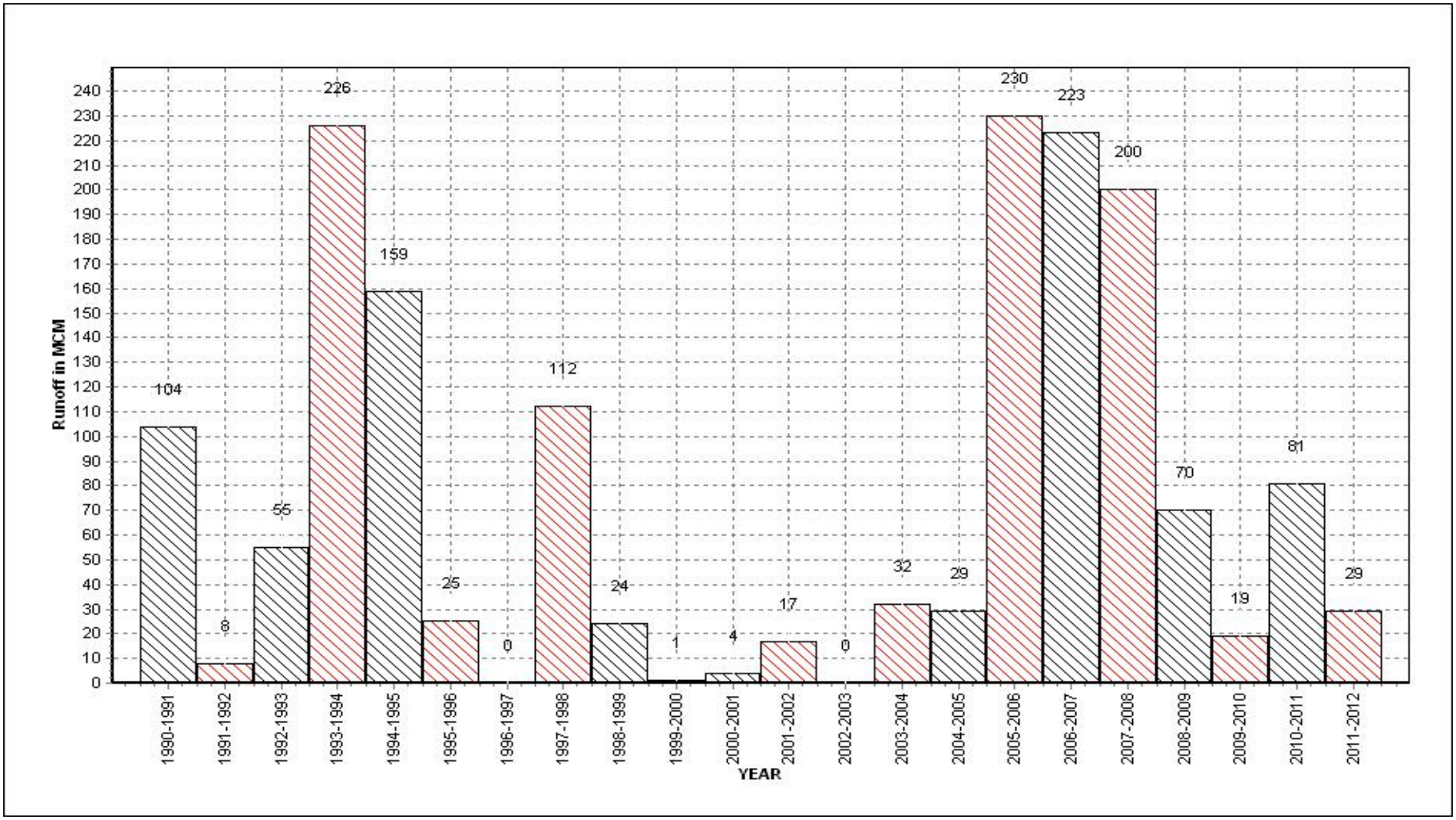
Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur



Annual Runoff Values for the period: 1990 - 2012

Station Name : Rupen at Sapawada (01 02 04 001)
Local River : Rupen

Division : Mahi Division, Gandhinagar
Sub-Division : B.L.Sub Divn, Palanpur



Note: Missing values have not been considered while arriving at Annual Runoff

Water Level vs. Time - Graph of Highest Flood Peak during the Year : 2011-2012

Station Name : Rupen at Sapawada (01 02 04 001) **Division : Mahi Division, Gandhinagar**

Local River : Rupen **Sub-Division : B.L.Sub Divn, Palanpur**



Time Span: 72 Hrs

Water Level vs. Time - Graph of 2nd Highest Flood Peak during the Year : 2011-2012

Station Name : Rupen at Sapawada (01 02 04 001) **Division : Mahi Division, Gandhinagar**

Local River : Rupen **Sub-Division : B.L.Sub Divn, Palanpur**

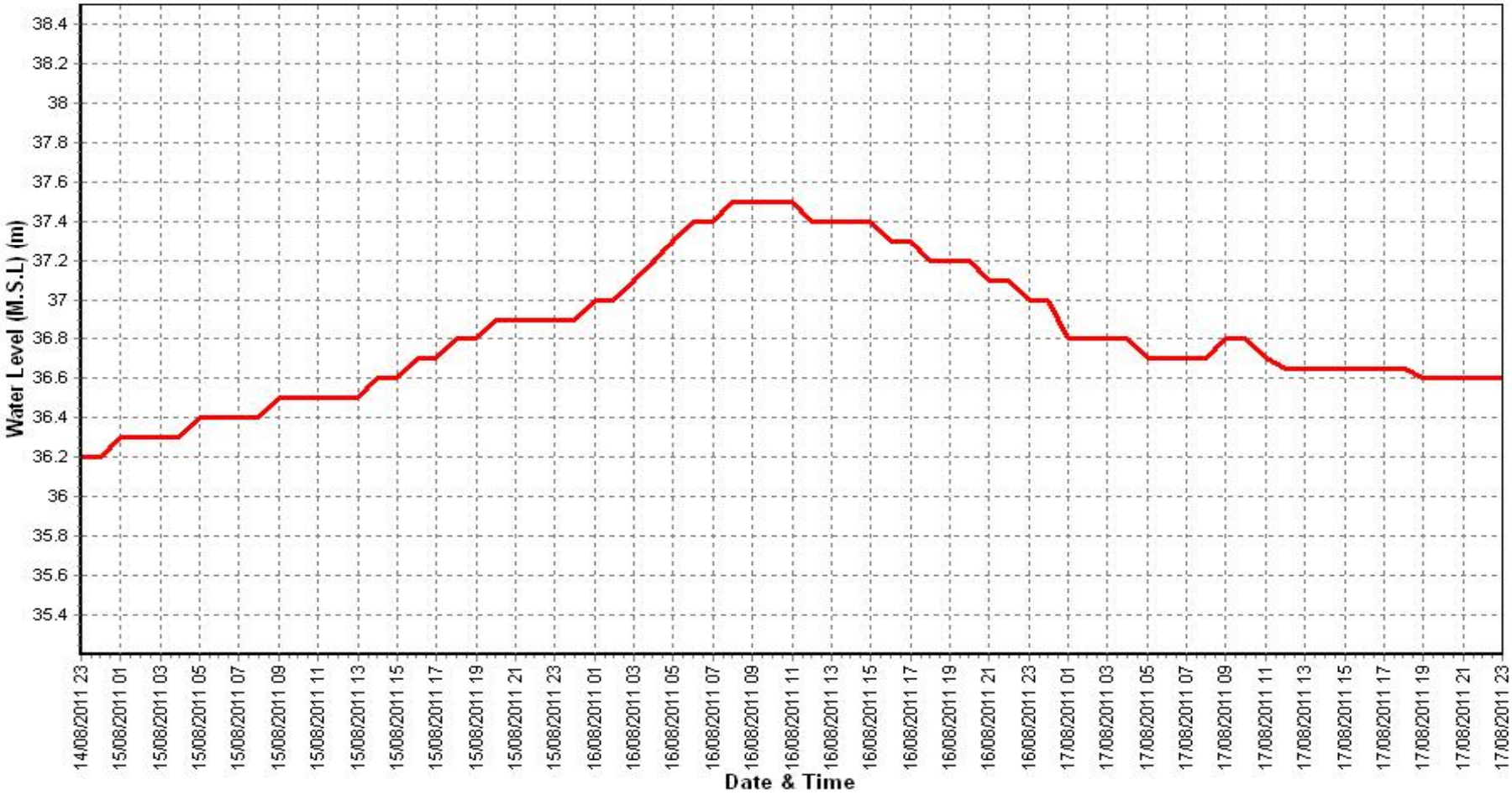


Time Span: 72 Hrs

Water Level vs. Time - Graph of 3rd Highest Flood Peak during the Year : 2011-2012

Station Name : Rupen at Sapawada (01 02 04 001) **Division : Mahi Division, Gandhinagar**

Local River : Rupen **Sub-Division : B.L.Sub Divn, Palanpur**



Time Span: 72 Hrs

5. Trend Analysis

5.1 Trend Analysis- Mahi Basin

5.1.1 Introduction

Trends are important indicators of the temporal variability of runoff as computed from observed discharge at site. By analyzing the time sequence of the runoff, we assess the magnitude and significance of the temporal variability. The present surface runoff trend study involves analysis of the temporal variability of data sets on the observed discharges in Mahi basin using available data of existing river gauging stations.

5.1.2 Methodology

In the analysis of the trends of runoff on Mahi River and its major tributary Jakham, Som and Anas, annual runoff is computed and analyzed. The analysis is carried out for six (6) river gauging stations with sufficiently long and continuous data sets that are fairly representatively distributed across Mahi river Basin.

Overall six stations have been considered in this study. The length of the data sets of river gauging station varies from 21 to 34 years. Subsequently, time series are analysed on various statistical parameters, fitting of mathematical equations, observing moving means for various period so as to find out if there are any trends in the annual runoff data.

5.1.3 Time series analysis

Time series is defined as a sequence of values arrayed in order of their occurrence which can be characterized by statistical properties. Time series analysis may be used to test the variability, homogeneity and trend of a stream flow series or simply to give an upright list the characteristics of the series as graphically displayed. Significant movements of time series are the secular, periodic, cyclic and irregular trends. A time series may display a tendency to increase or decrease, over a specified period. Such a series provides an interesting illustration because if the trend is usually predominant, virtually no other movements are discernible.

Various methods exist for analysis of time series such as moving averages, residual series, residual mass curves and balance. Trends may also be revealed by determining if observed stream flow follows some mathematical equation as a function of time.

In this chapter, first statistical parameters have been computed for time series data of annual runoff at different sites in Mahi basin. It is also ascertained if any mathematical equation can be fitted to the time series to assess predictability. Finally, the data is analysed by the method of moving means for various periods.

5.1.4 Availability of Annual runoff data

There are 6 G&D sites in Mahi Basin. Availability of annual runoff data for these sites is summarized in **Table -1** and superimposed plot of annual runoff data of all sites in Mahi basin is given under **Fig. 5.1.1.**

Table-1: Availability of Annual runoff data

Sl.No.	Site name	River/Tribu.	Data availability	Tot. years
1	Chakaliya	Anas	1991-92 to 2011-12	21
2	Dhariawad	Jakham	1988-89 to 2011-12	23
3	Khanpur	Mahi	1979-80 to 2011-12	33
4	Mataji	Mahi	1982-83 to 2011-12	30
5	Paderdibadi	Mahi	1978-79 to 2011-12	34
6	Rangeli	Som	1979-80 to 2011-12	33

The data is placed at **Annexure-1** and shown in line diagram in **Plate – 2.1.2.**

5.1.5 Analysis

5.1.5.1 Statistical Analysis

Various statistical parameters of the time series of available data are given below in **Table-2**.

Table-2: Statistical parameters of Annual Runoff series at various sites

GD station	Data length (years)	Mean (MCM)	Median (MCM)	SD (MCM)	Coeff. Of variation
Chakaliya	21	1599	1006	1579	0.988
Dhariawad	23	226	117	298	1.319
Khanpur	33	4432	2779	5046	1.139
Mataji	30	1314	1087	998	0.759
Paderdibadi	34	2038	1338	2177	1.068
Rangeli	33	664	517	657	0.989

5.1.5.2 Fit characteristics

In order to find out if any mathematical equation represents the time series as a function of time, fitting of various types of equations viz. linear, logarithmic,

exponential and polynomial have been attempted. Results of such fits are given in the **Table- 3** and shown in **Fig 5.1.2 through 5.1.7**.

Table-3: Fit Characteristics

Sl.No.	Site	Function Type	Fitted Equation	R^2
1	Chakaliya	Linear	$y = -48.6 x + 98847$	0.036
		Logarithmic	$y = -9714 \ln(x) + 74003$	0.036
		Polynomial	$y = -7.096x^2 + 28353x – 3E+07$	0.059
		Exponential	$y = 8E+22e^{-0.02x}$	0.013
2	Dhariawad	Linear	$y = 10.75x - 21294$	0.069
		Logarithmic	$y = 21468.\ln(x) - 16296$	0.068
		Polynomial	$y = 1.846x^2 - 7373x + 7E+06$	0.146
3	Khanpur	Linear	$y = 34.89x - 65178$	0.004
		Logarithmic	$y = 69892\ln(x) - 52662$	0.004
		Polynomial	$y = -7.409x^2 + 29607x - 3E+07$	0.016
		Exponential	$y =2E+13e^{-0.01x}$	0.009
4	Mataji	Linear	$y = 16.22x - 31070$	0.02
		Logarithmic	$y = 32359 \ln(x) - 24458$	0.02
		Polynomial	$y = 0.852x^2 - 3386 x + 3E+06$	0.023
		Exponential	$y = 2.276e^{+0.003x}$	0.000
5	Paderdibadi	Linear	$y = -27.55x + 56990$	0.015
		Logarithmic	$y = -5515\ln(x) + 42109$	0.016
		Polynomial	$y = 5.227x^2 - 20880x + 2E+07$	0.059
		Exponential	$y =9E+35e^{-0.03x}$	0.131
6	Rangeli	Linear	$y = -4.366x + 9374$	0.004
		Logarithmic	$y = -8723\ln(x) + 66946$	0.004
		Polynomial	$y = 0.370x^2 - 1481x + 1E+06$	0.006
		Exponential	$y = 5E+26e^{-0.02x}$	0.082

5.1.5.3 Moving Mean Analysis

In statistics, a moving mean (average), also called rolling average, rolling mean or running average, is a type of finite impulse response filter used to analyze a set of data points by creating a series of averages of different subsets of the full data set.

The first element of the moving average is obtained by taking the average of the initial fixed subset of the number series. Then the subset is modified by "shifting forward", that is excluding the first number of the series and including the next number following the original subset in the series. This creates a new subset of numbers, which is averaged. This process is repeated over the entire data series. The

plot line connecting all the (fixed) averages is the moving average. A moving average is a set of numbers, each of which is the average of the corresponding subset of a larger set of data points.

A moving average may also use unequal weights for each data value in the subset to emphasize particular values in the subset. A moving average is commonly used with time series data to smooth out short-term fluctuations and highlight longer-term trends or cycles.

In the present analysis, moving means have been computed for 3, 5 and 7 year periods for various sites of Mahi River Basin and shown in **Fig 5.1.8 through 5.1.13**.

5.1.6 Interpretation

5.1.6.1 Fitting of various statistical/mathematical models viz linear, logarithmic, exponential and polynomial reveals that values of R^2 range from 0.036 to 0.013 for Chakaliya, from 0.068 to 0.146 for Dhairawadi, from 0.004 to 0.016 for Khanpur, from 0.02 to 0.023 for Mataji, 0.015 to 0.131 for Paderdibadi and from 0.004 to 0.082 for Rangeli. The values of R^2 are quite close to 0 indicating absence of any significant trend.

5.6.1.2 Moving average analysis done for all the 6 sites under Mahi basin reveal elements of periodicities present in the data. This feature is observed in plots of all 3, 5 and 7 year moving averages. However, in view of the limited length of data series, it may be premature to conclude that there exists a definite cyclic trend in the average annual runoff.

5.1.7 Conclusion

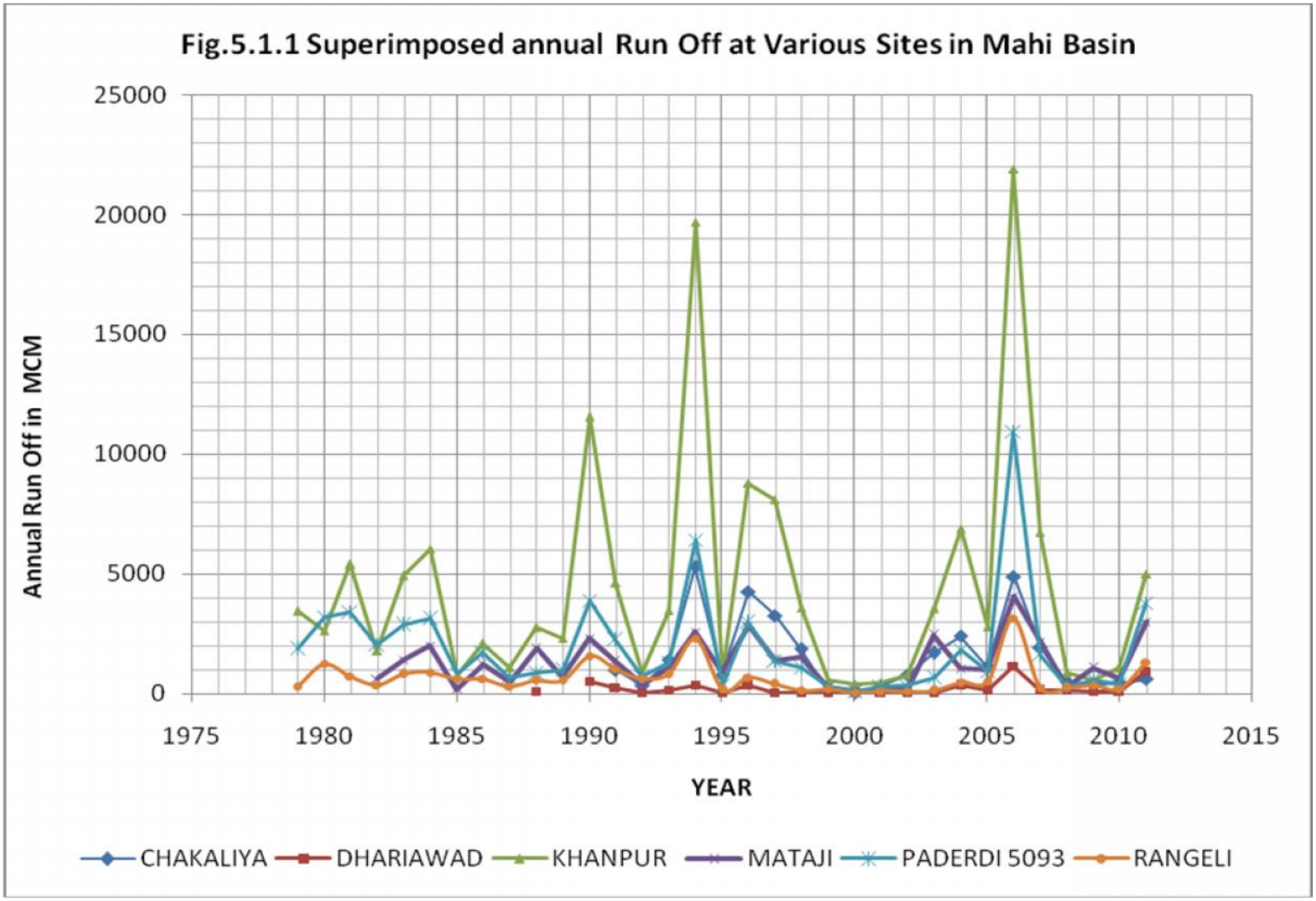
Statistically speaking, the annual runoff of river Mahi and its tributary Anas, Som and Jakham, in general, appears to be a random variable; however elements of cyclicalness cannot be ruled out on the strength of moving mean analysis. A longer set of time series data may help identify trends in annual runoff, if any.

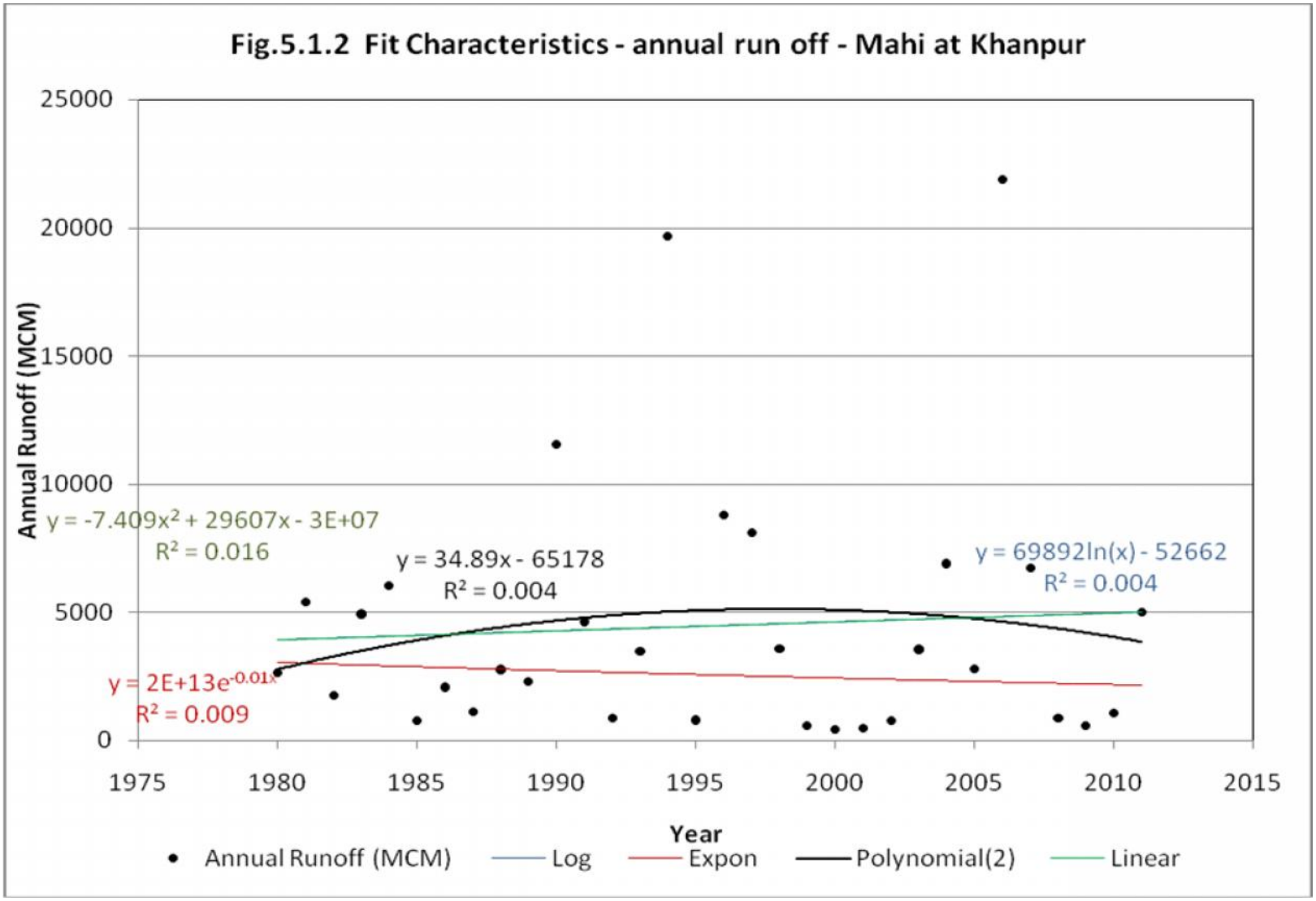
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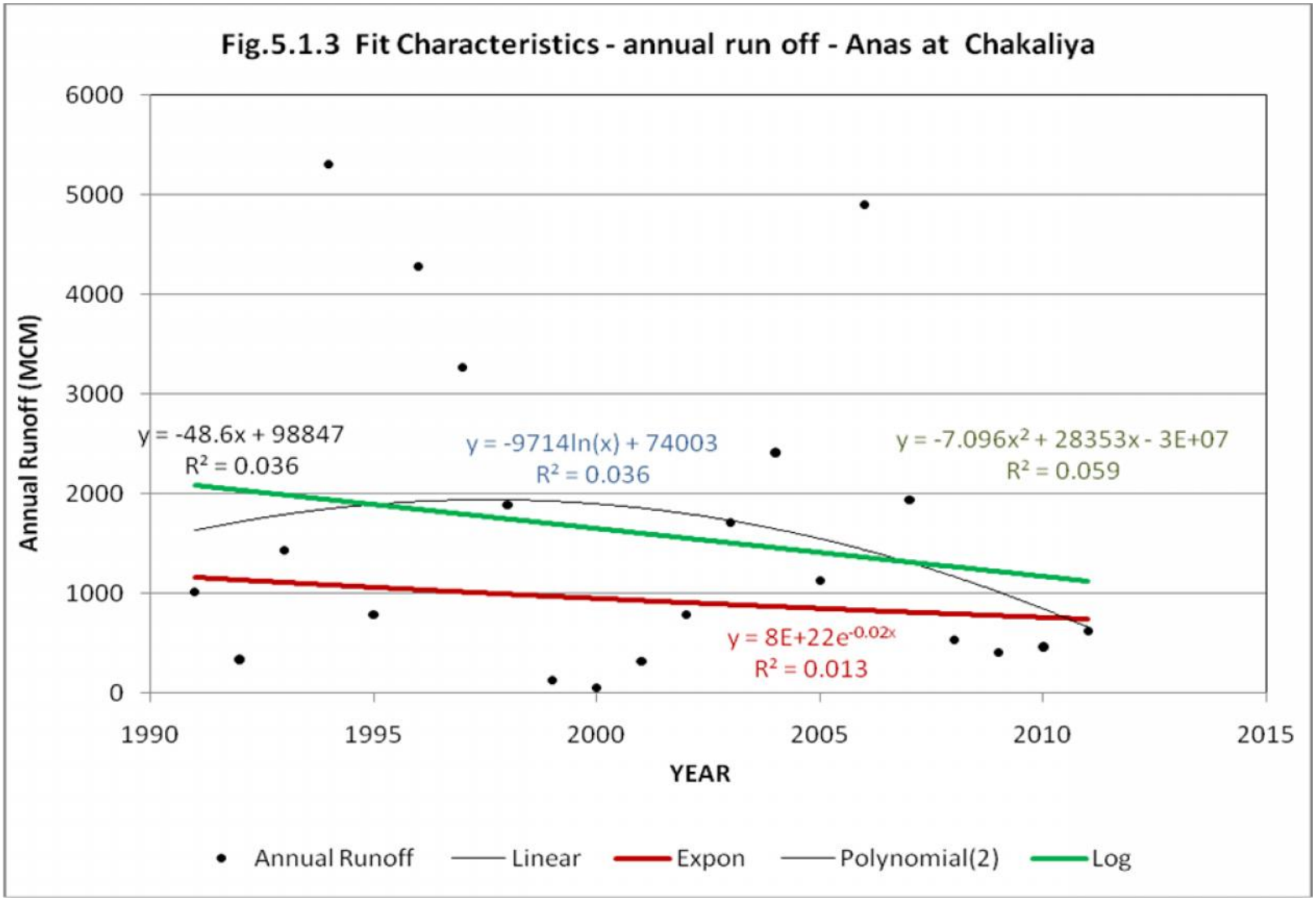
Annexure - 1

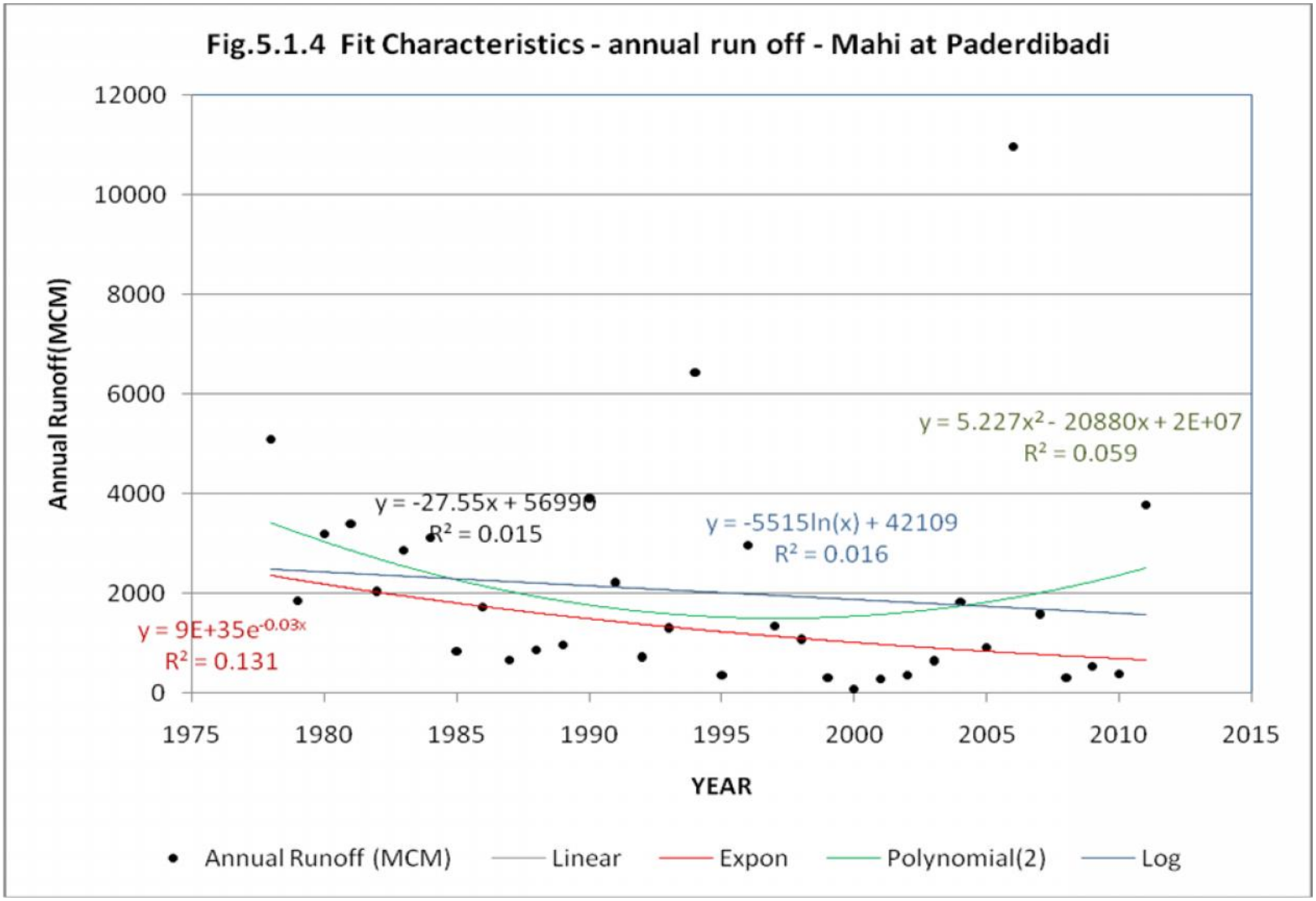
ANNUAL RUNOFF OF MAHI BASIN

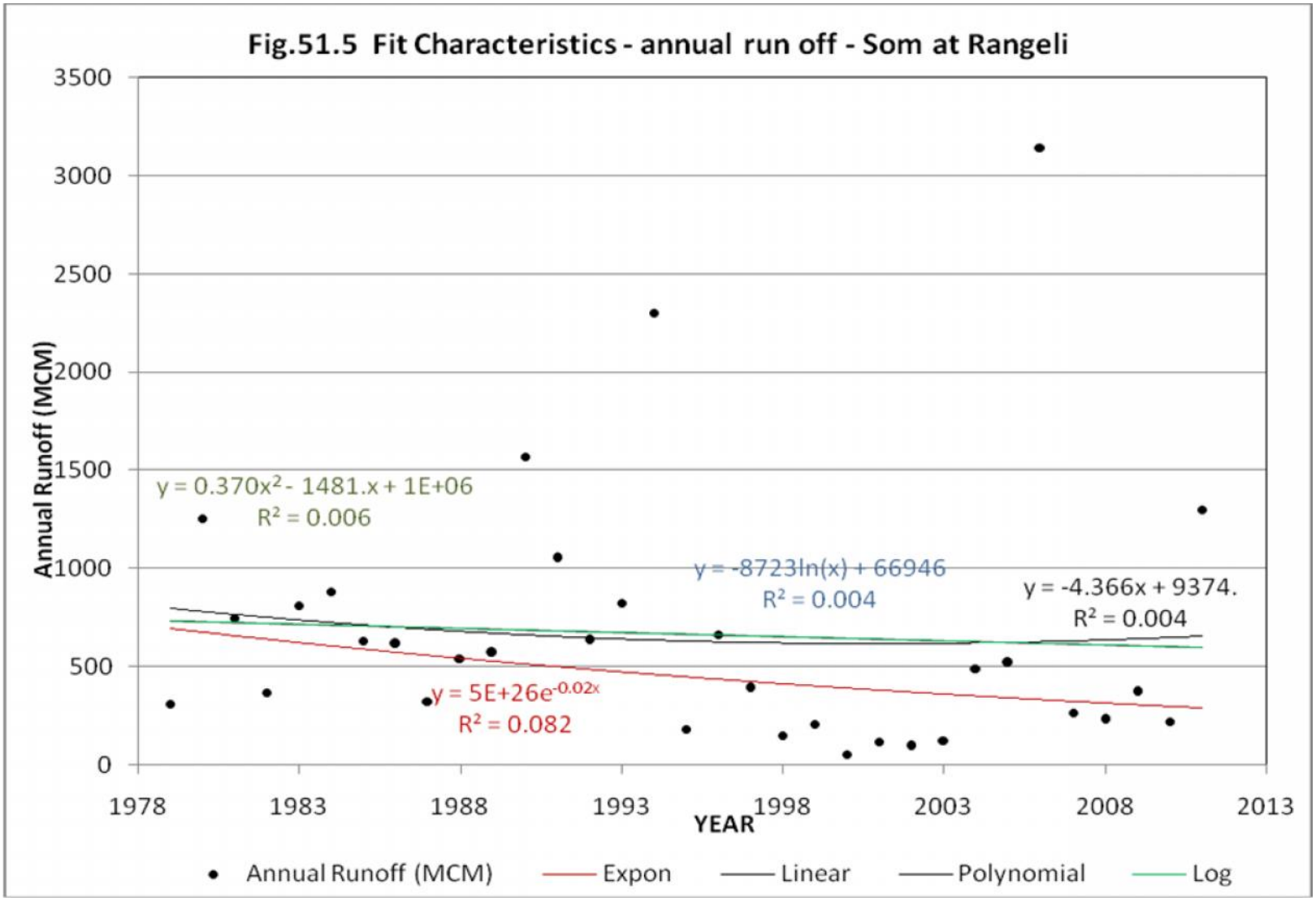
YEAR	CHAKALIYA	DHARIAWAD	KHANPUR	MATAJI	PADERDI	RANGELI
1978-79					5093	
1979			3449		1868	310
1980			2622		3205	1256
1981			5394		3408	744
1982			1769	625	2051	365
1983			4921	1426	2863	809
1984			6034	1996	3123	881
1985			755	171	848	633
1986			2068	1234	1743	614
1987			1109	489	685	320
1988		**81**	2760	1924	885	542
1989			2300	707	972	569
1990		511	11550	2319	3909	1570
1991	1006	259	4631	1340	2229	1051
1992	331	35	869	388	742	633
1993	1425	148	3470	1107	1321	822
1994	5295	353	19684	2573	6428	2302
1995	778	27	791	891	368	178
1996	4274	340	8804	2833	2970	663
1997	3262	56	8118	1389	1355	390
1998	1881	27	3582	1548	1096	148
1999	125	45	554	258	321	207
2000	48	33	428	137	99	51
2001	313	44	479	161	304	118
2002	780	23	768	220	373	93
2003	1703	32	3553	2440	662	123
2004	2406	336	6890	1055	1837	486
2005	1125	124	2779	1019	930	517
2006	4889	1144	21880	4055	10946	3146
2007	1927	120	6737	2160	1600	264
2008	531	150	868	278	314	229
2009	401	106	553	1067	552	370
2010	458	114	1078	623	407	217
2011	616	937	5014	3001	3777	1299
MEAN	**1599**	**226**	**4432**	**1314**	**2038**	**664**
MEDIAN	**1006**	**117**	**2779**	**1087**	**1338**	**517**
STANDARD DEVAIATION	**1579**	**298**	**5046**	**998**	**2177**	**657**
CO-EFFICIENT OF VARIATION	**0.988**	**1.319**	**1.139**	**0.759**	**1.068**	**0.989**

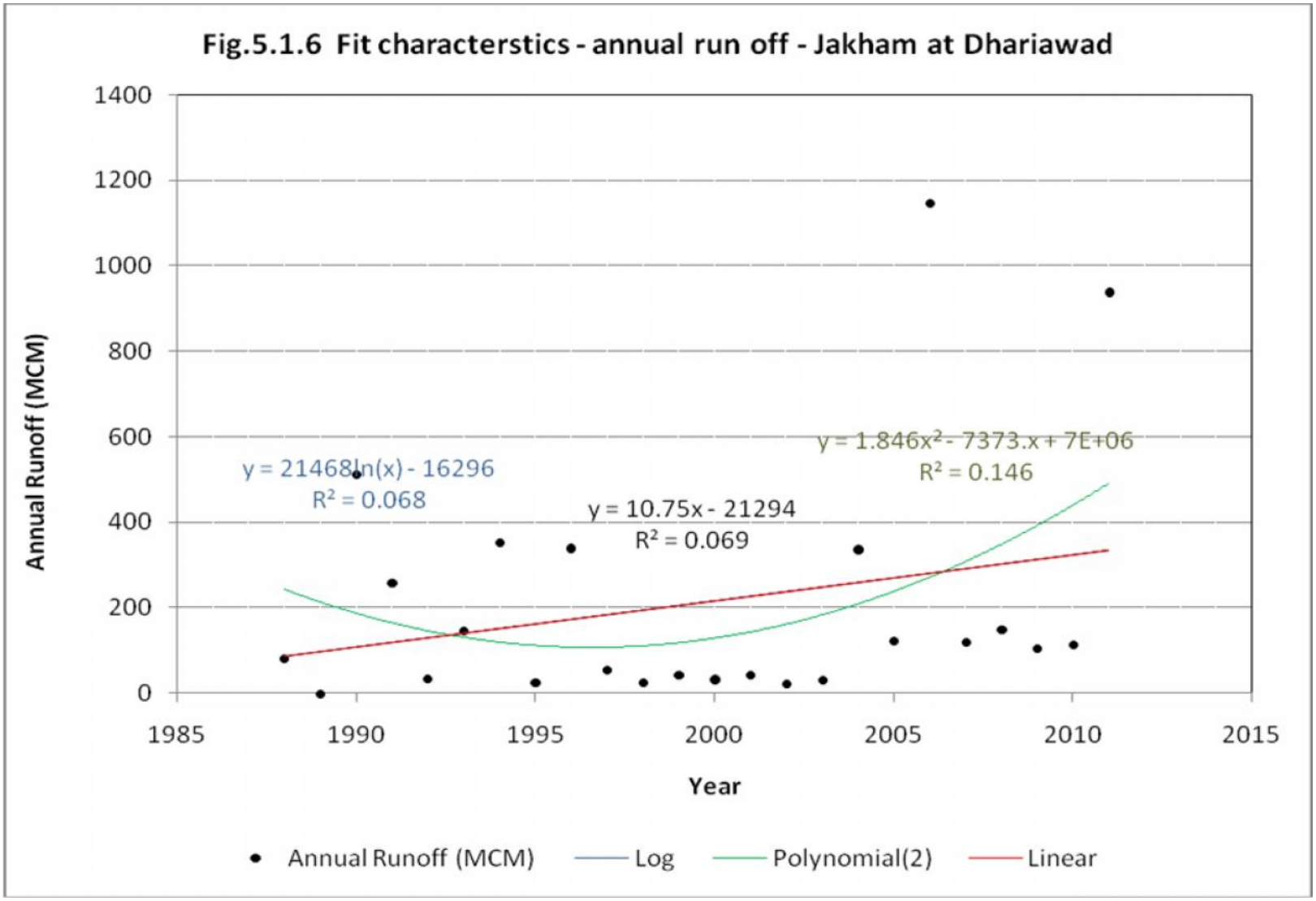

Fig.5.1.1 Superimposed annual Run Off at Various Sites in Mahi Basin
Annual Run Off in MCM
25000
20000
15000
10000
5000
0
1975
1980
1985
1990
1995
2000
2005
2010
2015
YEAR
CHAKALIYA
DHARIAWAD
KHANPUR
MATAJI
PADERDI 5093
RANGELI

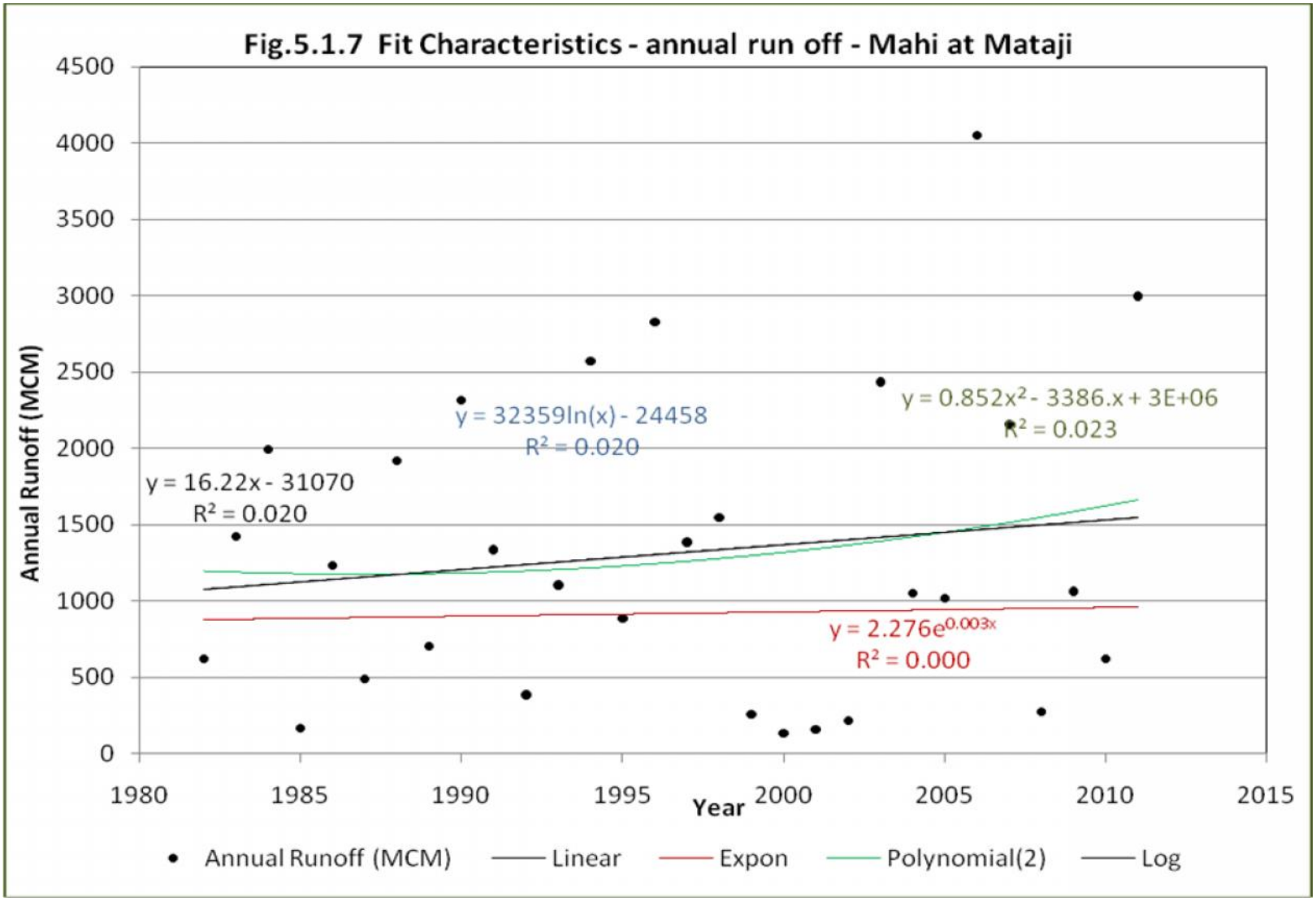

Fig.5.1.2 Fit Characteristics - annual run off - Mahi at Khanpur
Annual Runoff (MCM)
25000
20000
15000
10000
5000
0
y = -7.409x² + 29607x - 3E+07
R² = 0.016
y = 34.89x - 65178
R² = 0.004
y = 69892ln(x) - 52662
R² = 0.004
y = 2E+13e^-0.01x
R² = 0.009
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
Annual Runoff (MCM)
Log
Expon
Polynomial(2)
Linear

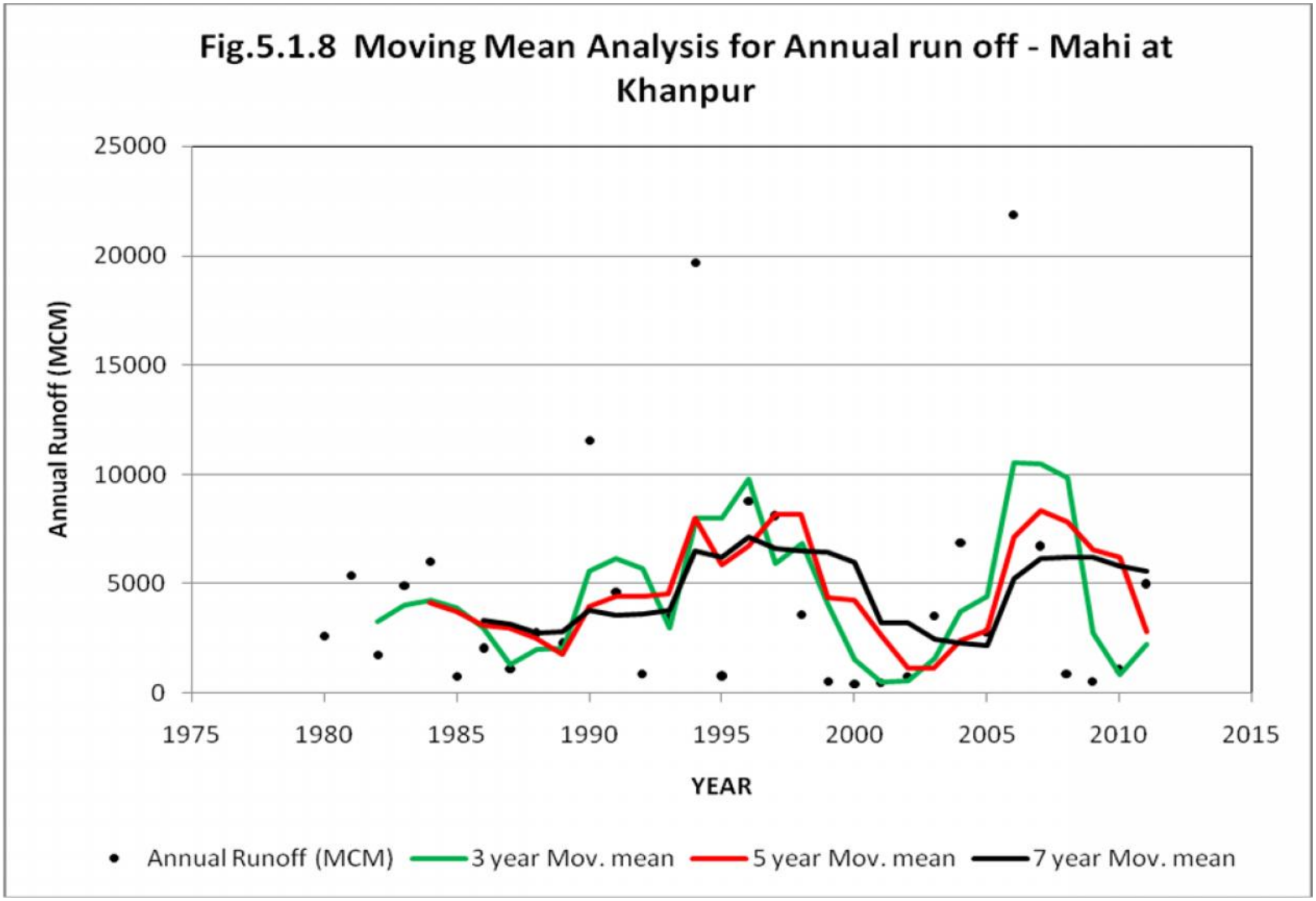

Fig.5.1.3 Fit Characteristics - annual run off - Anas at Chakaliya
Annual Runoff (MCM)
6000
5000
4000
3000
2000
1000
0
1990
1995
2000
2005
2010
2015
YEAR
y = -48.6x + 98847
R² = 0.036
y = -9714ln(x) + 74003
R² = 0.036
y = -7.096x² + 28353x - 3E+07
R² = 0.059
y = 8E+22e^-0.02x
R² = 0.013
Annual Runoff
Linear
Expon
Polynomial(2)
Log

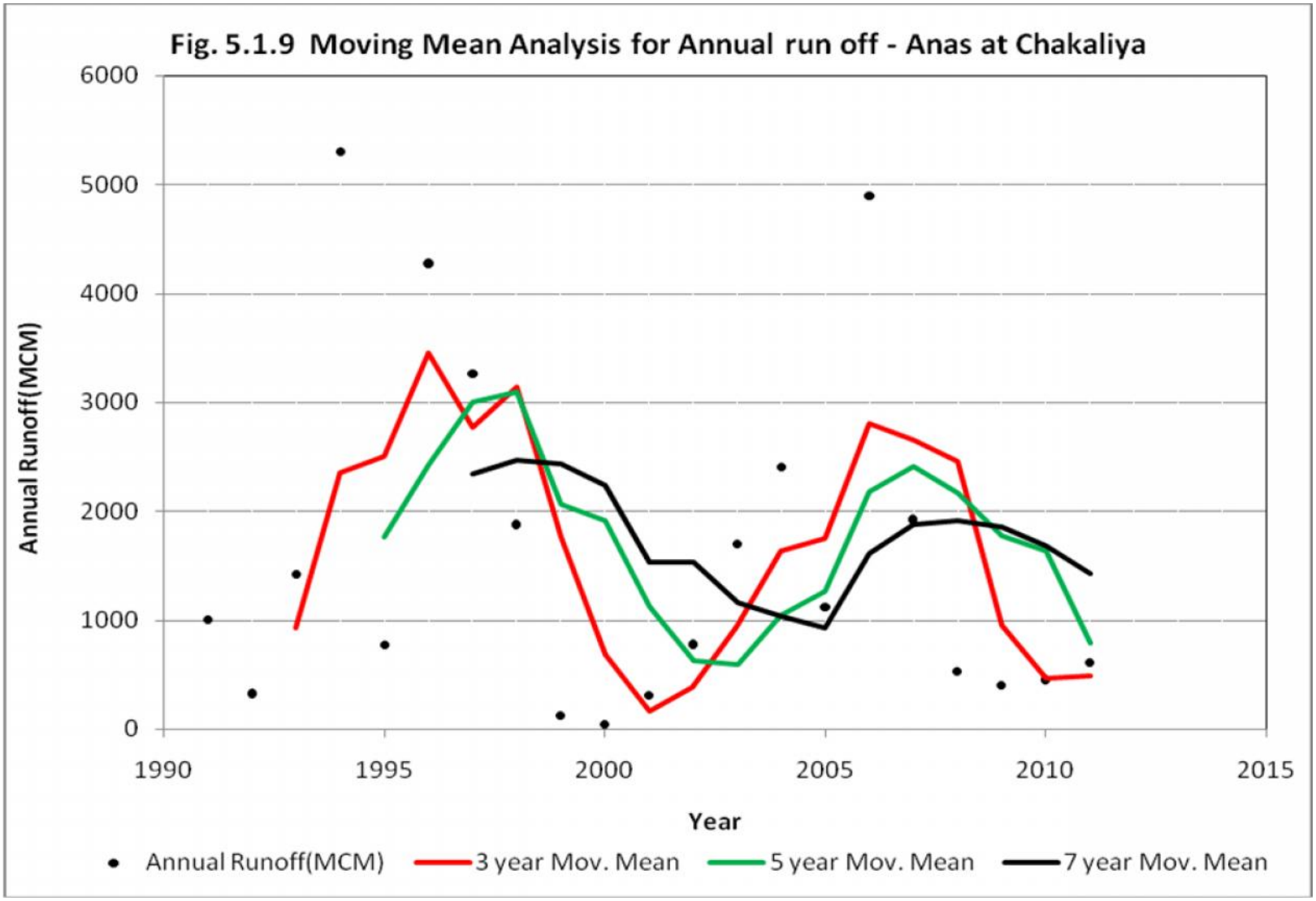

Fig.5.1.4 Fit Characteristics - annual run off - Mahi at Paderdibadi
Annual Runoff(MCM)
12000
10000
8000
6000
4000
2000
0
1975
1980
1985
1990
1995
2000
2005
2010
2015
YEAR
y = 5.227x² - 20880x + 2E+07
R² = 0.059
y = -27.55x + 56990
R² = 0.015
y = -5515ln(x) + 42109
R² = 0.016
y = 9E+35e^-0.03x
R² = 0.131
Annual Runoff (MCM)
Linear
Expon
Polynomial(2)
Log

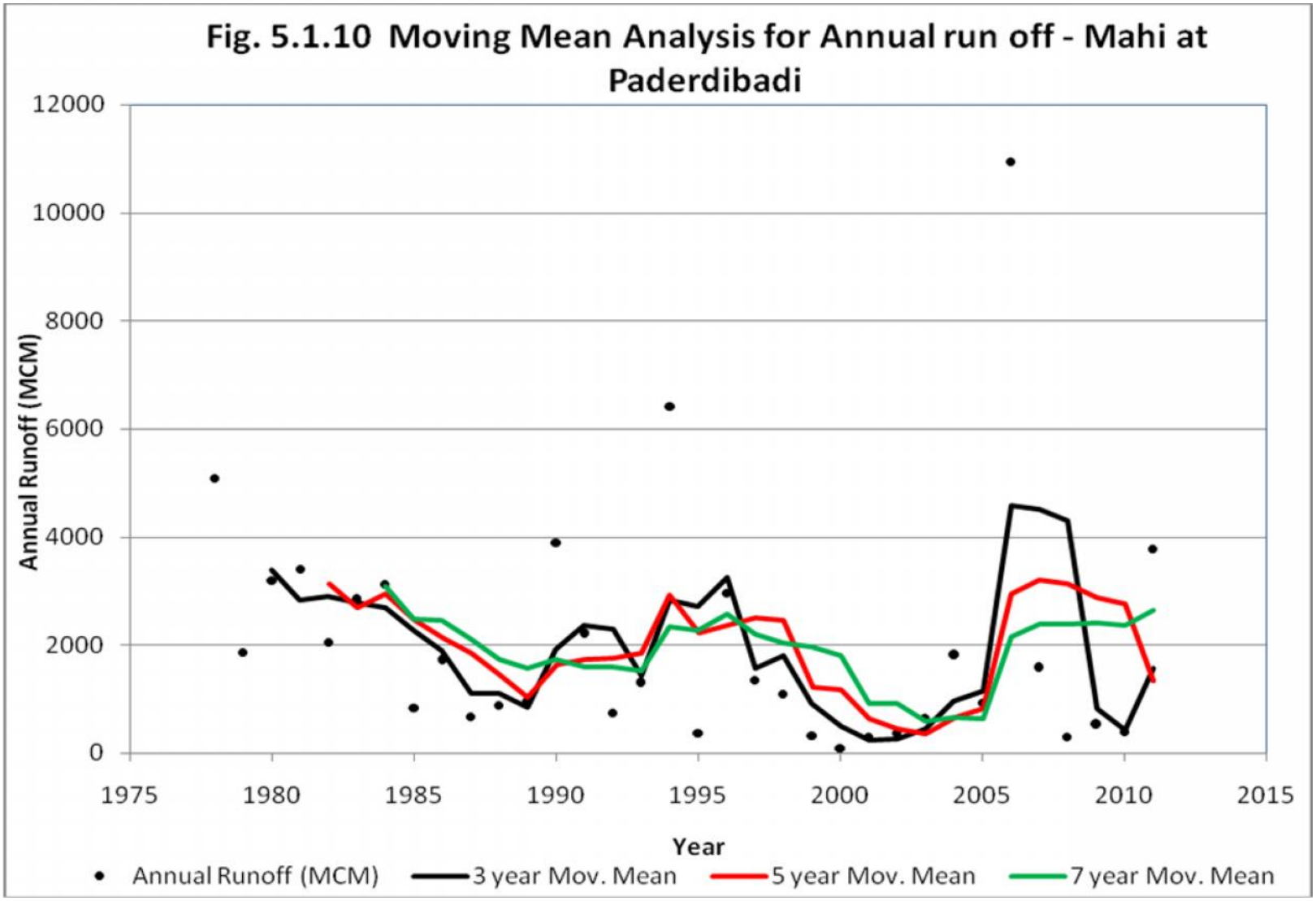

Fig.51.5 Fit Characteristics - annual run off - Som at Rangeli
Annual Runoff (MCM)
3500
3000
2500
2000
1500
1000
500
0
1978
1983
1988
1993
1998
2003
2008
2013
YEAR
y = 0.370x² - 1481.x + 1E+06
R² = 0.006
y = -8723ln(x) + 66946
R² = 0.004
y = -4.366x + 9374.
R² = 0.004
y = 5E+26e^-0.02x
R² = 0.082
Annual Runoff (MCM)
Expon
Linear
Polynomial
Log

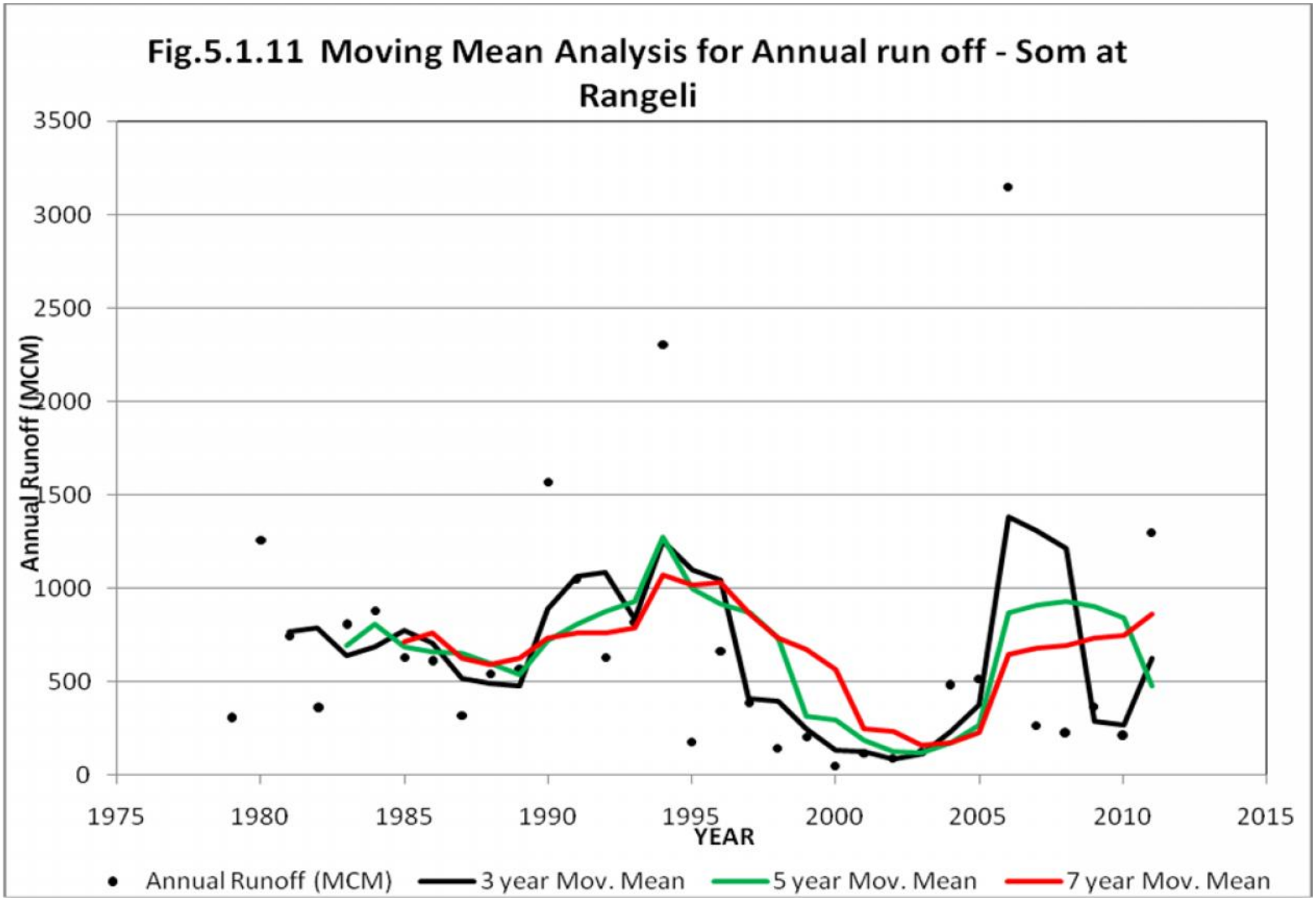

Fig.5.1.6 Fit characterstics - annual run off - Jakham at Dhariawad
Annual Runoff (MCM)
1400
1200
1000
800
600
400
200
0
1985
1990
1995
2000
2005
2010
2015
Year
y = 21468ln(x) - 16296
R² = 0.068
y = 10.75x - 21294
R² = 0.069
y = 1.846x² - 7373.x + 7E+06
R² = 0.146
Annual Runoff (MCM)
Log
Polynomial(2)
Linear

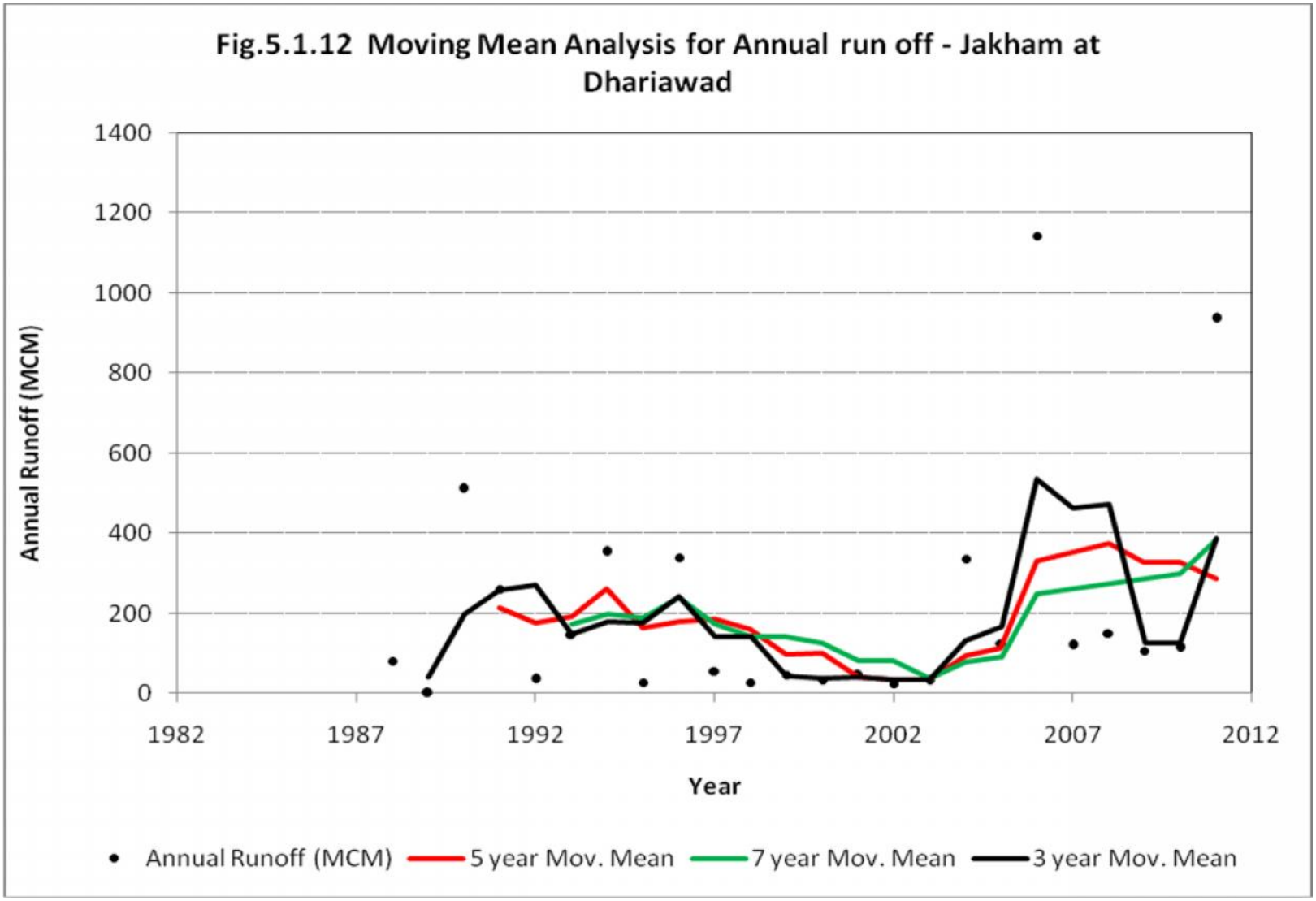

Fig.5.1.7 Fit Characteristics - annual run off - Mahi at Mataji
Annual Runoff (MCM)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1980
1985
1990
1995
2000
2005
2010
2015
Year
y = 16.22x - 31070
R² = 0.020
y = 32359ln(x) - 24458
R² = 0.020
y = 0.852x² - 3386.x + 3E+06
R² = 0.023
y = 2.276e^0.003x
R² = 0.000
Annual Runoff (MCM)
Linear
Expon
Polynomial(2)
Log

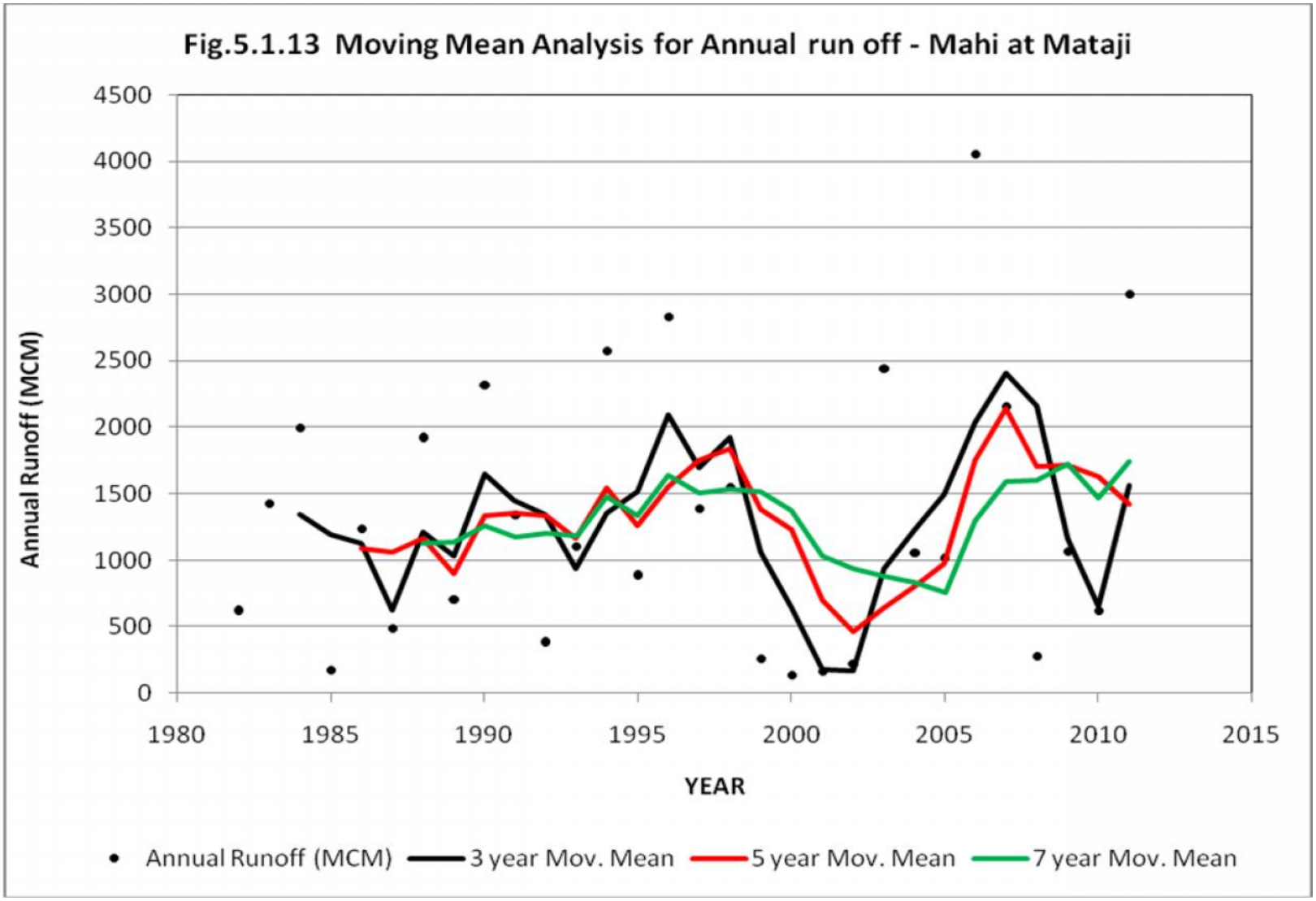

Fig.5.1.8 Moving Mean Analysis for Annual run off - Mahi at Khanpur
Annual Runoff (MCM)
25000
20000
15000
10000
5000
0
1975
1980
1985
1990
1995
2000
2005
2010
2015
YEAR
Annual Runoff (MCM)
3 year Mov. mean
5 year Mov. mean
7 year Mov. mean


Fig. 5.1.9 Moving Mean Analysis for Annual run off - Anas at Chakaliya
Annual Runoff(MCM)
6000
5000
4000
3000
2000
1000
0
1990
1995
2000
2005
2010
2015
Year
Annual Runoff(MCM)
3 year Mov. Mean
5 year Mov. Mean
7 year Mov. Mean


Fig. 5.1.10 Moving Mean Analysis for Annual run off - Mahi at Paderdibadi
12000
10000
8000
6000
4000
2000
0
Annual Runoff (MCM)
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
Annual Runoff (MCM)
3 year Mov. Mean
5 year Mov. Mean
7 year Mov. Mean


Fig.5.1.11 Moving Mean Analysis for Annual run off - Som at Rangeli
3500
3000
2500
2000
1500
1000
500
0
Annual Runoff (MCM)
1975
1980
1985
1990
1995
2000
2005
2010
2015
YEAR
Annual Runoff (MCM)
3 year Mov. Mean
5 year Mov. Mean
7 year Mov. Mean


Fig.5.1.12 Moving Mean Analysis for Annual run off - Jakham at Dhariawad
Annual Runoff (MCM)
1400
1200
1000
800
600
400
200
0
1982
1987
1992
1997
2002
2007
2012
Year
Annual Runoff (MCM)
5 year Mov. Mean
7 year Mov. Mean
3 year Mov. Mean


Fig.5.1.13 Moving Mean Analysis for Annual run off - Mahi at Mataji
Annual Runoff (MCM)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1980
1985
1990
1995
2000
2005
2010
2015
YEAR
Annual Runoff (MCM)
3 year Mov. Mean
5 year Mov. Mean
7 year Mov. Mean

5.2 Trend Analysis -Sabarmati basin

5.2.1 Introduction

Trends are important indicators of the temporal variability of runoff as computed from observed discharge at site. By analyzing the time sequence of the runoff, we assess the magnitude and significance of the temporal variability. The present surface runoff trend study involves analysis of the temporal variability of data sets on the observed discharges in Sabarmati basin using available data of existing river gauging stations.

5.2.2 Methodology

In the analysis of the trends of runoff on Sabarmati River and its major tributary Wakal, and Watrak, annual runoff is computed and analyzed. The analysis is carried out for six (6) river gauging stations with sufficiently long and continuous data sets that are fairly representatively distributed across Sabarmati River Basin.

Overall six stations have been considered in this study. The length of the data sets of river gauging station varies from 11 to 23 years. Subsequently, time series are analysed on various statistical parameters, fitting of mathematical equations, observing moving means for various period so as to find out if there are any trends in the annual runoff data.

5.2.3 Time series analysis

Time series is defined as a sequence of values arrayed in order of their occurrence which can be characterized by statistical properties. Time series analysis may be used to test the variability, homogeneity and trend of a stream flow series or simply to give an upright list the characteristics of the series as graphically displayed. Significant movements of time series are the secular, periodic, cyclic and irregular trends. A time series may display a tendency to increase or decrease, over a specified period. Such a series provides an interesting illustration because if the trend is usually predominant, virtually no other movements are discernible.

Various methods exist for analysis of time series such as moving averages, residual series, residual mass curves and balance. Trends may also be revealed by determining if observed stream flow follows some mathematical equation as a function of time.

In this chapter, first statistical parameters have been computed for time series data of annual runoff at different sites in Sabarmati Basin. It is also ascertained if any

mathematical equation can be fitted to the time series to assess predictability. Finally, the data is analysed by the method of moving means for various periods.

5.2.4 Availability of Annual runoff Data

There are 6 G&D sites in Sabarmati Basin. Availability of annual runoff data for these sites is summarized in **Table -1**

Table-1 Availability of annual runoff data

Sl.No.	Site name	River/Tributaries.	Data availability	Total years
1	Derol bridge	Sabarmati	1992-91 to 2011-12	20
2	Kheroj	Sabarmati	1992-91 to 2011-12	20
3	Voutha	Sabarmati	2001-02 to 2011-12	11
4	Jotasan	Wakal	1995-96 to 2011-12	17
5	Ratanpur	Watrak	1991-92 to 2011-12	21
6	Kheda	Watrak	1989-90 to 2011-12	23

The data is placed at **Annexure-2** and shown in line diagram in **Fig.2.2.2** and superimposed graph of annual runoff is given under Fig.5.2.1.

5.2.5 Analysis

5.2.5.1 Statistical Analysis

Various statistical parameters of the time series of available data are given below in **Table-2**.

Table-2: Statistical parameters of Annual Runoff series at various Sites

GD station	Data length (years)	Mean (MCM)	Median (MCM)	SD (MCM)	Coeff. Of variation
Derol bridge	20	460	161	751.4	1.63
Kheroj	20	352	220	329.86	0.94
Voutha	11	2693	2490	2153.66	0.80
Jotasan	17	174	99	255.89	1.47
Ratanpur	21	332	146	417.34	1.26
Kheda	23	479	190	664.33	1.39

5.2.5.2 Fit characteristics

In order to find out if any mathematical equation represents the time series as a function of time, fitting of various types of equations viz. linear, logarithmic, exponential and polynomial have been attempted. Results of such fits are given in the **Table- 3** and shown in **Fig.5.2.2 through 5.2.7**.

Table-3: Fit Characteristics

Sl.No.	Site	Function Type	Fitted Equation	R^2
1	Derol bridge	Linear	$y = -1.144x + 2666$	8E-05
		Logarithmic	$y = -2301 \ln(x) + 17863$	8E-05
		Polynomial	$y = 0.686x^2 - 2750x + 3E+06$	0.000
2	Kheroj	Linear	$y = -2.749 x + 5855$	0.002
		Logarithmic	$y = -5577 \ln(x) + 42743$	0.002
		Polynomial	$y = 5.535x^2 - 22159x + 2E+07$	0.262
		Exponential	$y = 11319e^{-0.00x}$	0.000
3	Voutha	Linear	$y = 79.56 x - 15690$	0.015
		Logarithmic	$y = 16015 \ln(x) - 1E+06$	0.015
		Polynomial	$y = -142.8 x^2 + 57304 x - 6E+08$	0.392
		Exponential	$y = 8E-11e^{0.139x}$	0.147
4	Jotasan	Linear	$y = 16.61x - 33100$	0.107
		Logarithmic	$y = 33287 \ln(x) - 25289$	0.107
		Polynomial	$y = -1.383x^2 + 5557x - 6E+06$	0.121
		Exponential	$y =4 E-82e^{0.095x}$	0.199
5	Ratanpur	Linear	$y = 8.889x - 17456$	0.017
		Logarithmic	$y = 17811 \ln(x) - 13505$	0.017
		Polynomial	$y = -1.630x^2 + 6534 x - 7E+06$	0.034
		Exponential	$y = 3E-18e^{0.022x}$	0.009
6	Kheda	Linear	$y = 7.279x - 14079$	0.005
		Logarithmic	$y = 21443 \ln(x) - 16249$	0.010
		Polynomial	$y = -1.142x^2 + 4580 x - 5E+06$	0.014

5.2.5.3 Moving Mean Analysis

In statistics, a moving mean (average), also called rolling average, rolling mean or running average, is a type of finite impulse response filter used to analyze a set of data points by creating a series of averages of different subsets of the full data set.

The first element of the moving average is obtained by taking the average of the initial fixed subset of the number series. Then the subset is modified by "shifting forward", that is excluding the first number of the series and including the next number following the original subset in the series. This creates a new subset of numbers, which is averaged. This process is repeated over the entire data series. The

plot line connecting all the (fixed) averages is the moving average. A moving average is a set of numbers, each of which is the average of the corresponding subset of a larger set of data points. A moving average may also use unequal weights for each data value in the subset to emphasize particular values in the subset.

A moving average is commonly used with time series data to smooth out short-term fluctuations and highlight longer-term trends or cycles.

In the present analysis, moving means have been computed for 3, 5 and 7 year periods for various sites of Sabarmati River Basin and shown in **Fig.5.2.8 through 5.2.13**.

5.3.6 Interpretation

5.3.6.1 Fitting of various statistical/mathematical models viz linear, logarithmic, exponential and polynomial reveals that values of R^2 range from 0.015 to 0.392 for Voutha, from 0.005 to 0.014 for Kheda, from 0.009 to 0.034 for Ratanpur, from 0.000 to 8E-05 for Derol Bridge, 0.000 to 0.262 for Kheroj and from 0.107 to 0.199 for Jotasan. The values of R^2 are quite close to 0 indicating absence of any significant trend.

5.3.6.2 Presence of periodicities in annual runoff data of various sites in Sabarmati basin is reflected in the moving mean plots except for site Vautha which has a very small length of time series data. However, the length of time series data at other sites is also too small to conclude definite trends in the annual runoff data.

5.3.7 Conclusion

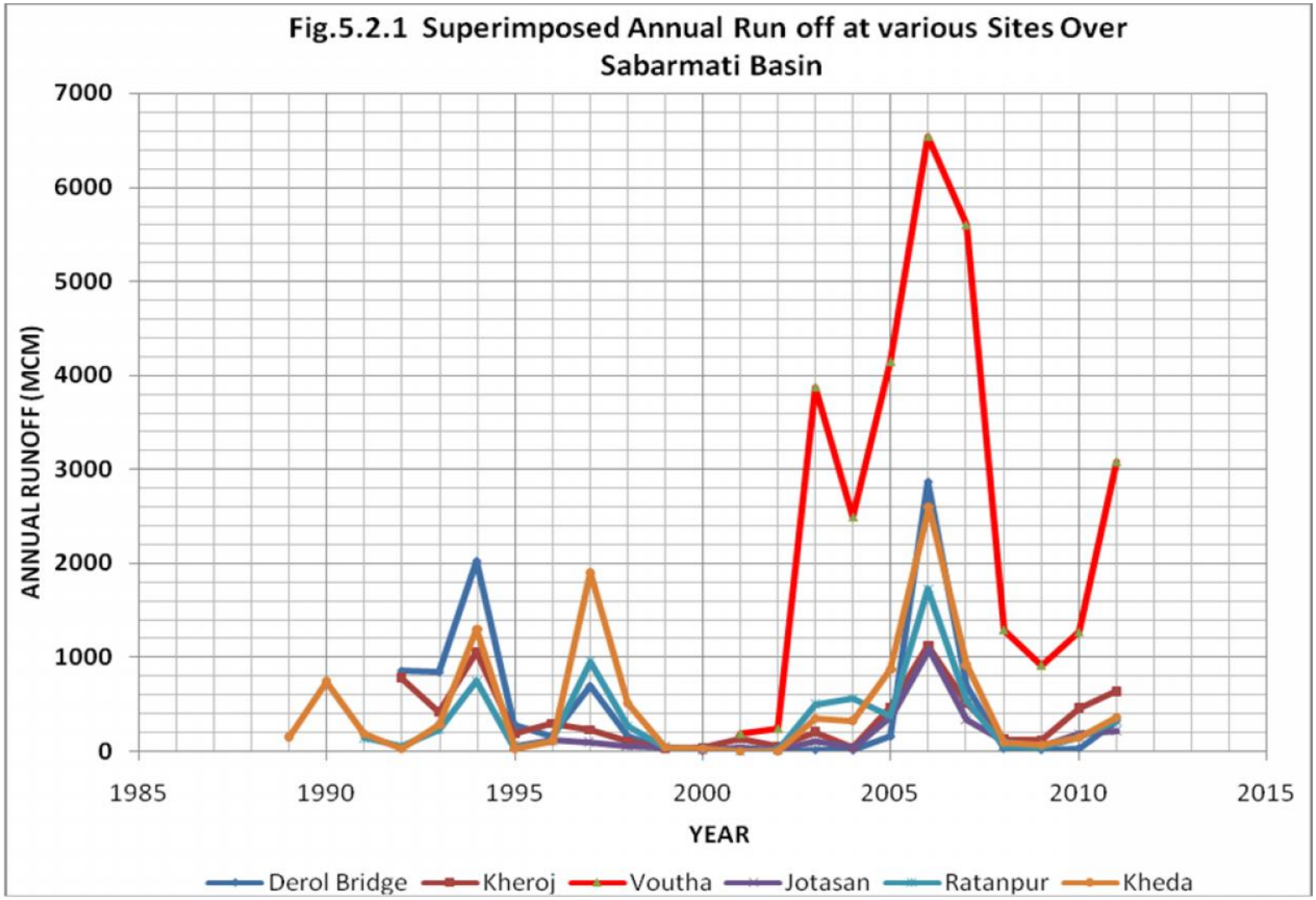
Statistically speaking, the annual runoff of river Sabarmati and its tributary Wakal, and Watrak, in general, appear to be a random variable; however elements of cyclicalness cannot be ruled out on the strength of moving mean analysis. A longer set of time series data may help identify trends in annual runoff, if any.

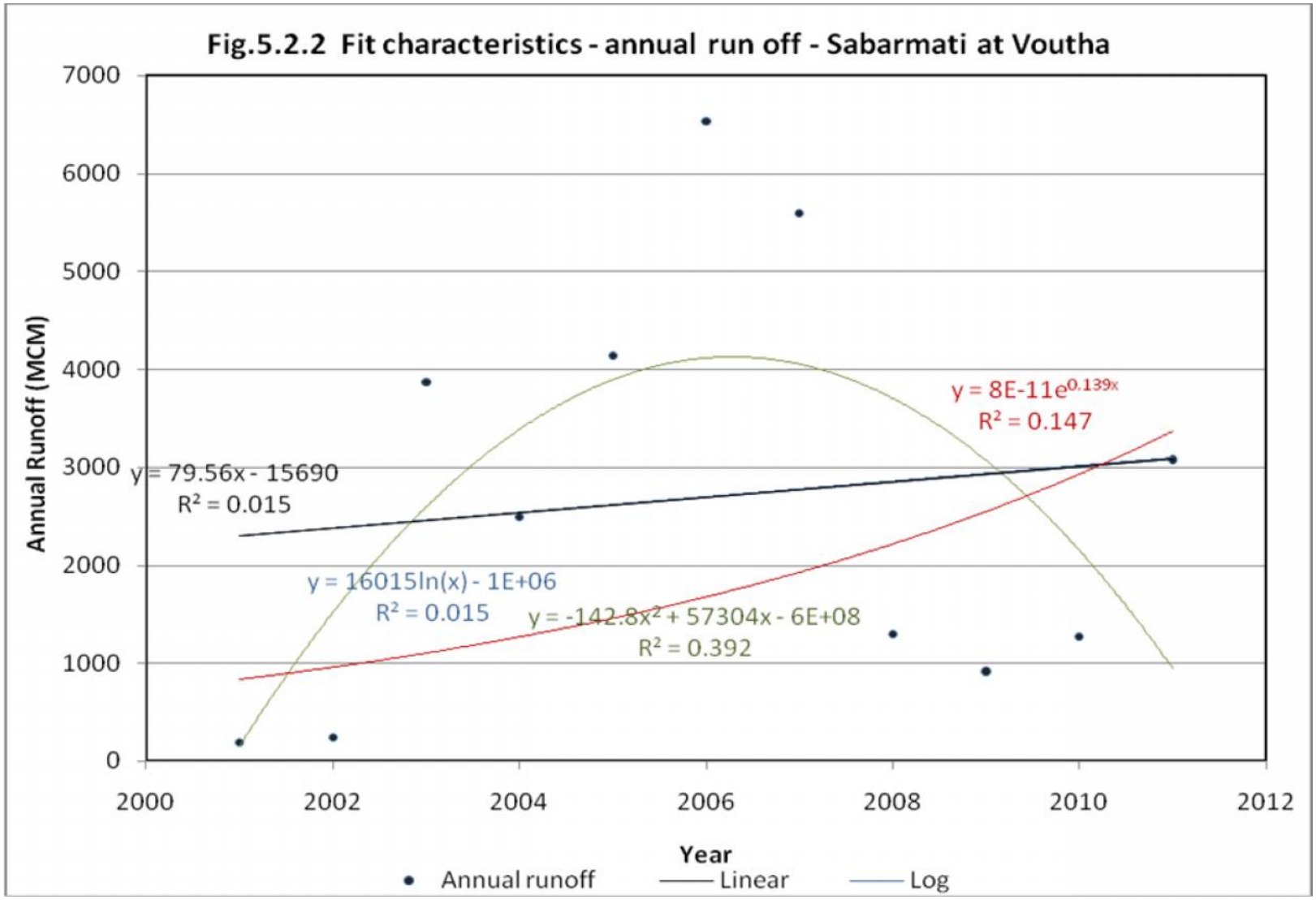
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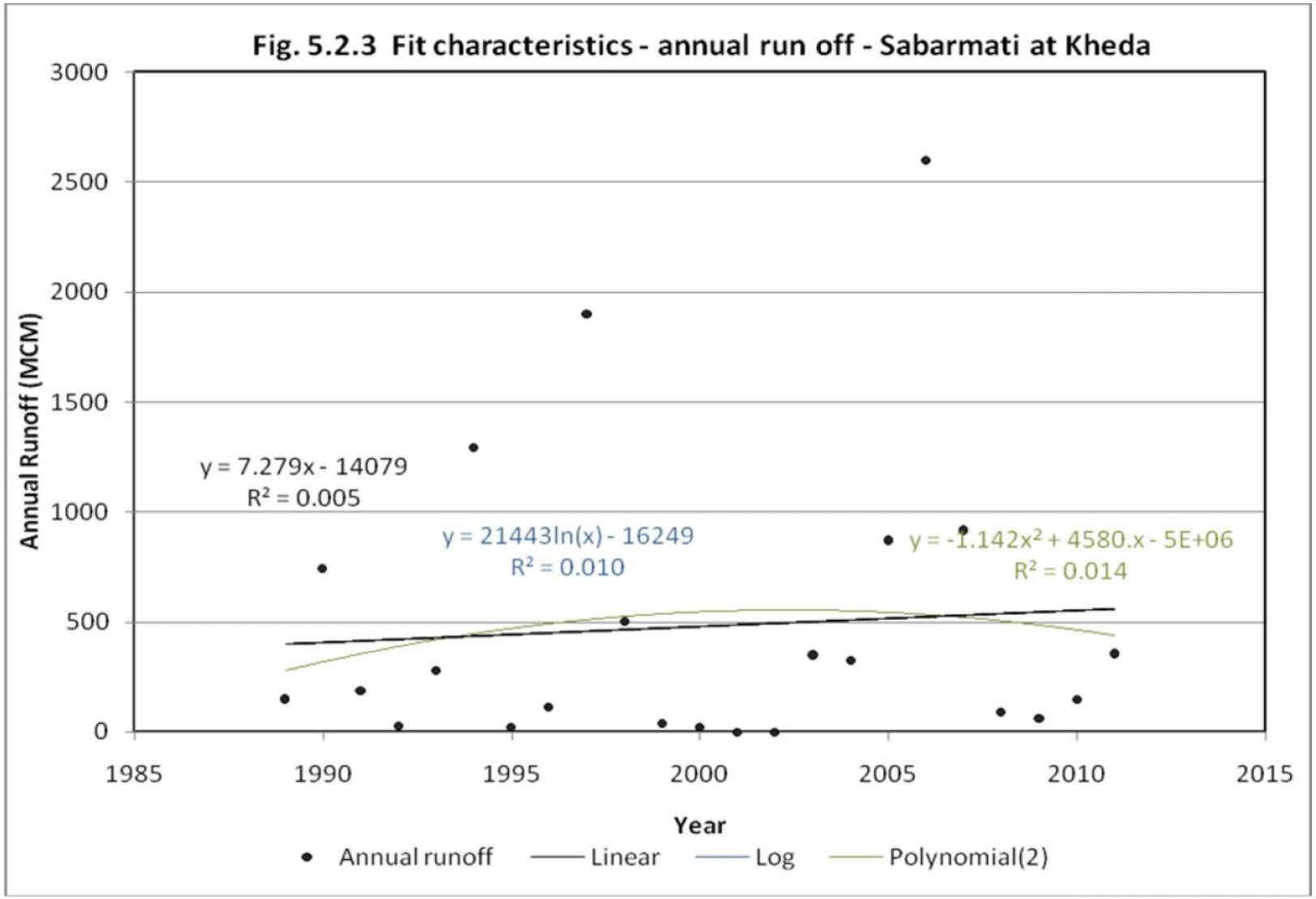
Annexure - 2

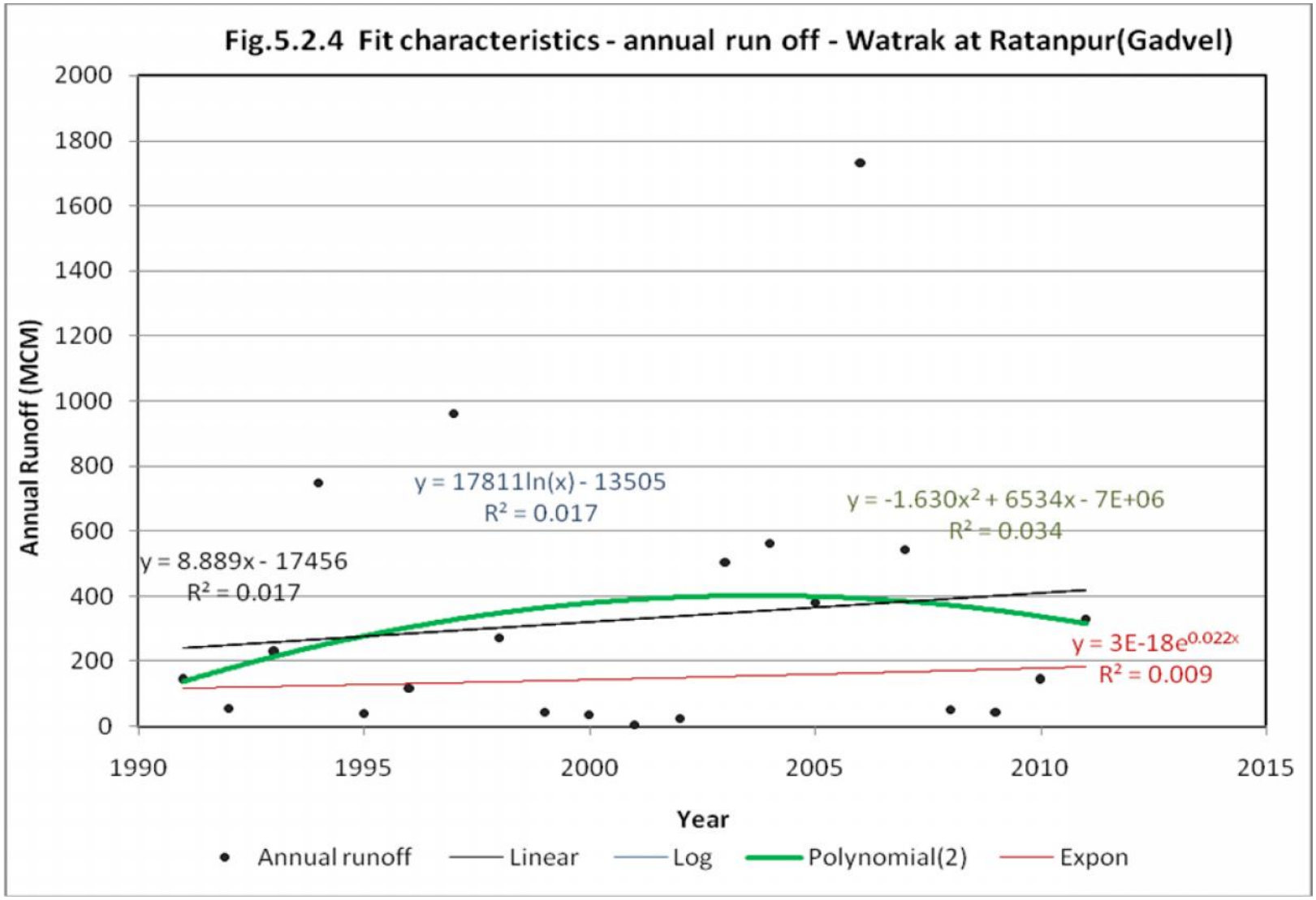
Annual Runoff at various sites over Sabarmati Basin

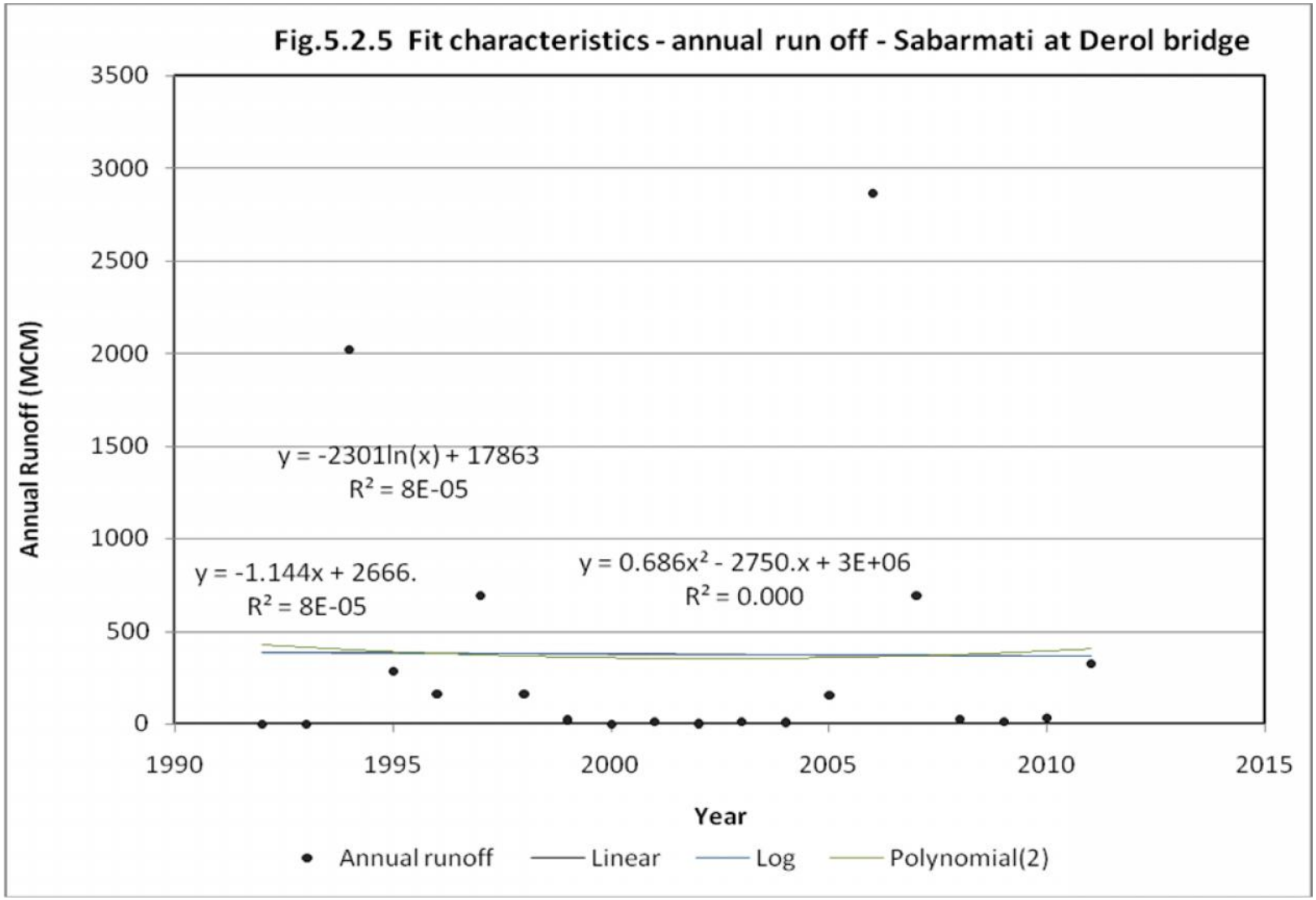
Year	Derol Bridge	Kheroj	Voutha	Jotasan	Ratanpur	Kheda
1989						151
1990						743
1991					145	190
1992	854	782			55	30
1993	839	421			231	278
1994	2022	1056			748	1294
1995	286	190		62	38	23
1996	165	296		116	115	113
1997	694	233		99	961	1898
1998	164	112		55	271	503
1999	23	29		48	44	38
2000	0	42		16	35	21
2001	15	136	187	45	5	0
2002	2	50	239	20	24	0
2003	13	207	3871	102	505	351
2004	9	44	2490	39	562	326
2005	157	468	4144	370	379	872
2006	2864	1122	6539	1081	1731	2598
2007	693	504	5599	334	542	918
2008	26	128	1291	104	52	89
2009	14	121	914	62	44	63
2010	32	462	1267	185	146	150
2011	326	636	3078	220	329	357
MEAN	460	352	2693	174	332	479
MEDIAN	161	220	2490	99	146	190
STANDARD DEVAIATION	751.40	329.86	2153.66	255.89	417.34	664.33
CO-EFFICIENT OF VARIATION	1.63	0.94	0.80	1.47	1.26	1.39

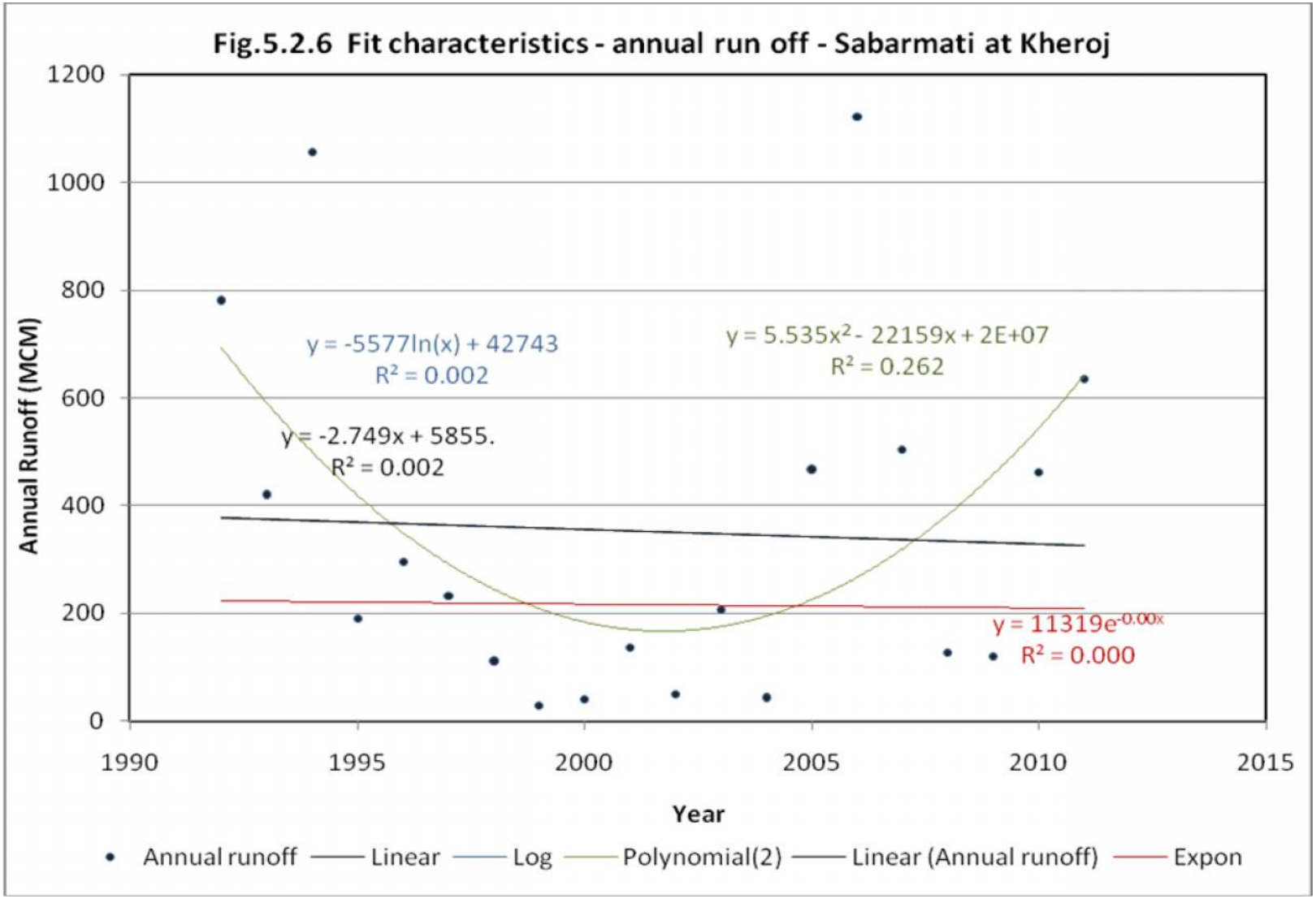

Fig.5.2.1 Superimposed Annual Run off at various Sites Over Sabarmati Basin
ANNUAL RUNOFF (MCM)
7000
6000
5000
4000
3000
2000
1000
0
1985
1990
1995
2000
2005
2010
2015
YEAR
Derol Bridge
Kheroj
Voutha
Jotasan
Ratanpur
Kheda

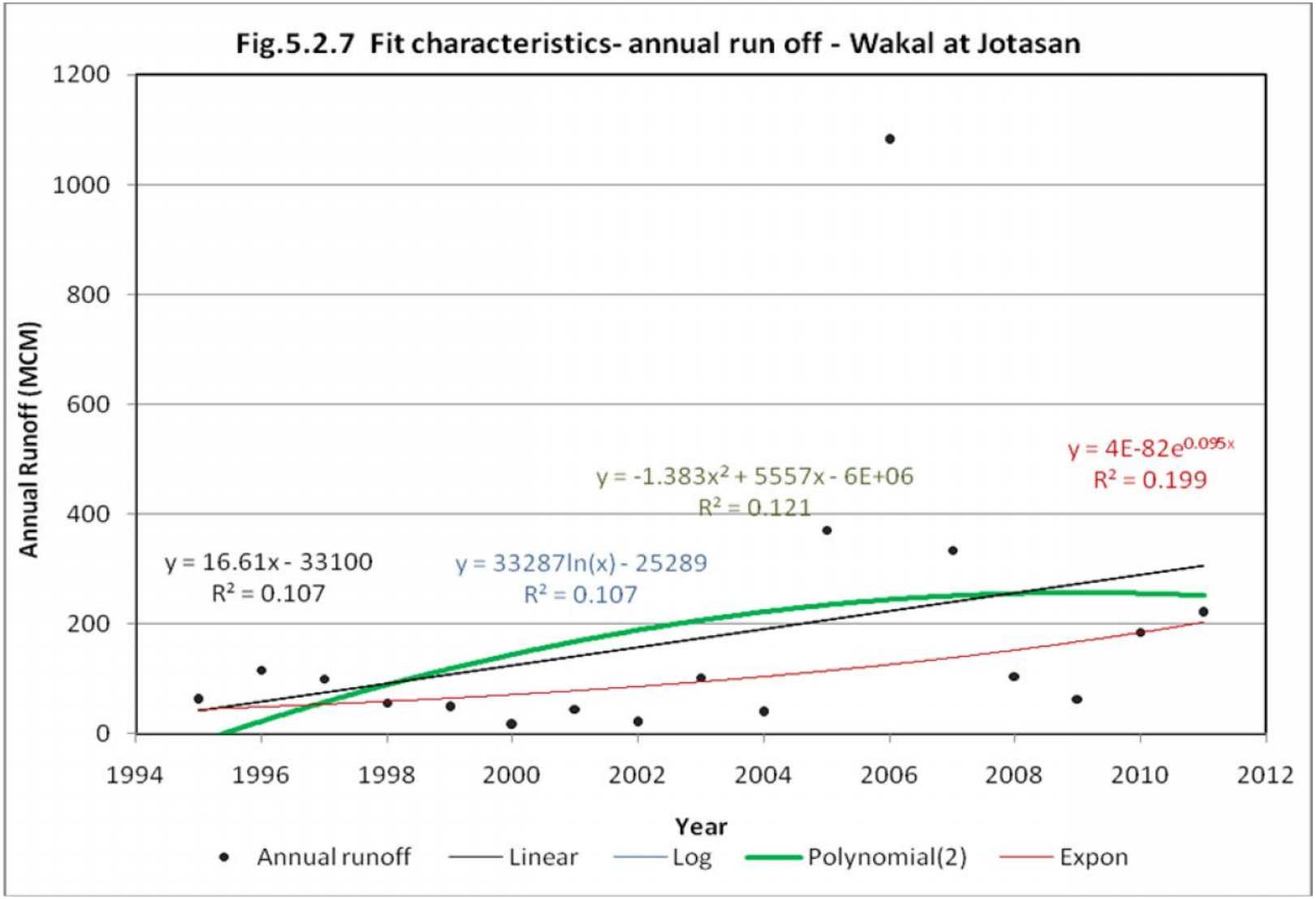

Fig.5.2.2 Fit characteristics - annual run off - Sabarmati at Voutha
Annual Runoff (MCM)
7000
6000
5000
4000
3000
2000
1000
0
2000
2002
2004
2006
2008
2010
2012
Year
y = 79.56x - 15690
R² = 0.015
y = 16015ln(x) - 1E+06
R² = 0.015
y = -142.8x² + 57304x - 6E+08
R² = 0.392
y = 8E-11e^0.139x
R² = 0.147
Annual runoff
Linear
Log

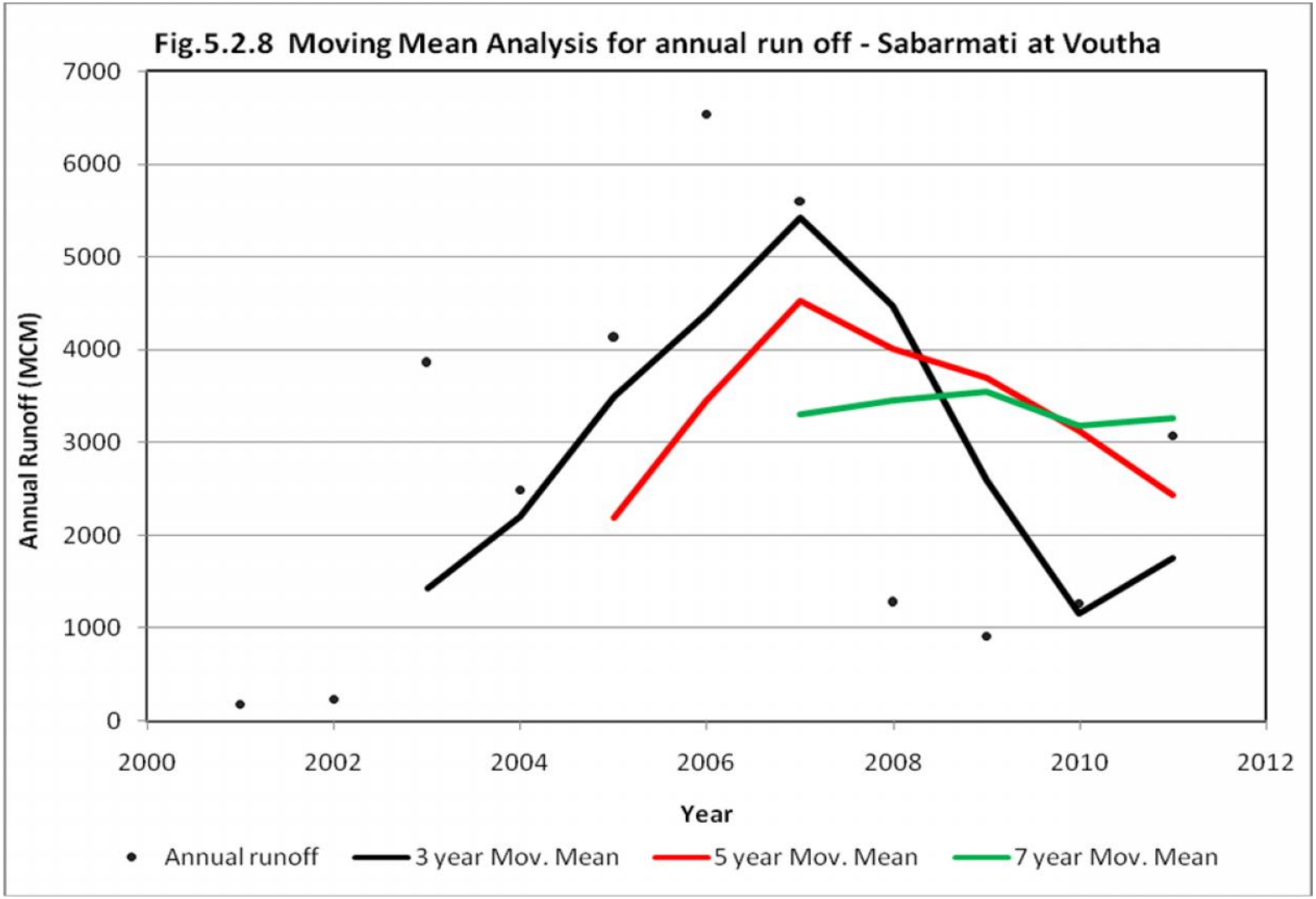

Fig. 5.2.3 Fit characteristics - annual run off - Sabarmati at Kheda
Annual Runoff (MCM)
3000
2500
2000
1500
1000
500
0
1985
1990
1995
2000
2005
2010
2015
Year
y = 7.279x - 14079
R² = 0.005
y = 21443ln(x) - 16249
R² = 0.010
y = -1.142x² + 4580.x - 5E+06
R² = 0.014
Annual runoff
Linear
Log
Polynomial(2)

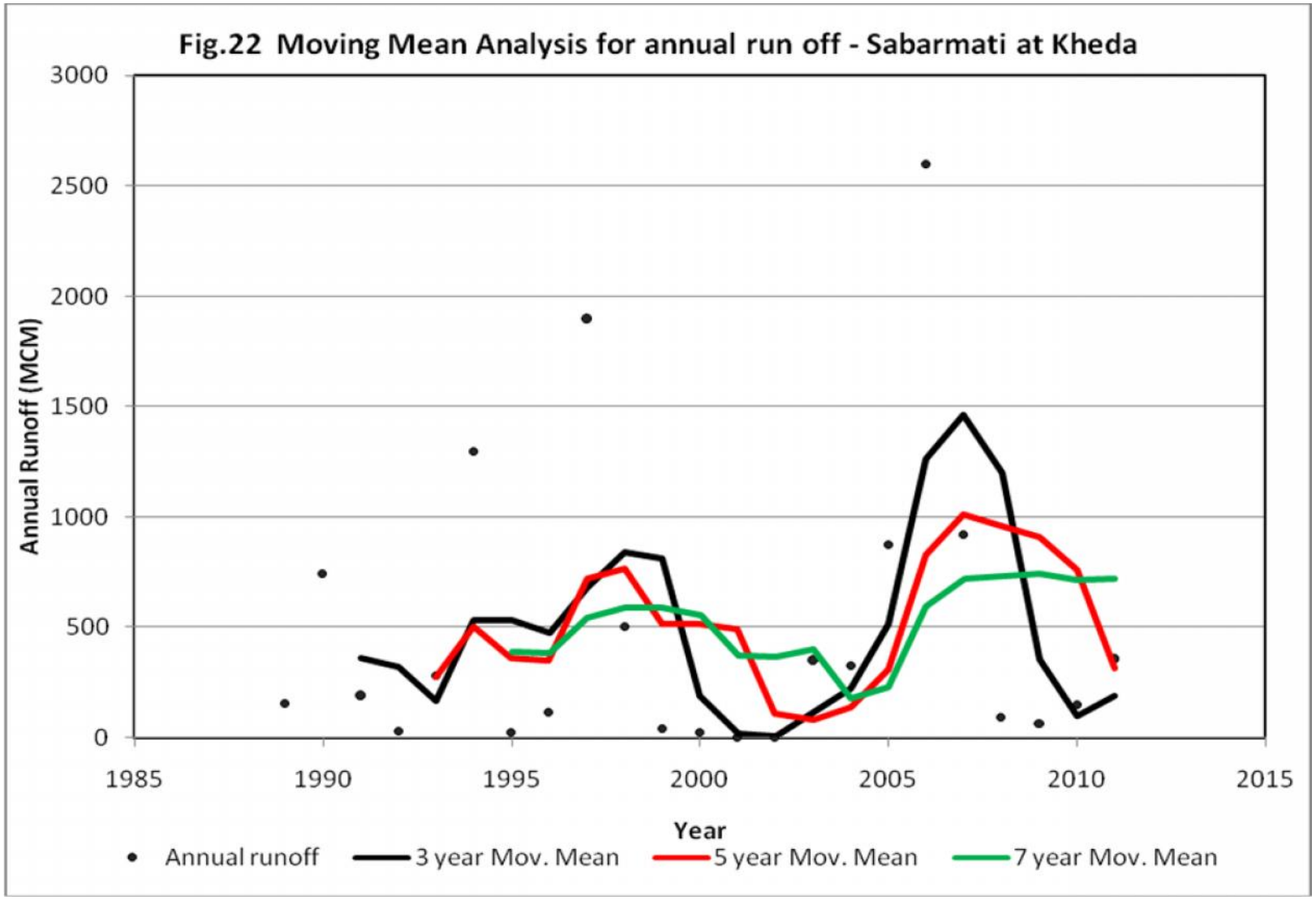

Fig.5.2.4 Fit characteristics - annual run off - Watrak at Ratanpur(Gadvel)
Annual Runoff (MCM)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1990
1995
2000
2005
2010
2015
Year
y = 17811ln(x) - 13505
R² = 0.017
y = -1.630x² + 6534x - 7E+06
R² = 0.034
y = 8.889x - 17456
R² = 0.017
y = 3E-18e^0.022x
R² = 0.009
Annual runoff
Linear
Log
Polynomial(2)
Expon

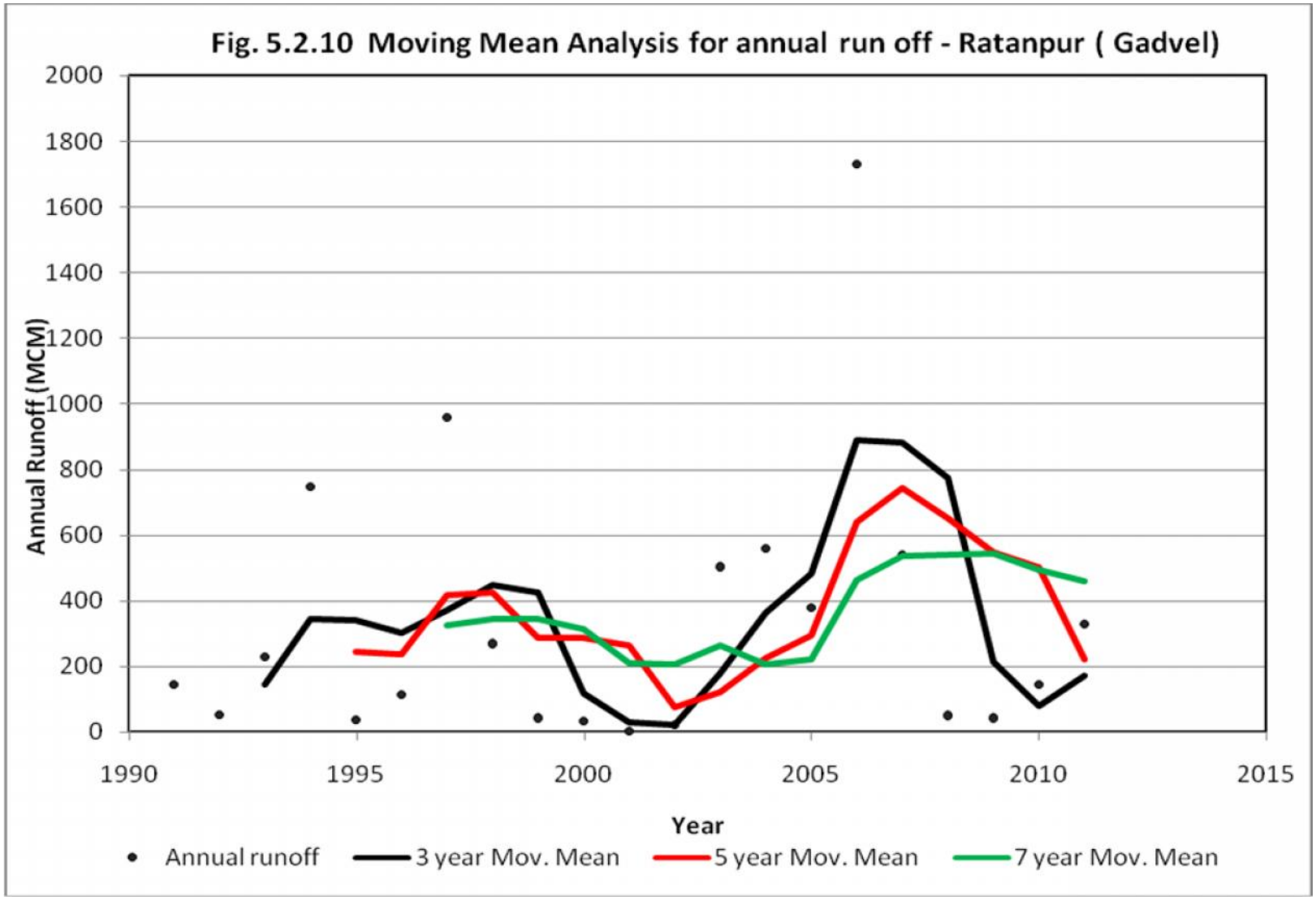

Fig.5.2.5 Fit characteristics - annual run off - Sabarmati at Derol bridge
Annual Runoff (MCM)
3500
3000
2500
2000
1500
1000
500
0
1990
1995
2000
2005
2010
2015
Year
y = -2301ln(x) + 17863
R² = 8E-05
y = -1.144x + 2666.
R² = 8E-05
y = 0.686x² - 2750.x + 3E+06
R² = 0.000
Annual runoff
Linear
Log
Polynomial(2)

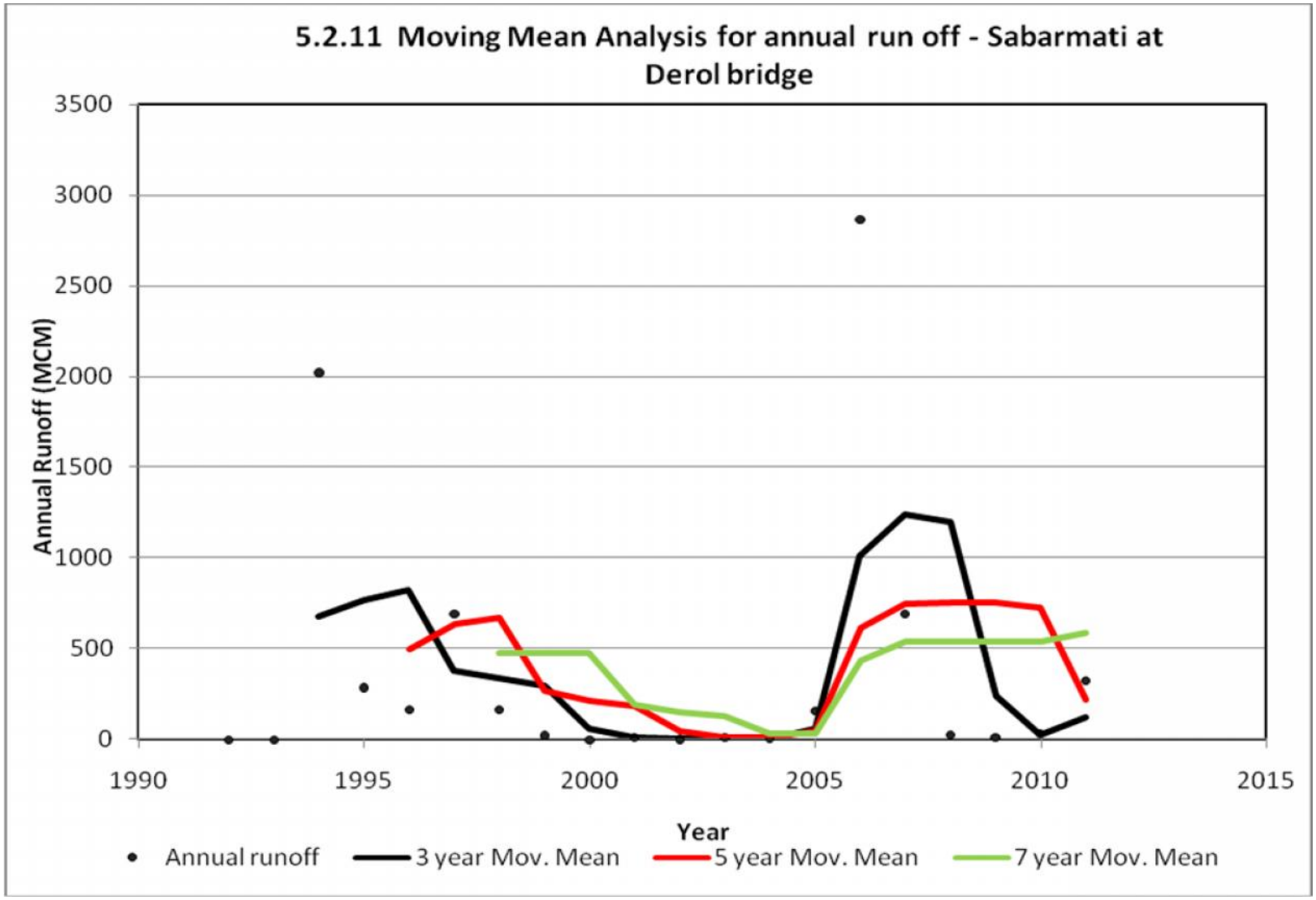

Fig.5.2.6 Fit characteristics - annual run off - Sabarmati at Kheroj
Annual Runoff (MCM)
1200
1000
800
600
400
200
0
1990
1995
2000
2005
2010
2015
Year
y = -5577ln(x) + 42743
R² = 0.002
y = 5.535x² - 22159x + 2E+07
R² = 0.262
y = -2.749x + 5855.
R² = 0.002
y = 11319e-0.00x
R² = 0.000
Annual runoff
Linear
Log
Polynomial(2)
Linear (Annual runoff)
Expon

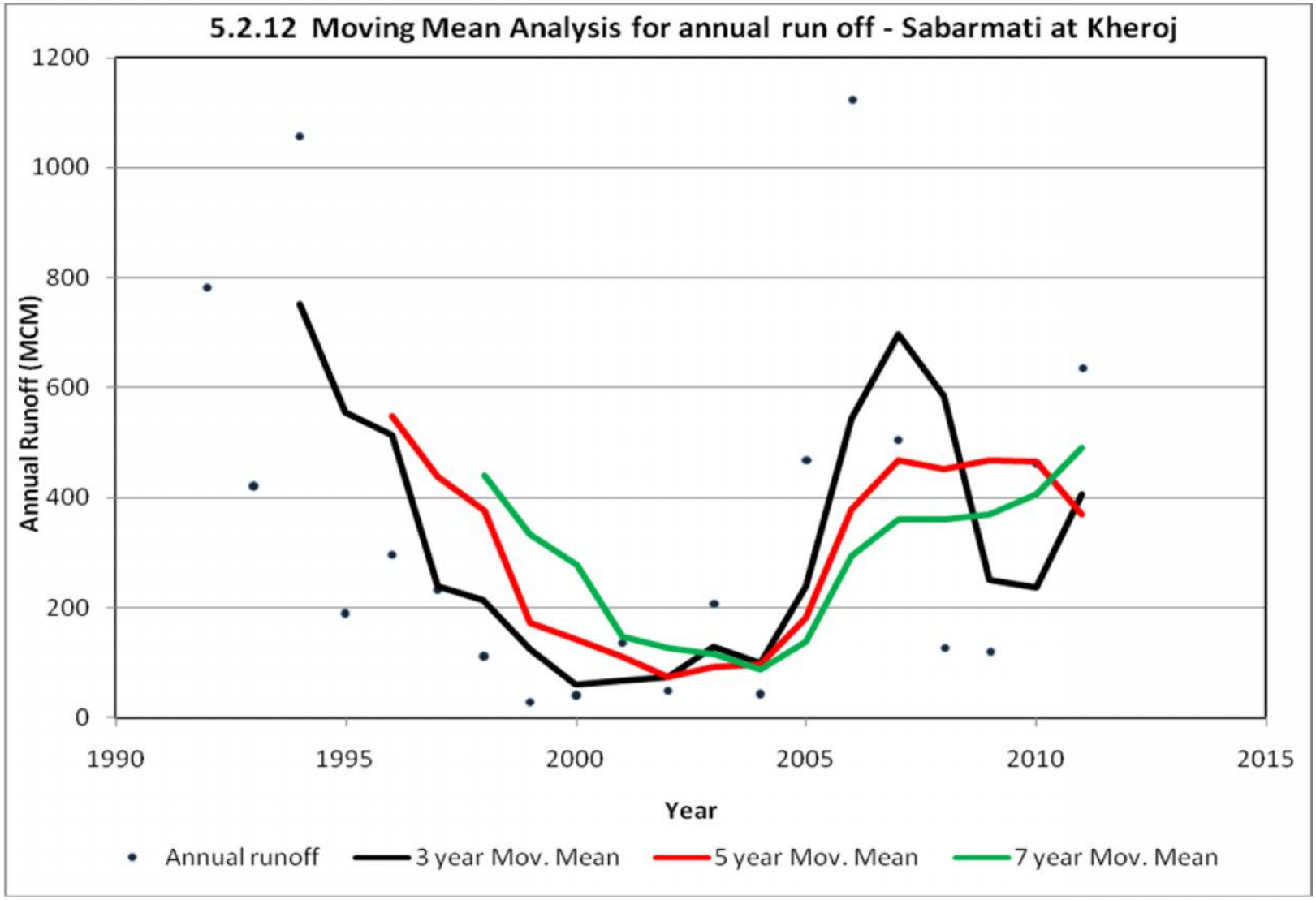

Fig.5.2.7 Fit characteristics- annual run off - Wakal at Jotasan
Annual Runoff (MCM)
1200
1000
800
600
400
200
0
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
Year
y = 16.61x - 33100
R² = 0.107
y = 33287ln(x) - 25289
R² = 0.107
y = -1.383x² + 5557x - 6E+06
R² = 0.121
y = 4E-82e^0.095x
R² = 0.199
Annual runoff
Linear
Log
Polynomial(2)
Expon

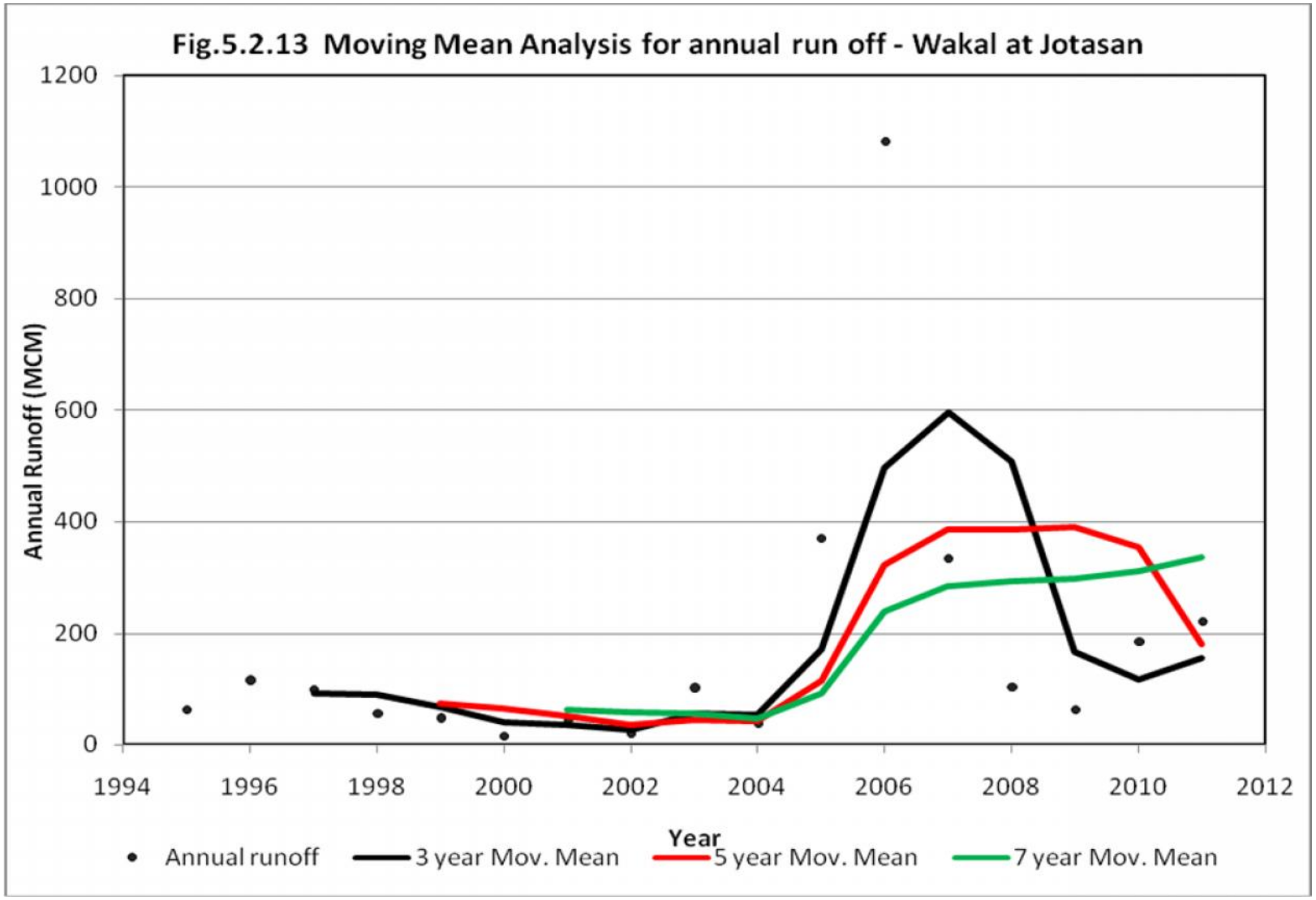

Fig.5.2.8 Moving Mean Analysis for annual run off - Sabarmati at Voutha
Annual Runoff (MCM)
7000
6000
5000
4000
3000
2000
1000
0
2000
2002
2004
2006
2008
2010
2012
Year
Annual runoff
3 year Mov. Mean
5 year Mov. Mean
7 year Mov. Mean


Fig.22 Moving Mean Analysis for annual run off - Sabarmati at Kheda
Annual Runoff (MCM)
3000
2500
2000
1500
1000
500
0
1985
1990
1995
2000
2005
2010
2015
Year
Annual runoff
3 year Mov. Mean
5 year Mov. Mean
7 year Mov. Mean


Fig. 5.2.10 Moving Mean Analysis for annual run off - Ratanpur (Gadvel)
Annual Runoff (MCM)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1990
1995
2000
2005
2010
2015
Year
Annual runoff
3 year Mov. Mean
5 year Mov. Mean
7 year Mov. Mean


5.2.11 Moving Mean Analysis for annual run off - Sabarmati at Derol bridge
Annual Runoff (MCM)
3500
3000
2500
2000
1500
1000
500
0
1990
1995
2000
2005
2010
2015
Year
Annual runoff
3 year Mov. Mean
5 year Mov. Mean
7 year Mov. Mean


5.2.12 Moving Mean Analysis for annual run off - Sabarmati at Kheroj
Annual Runoff (MCM)
1200
1000
800
600
400
200
0
1990
1995
2000
2005
2010
2015
Year
Annual runoff
3 year Mov. Mean
5 year Mov. Mean
7 year Mov. Mean


Fig.5.2.13 Moving Mean Analysis for annual run off - Wakal at Jotasan
1200
1000
800
600
400
200
0
Annual Runoff (MCM)
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
Year
Annual runoff
3 year Mov. Mean
5 year Mov. Mean
7 year Mov. Mean

5.3 Trend Analysis - Luni Basin

5.3.1 Introduction

Trends are important indicators of the temporal variability of runoff as computed from observed discharge at site. By analyzing the time sequence of the runoff, we assess the magnitude and significance of the temporal variability. The present surface runoff trend study involves analysis of the temporal variability of data sets on the observed discharges in Luni basin using available data of existing river gauging stations.

5.3.2 Methodology

In the analysis of the trends of runoff on Luni River, annual runoff is computed and analyzed. The analysis is carried out for two (2) river gauging stations with sufficiently long and continuous data sets that are fairly representatively distributed across Luni river Basin.

Overall two stations have been considered in this study. The length of the data sets of river gauging station varies from 22 to 36 years. Subsequently, time series are analysed on various statistical parameters, fitting of mathematical equations, observing moving means for various period so as to find out if there are any trends in the annual runoff data.

5.3.3 Time series analysis

Time series is defined as a sequence of values arrayed in order of their occurrence which can be characterized by statistical properties. Time series analysis may be used to test the variability, homogeneity and trend of a stream flow series or simply to give an upright list the characteristics of the series as graphically displayed. Significant movements of time series are the secular, periodic, cyclic and irregular trends. A time series may display a tendency to increase or decrease, over a specified period. Such a series provides an interesting illustration because if the trend is usually predominant, virtually no other movements are discernible.

Various methods exist for analysis of time series such as moving averages, residual series, residual mass curves and balance. Trends may also be revealed by determining if observed stream flow follows some mathematical equation as a function of time.

In this chapter, first statistical parameters have been computed for time series data of annual runoff at different sites in Luni basin. It is also ascertained if any mathematical

equation can be fitted to the time series to assess predictability. Finally, the data is analysed by the method of moving means for various periods.

5.3.4 Availability of annual run off Data

There are 2 G&D sites in Luni Basin. Availability of annual runoff data for these sites is summarized in **Table -1** and the superimposed graph of annual run off at both the sites in Luni are given under **Fig.5.3.1.**

Table-1: Availability of Data

Sl.No.	Site name	River/Tributaries.	Data availability	Total years
1	Balotra	Luni	1990-91 to 2011-12	22
2	Gandhav	Luni	1974-75 to 2011-12 No data on 1984-85 & 1985-86	36

The data is placed at Annexure-1 and shown in line diagram in **Plate 2.3.2.**

5.3.5 Analysis

5.3.5.1 Statistical Analysis

Various statistical parameters of the time series of available data are given below in **Table-2**.

Table-2: Statistical parameters of Annual Runoff series at various sites

GD station	Data length (years)	Mean (MCM)	Median (MCM)	SD (MCM)	Coeff. Of variation
Balotra	22	151	0	282.06	1.87
Gandhav	36	246	10	457.78	1.86

5.3.5.2 Fit characteristics

In order to find out if any mathematical equation represents the time series as a function of time, fitting of various types of equations viz. linear, logarithmic, exponential and polynomial have been attempted. Results of such fits are given in the **Table- 3** and shown in **Fig 5.3.2 &5.3.3**.

Table-3: Fit Characteristics

Sl.No.	Site	Function Type	Fitted Equation	R^2
1	Balotra	Linear	y = -23.89x + 47949	0.302
		Logarithmic	y = -4783ln(x) + 36375	0.303
		Polynomial	$y = 2.347x^2$ - 9416x + 9E+06	0.396
2	Gandhav	Linear	y = -15.22x + 30602	0.142
		Logarithmic	y = -3032ln(x) + 23062	0.142
		Polynomial	$y = -0.242x^2$ + 951.6x – 93258	0.146

5.3.5.3 Moving Mean Analysis

In statistics, a moving mean (average), also called rolling average, rolling mean or running average, is a type of finite impulse response filter used to analyze a set of data points by creating a series of averages of different subsets of the full data set.

The first element of the moving average is obtained by taking the average of the initial fixed subset of the number series. Then the subset is modified by "shifting forward", that is excluding the first number of the series and including the next number following the original subset in the series. This creates a new subset of numbers, which is averaged. This process is repeated over the entire data series. The plot line connecting all the (fixed) averages is the moving average. A moving average is a set of numbers, each of which is the average of the corresponding subset of a larger set of data points. A moving average may also use unequal weights for each data value in the subset to emphasize particular values in the subset.

A moving average is commonly used with time series data to smooth out short-term fluctuations and highlight longer-term trends or cycles.

In the present analysis, moving means have been computed for 3, 5 and 7 year periods for various sites of Luni River Basin and shown in **Fig.5.3.4 & 5.3.5.**

5.3.6 Interpretation

5.3.6.1 Fitting of various statistical/mathematical models viz linear, logarithmic, exponential and polynomial reveals that values of R^2 range from 0.142 to 0.146 for Gandhav, and from 0.302 to 0.396 for Balotra, The values of R^2 are much less than 1, though Balotra shows a higher value of R^2. Though such low values of R^2 do not establish a definite trend, visually speaking a falling trend in observed annual runoff data is observed at Gandhav.

5.3.6.2 Moving mean analysis for Gandhav may not be much useful for the relatively short time series coupled with several years reporting zero runoff. The moving means for Balotra, corroborate the falling trend as visualized during statistical fitting mentioned above. A very elementary cyclicalness towards te latter part of the series is also observed at Gandhav.

5.3.7 Conclusion

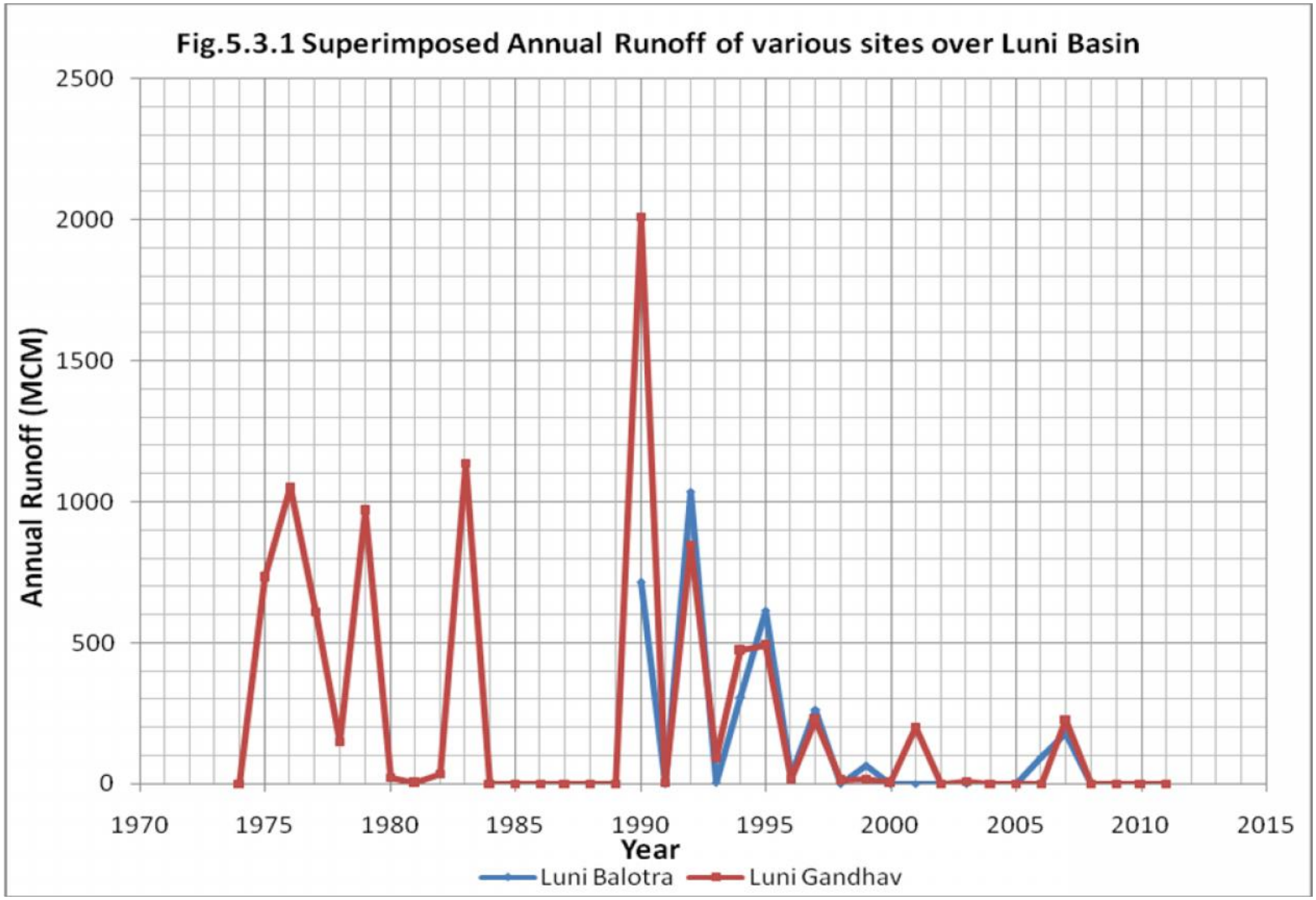
Statistically speaking, the annual runoff of river Luni, in general, appears to be a random variable; however values at Balotra reveal a decreasing trend of observed annual runoff. Elements of similar decreasing trend are also seen at Gandhav. A longer set of time series data may help establish conclusively trends, if any, in annual runoff in this basin.

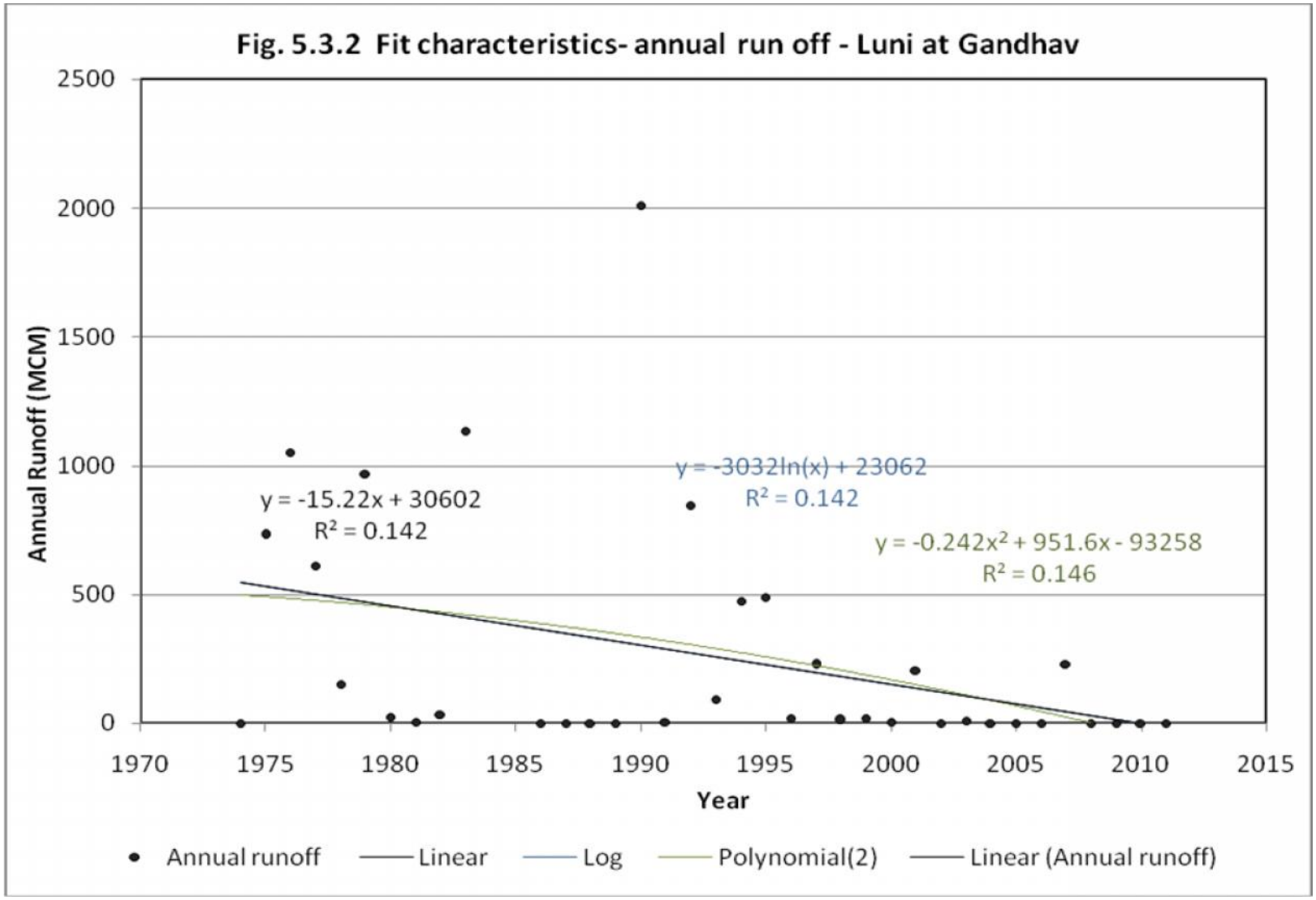
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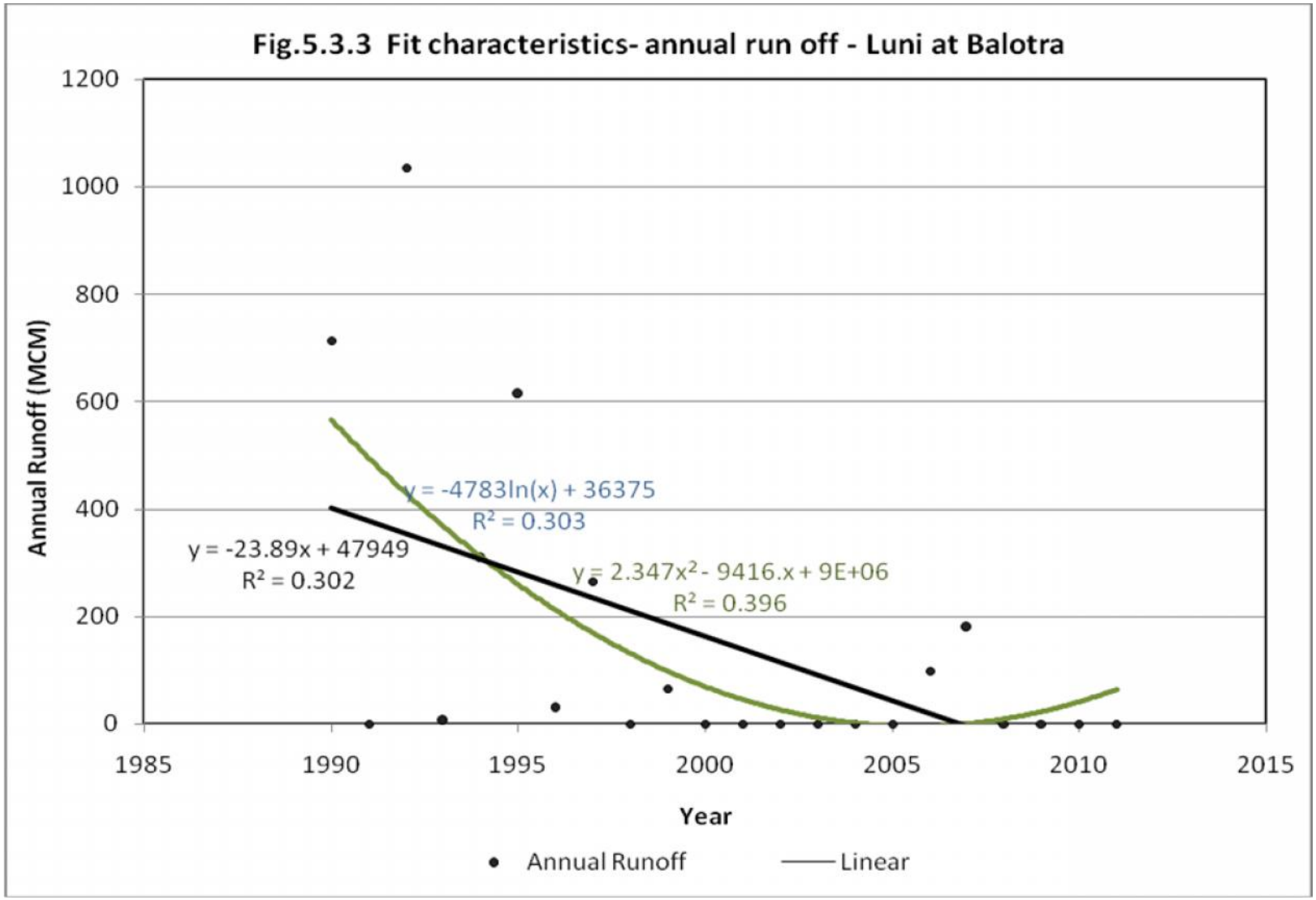
Annexure - I

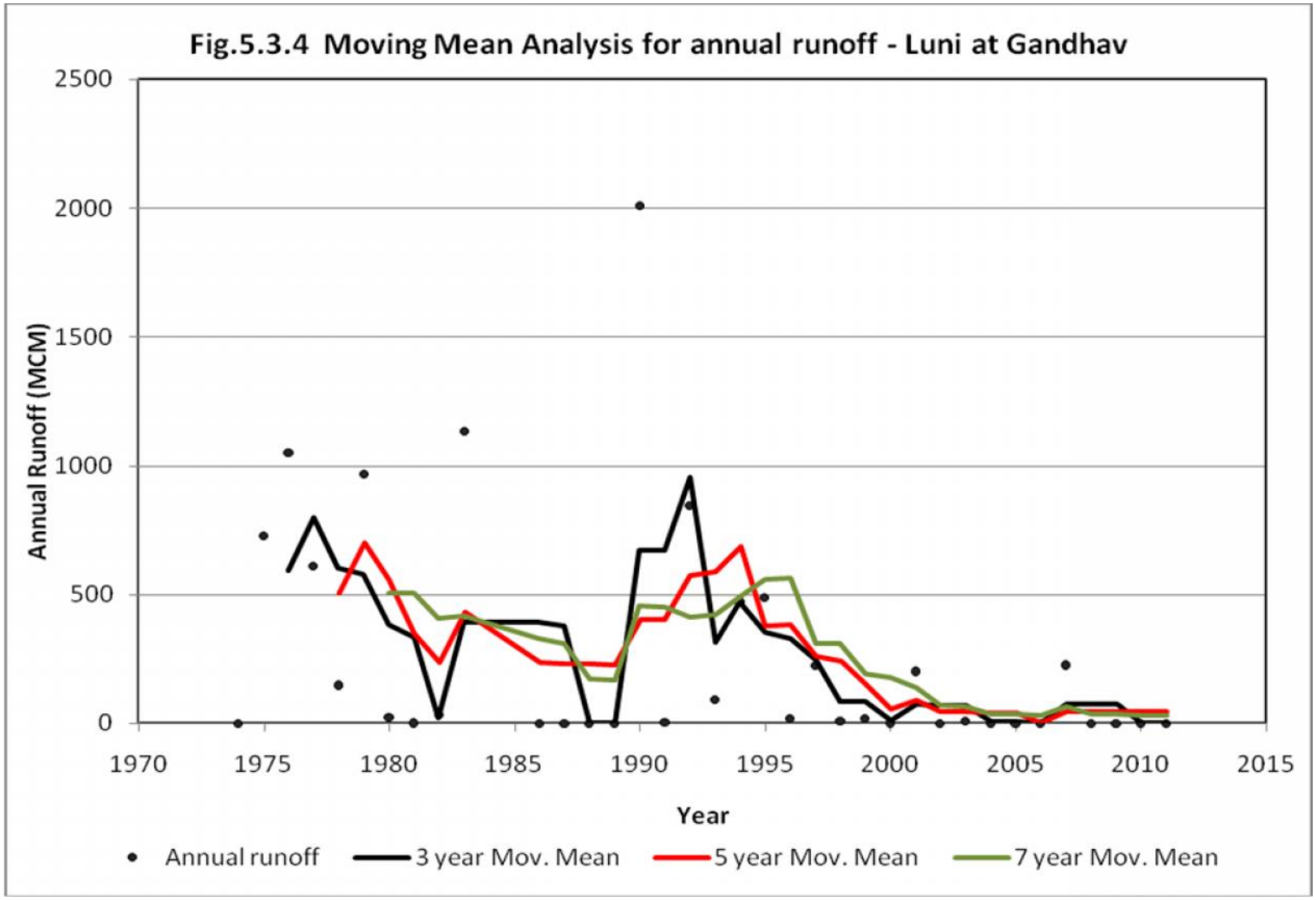
Annual Runoff at various sites over Luni Basin

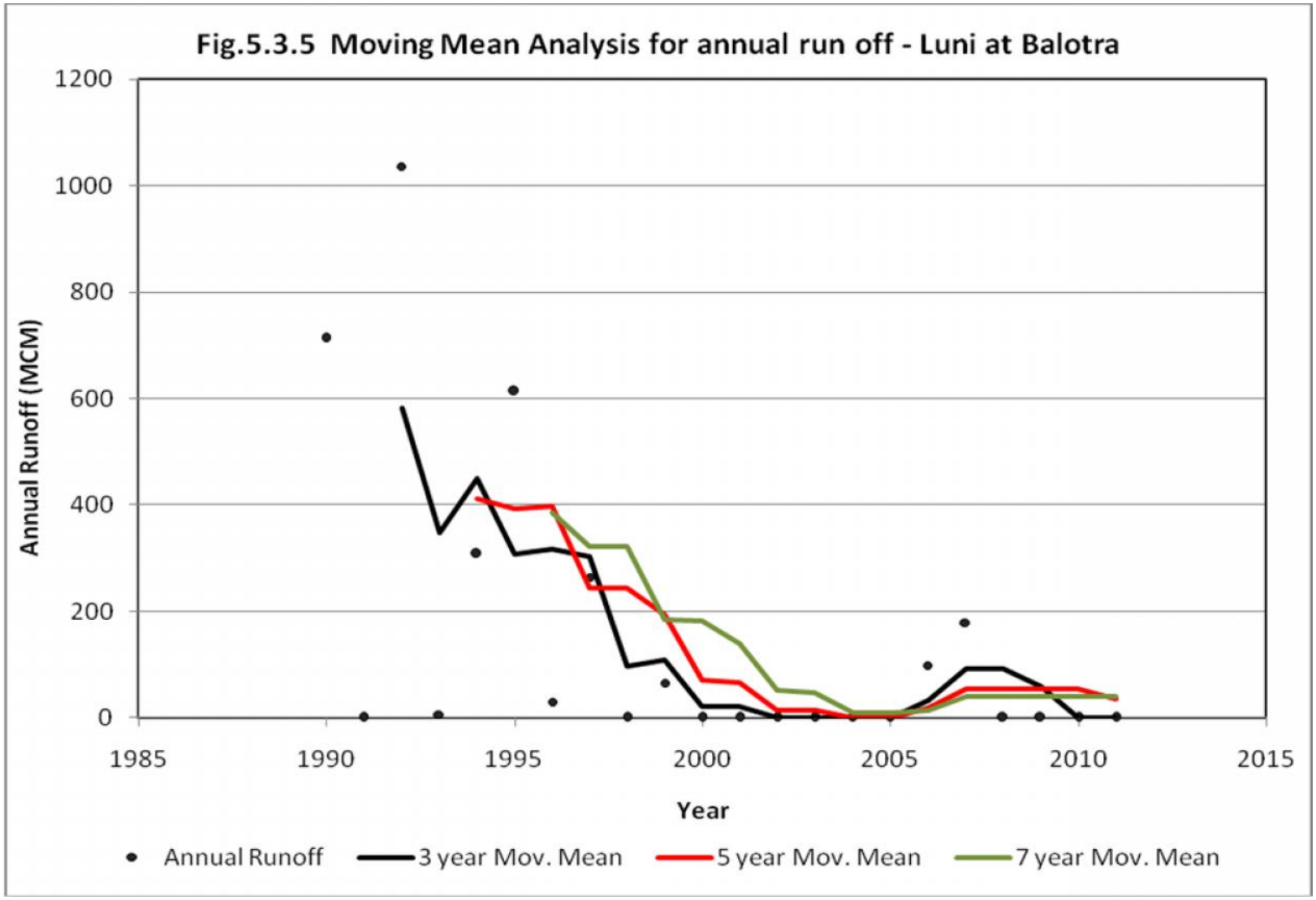
Year/Basin	Luni	Luni
Station	Balotra	Gandhav
1971		
1972		
1973		
1974		0
1975		730
1976		1052
1977		610
1978		149
1979		967
1980		23
1981		2
1982		34
1983		1135
1984		0
1985		0
1986		0
1987		0
1988		0
1989		0
1990	713	2010
1991	0	4
1992	1036	847
1993	5	92
1994	308	472
1995	614	489
1996	29	19
1997	264	226
1998	0	11
1999	65	17
2000	0	2
2001	0	203
2002	0	0
2003	0	9
2004	0	0
2005	0	0
2006	98	0
2007	179	227
2008	0	0
2009	0	0
2010	0	0
2011	0	0
MEAN	151	259
MEDIAN	0	14
STANDARD DEVAIATION	282.06	454.06
CO-EFFICIENT OF VARIATION	1.87	1.75


Fig.5.3.1 Superimposed Annual Runoff of various sites over Luni Basin
Annual Runoff (MCM)
2500
2000
1500
1000
500
0
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
Luni Balotra
Luni Gandhav


Fig. 5.3.2 Fit characteristics- annual run off - Luni at Gandhav
Annual Runoff (MCM)
2500
2000
1500
1000
500
0
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
y = -15.22x + 30602
R² = 0.142
y = -3032ln(x) + 23062
R² = 0.142
y = -0.242x² + 951.6x - 93258
R² = 0.146
Annual runoff
Linear
Log
Polynomial(2)
Linear (Annual runoff)


Fig.5.3.3 Fit characteristics- annual run off - Luni at Balotra
Annual Runoff (MCM)
1200
1000
800
600
400
200
0
1985
1990
1995
2000
2005
2010
2015
Year
y = -4783ln(x) + 36375
R² = 0.303
y = -23.89x + 47949
R² = 0.302
y = 2.347x² - 9416.x + 9E+06
R² = 0.396
Annual Runoff
Linear


Fig.5.3.4 Moving Mean Analysis for annual runoff - Luni at Gandhav
2500
2000
1500
1000
500
0
Annual Runoff (MCM)
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
Annual runoff
3 year Mov. Mean
5 year Mov. Mean
7 year Mov. Mean


Fig.5.3.5 Moving Mean Analysis for annual run off - Luni at Balotra
Annual Runoff (MCM)
1200
1000
800
600
400
200
0
1985
1990
1995
2000
2005
2010
2015
Year
Annual Runoff
3 year Mov. Mean
5 year Mov. Mean
7 year Mov. Mean

5.4 Trend Analysis - Banas Basin

5.4.1 Introduction

Trends are important indicators of the temporal variability of runoff as computed from observed discharge at site. By analyzing the time sequence of the runoff, we assess the magnitude and significance of the temporal variability. The present surface runoff trend study involves analysis of the temporal variability of data sets on the observed discharges in Banas basin using available data of existing river gauging stations.

5.4.2 Methodology

In the analysis of the trends of runoff on Banas River and its major tributary Balaram, annual runoff is computed and analyzed. The analysis is carried out for four (4) river gauging stations with sufficiently long and continuous data sets that are fairly representatively distributed across Banas river Basin.

Overall five stations have been considered in this study. The length of the data sets of river gauging station varies from 22 to 41 years. Subsequently, time series are analysed on various statistical parameters, fitting of mathematical equations, observing moving means for various period so as to find out if there are any trends in the annual runoff data.

5.4.3 Time series analysis

Time series is defined as a sequence of values arrayed in order of their occurrence which can be characterized by statistical properties. Time series analysis may be used to test the variability, homogeneity and trend of a stream flow series or simply to give an upright list the characteristics of the series as graphically displayed. Significant movements of time series are the secular, periodic, cyclic and irregular trends. A time series may display a tendency to increase or decrease, over a specified period. Such a series provides an interesting illustration because if the trend is usually predominant, virtually no other movements are discernible.

Various methods exist for analysis of time series such as moving averages, residual series, residual mass curves and balance. Trends may also be revealed by determining if observed stream flow follows some mathematical equation as a function of time.

In this chapter, first statistical parameters have been computed for time series data of annual runoff at different sites in Banas basin. It is also ascertained if any

mathematical equation can be fitted to the time series to assess predictability. Finally, the data is analysed by the method of moving means for various periods.

5.4.4 Availability of annual run off Data

There are 4 G&D sites in Banas Basin. Availability of annual runoff data for these sites is summarized in **Table -1** and superimposed graph of annual runoff is given under **Fig. 5.4.1.**

Table-1: Availability of Data

Sl.No.	Site name	River/Tributaries	Data availability	Total years
1	Chitrasani	Balaram	1990-91 to 2011-12	22
2	Abu Road	Banas	1989-90 to 2011-12	23
3	Kamalpur	Banas	1971-72 to 2011-12	41
4	Sarotry	Banas	1989-90 to 2011-12	23

The data is placed at **Annexure-1** and shown in line diagram in **Plate.2.4.2.**

5.4.5 Analysis

5.4.5.1 Statistical Analysis

Various statistical parameters of the time series of available data are given below in **Table-2**.

Table-2: Statistical parameters of Annual Runoff series at various sites

GD station	Data length (years)	Mean (MCM)	Median (MCM)	SD (MCM)	Coeff. Of variation
Chitrasani	22	35	12	46.32	1.33
Abu Road	23	123	42	172.11	1.40
Kamalpur	41	343	96	657.72	1.92
Sarotry	23	312	72	575.34	1.84

5.4.5.2 Fit characteristics

In order to find out if any mathematical equation represents the time series as a function of time, fitting of various types of equations viz. linear, logarithmic, exponential and polynomial have been attempted. Results of such fits are given in the **Table- 3** and shown in **Fig.5.4.2 through 5.4.5**.

Table-3: Fit Characteristics

Sl.No.	Site	Function Type	Fitted Equation	R^2
1	Chitrasani	Linear	$y = -0.733x + 1502$	0.010
		Logarithmic	$y = -1477 \ln(x) + 11259$	0.010
		Polynomial	$y = 0.563x^2 - 2253 x + 2E+06$	0.210
		Exponential	$y = 1E+34e^{-0.03x}$	0.015
2	Abu Road	Linear	$y = -6.506x + 13127$	0.059
		Logarithmic	$y = -1302\ln(x) + 99114$	0.059
		Polynomial	$y = 0.925x^2 - 3707.x + 4E+06$	0.097
		Exponential	$y = 2E+50e^{-0.05x}$	0.046
3	Kamalpur	Linear	$y = -9.213x + 18670$	0.029
		Logarithmic	$y = -1831 \ln(x) + 13945$	0.029
		Polynomial	$y = -0.5 x^2 + 1984x - 2E+06$	0.038
4	Sarotry	Linear	$y = -21.72x + 43770$	0.065
		Logarithmic	$y = -4349 \ln(x) + 33089$	0.065
		Polynomial	$y = 2.015x^2 - 8085x + 8E+06$	0.085
		Exponential	$y = 3E+60e^{-0.06x}$	0.065

5.4.5.3 Moving Mean Analysis

In statistics, a moving mean (average), also called rolling average, rolling mean or running average, is a type of finite impulse response filter used to analyze a set of data points by creating a series of averages of different subsets of the full data set.

The first element of the moving average is obtained by taking the average of the initial fixed subset of the number series. Then the subset is modified by "shifting forward", that is excluding the first number of the series and including the next number following the original subset in the series. This creates a new subset of numbers, which is averaged. This process is repeated over the entire data series. The plot line connecting all the (fixed) averages is the moving average. A moving average is a set of numbers, each of which is the average of the corresponding subset of a larger set of data points. A moving average may also use unequal weights for each data value in the subset to emphasize particular values in the subset.

A moving average is commonly used with time series data to smooth out short-term fluctuations and highlight longer-term trends or cycles.

In the present analysis, moving means have been computed for 3, 5 and 7 year periods for various sites of Banas River Basin and shown in **Fig.5.4.6 through 5.4.9**.

5.4.6 Interpretation

5.4.6.1 Fitting of various statistical/mathematical models viz linear, logarithmic, exponential and polynomial reveals that values of R^2 range from 0.029 to 0.038 for Kamalpur, from 0.010 to 0.210 for Chitrasani, from 0.065 to 0.085 for Sarotry, and from 0.012 to 0.106 for Abu Road. The values of R^2 are quite close to 0 indicating absence of any significant trend.

5.4.6.2 Moving mean analaysis of annual runoff performed over sites in Banas basin reveals elements of periodicities present in the data. Significant cyclicalness is observed in the data of site Kamalpur which has relatively longer time series in comparison with other sites. Though the moving mean analysis has brought out signatures of periodicities present in the data, only longer time series at all the sites may help conclude presence of definite cyclic nature of annual runoff data of Banas basin. .

5.4.7 Conclusion

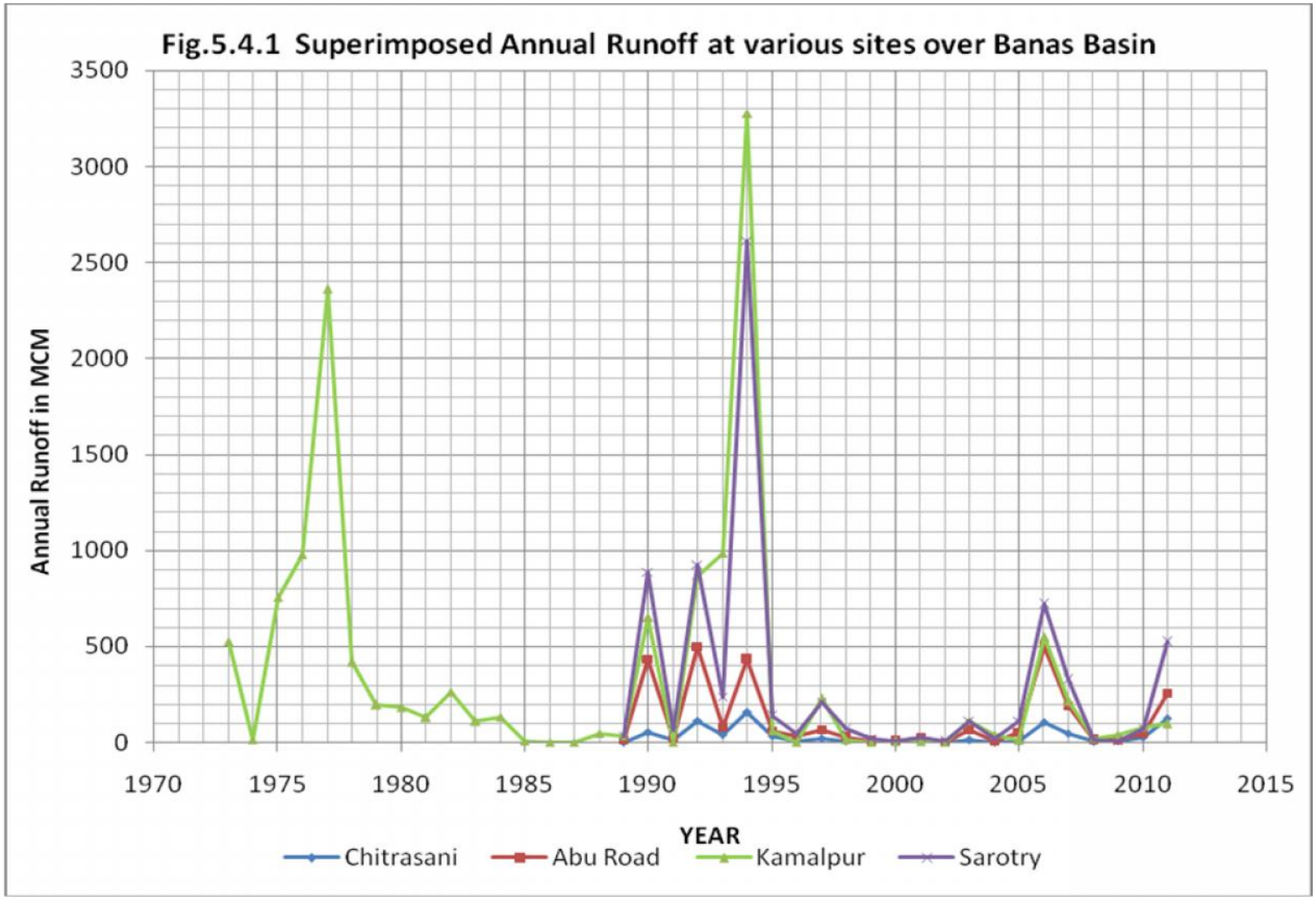
Statistically speaking, the annual runoff of river Banas and its tributary Balaram, in general, appears to be a random variable; however moving mean analysis reveals elements of cyclicalness. A longer set of time series data may help identify trends in annual runoff, if any, on definitive basis.

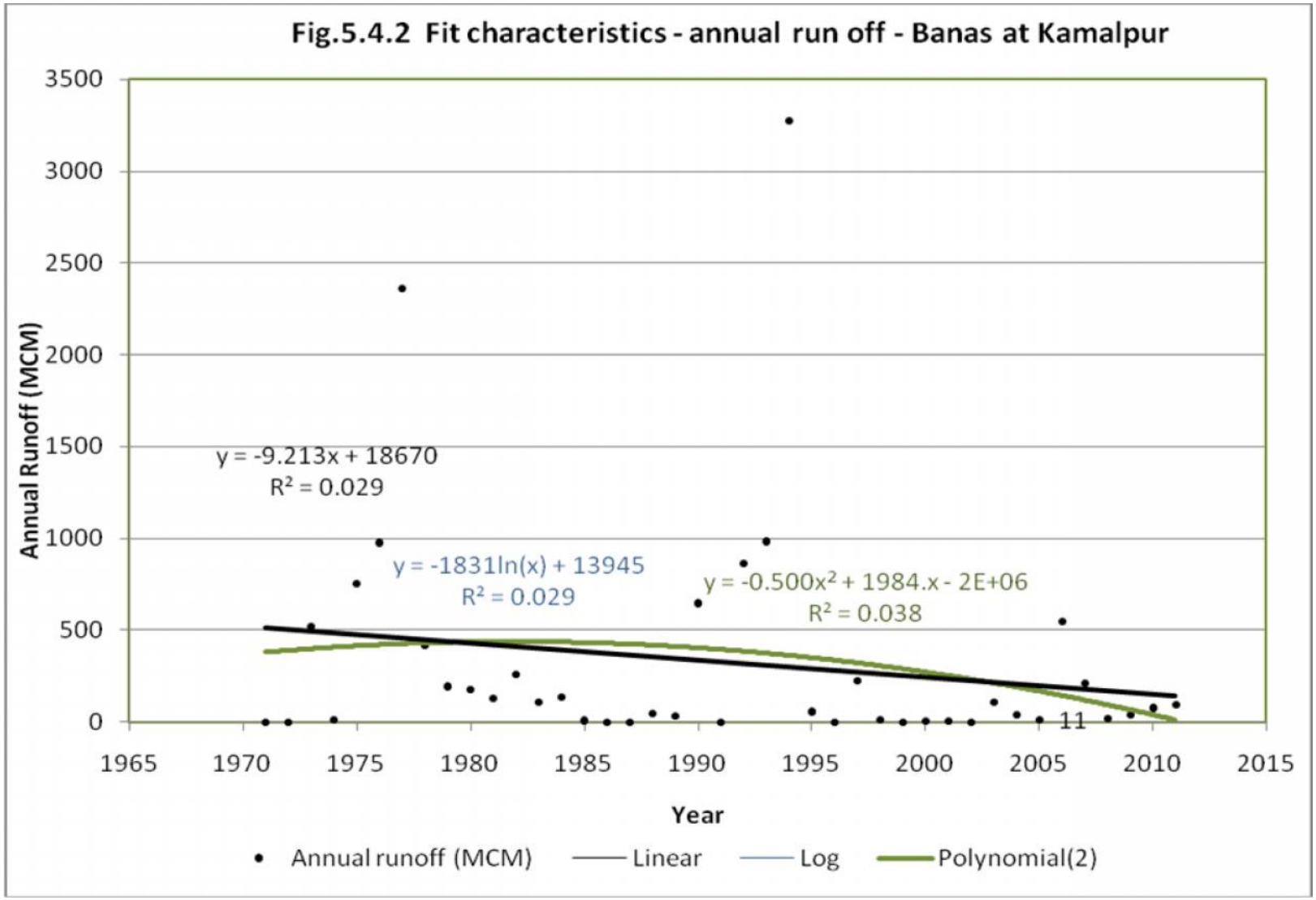
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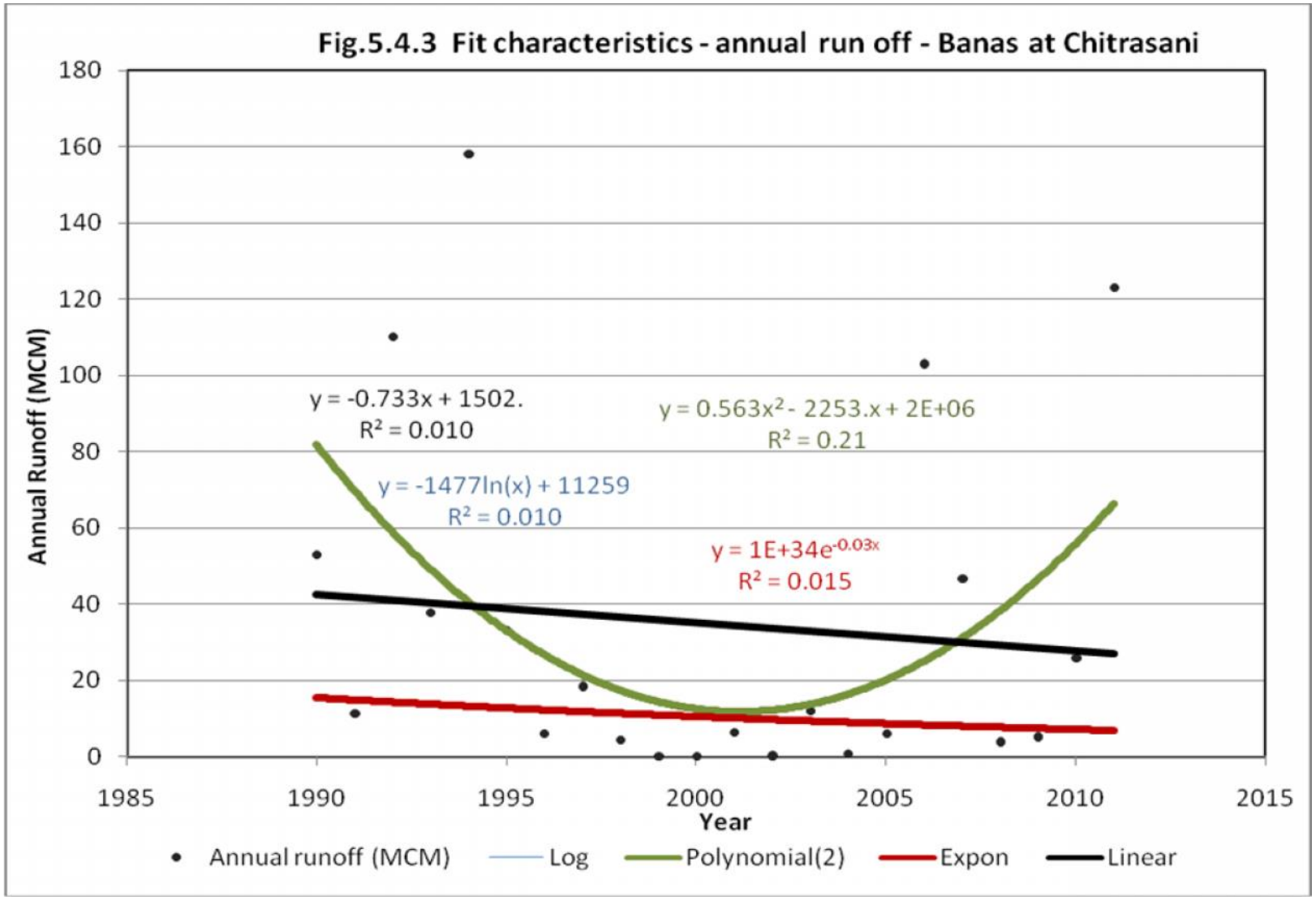
Annexure - 3

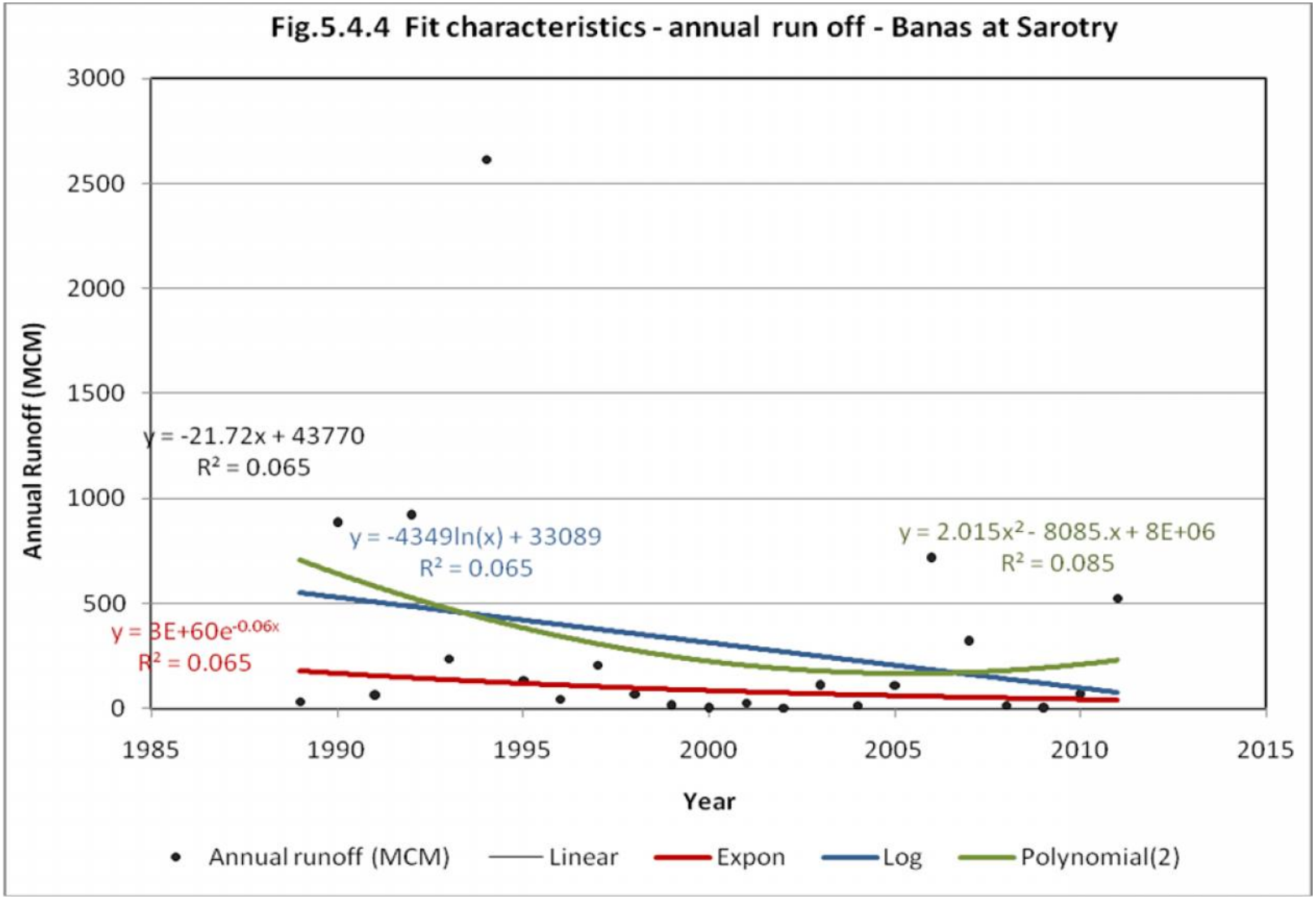
Annual Runoff at various sites over Banas Basin

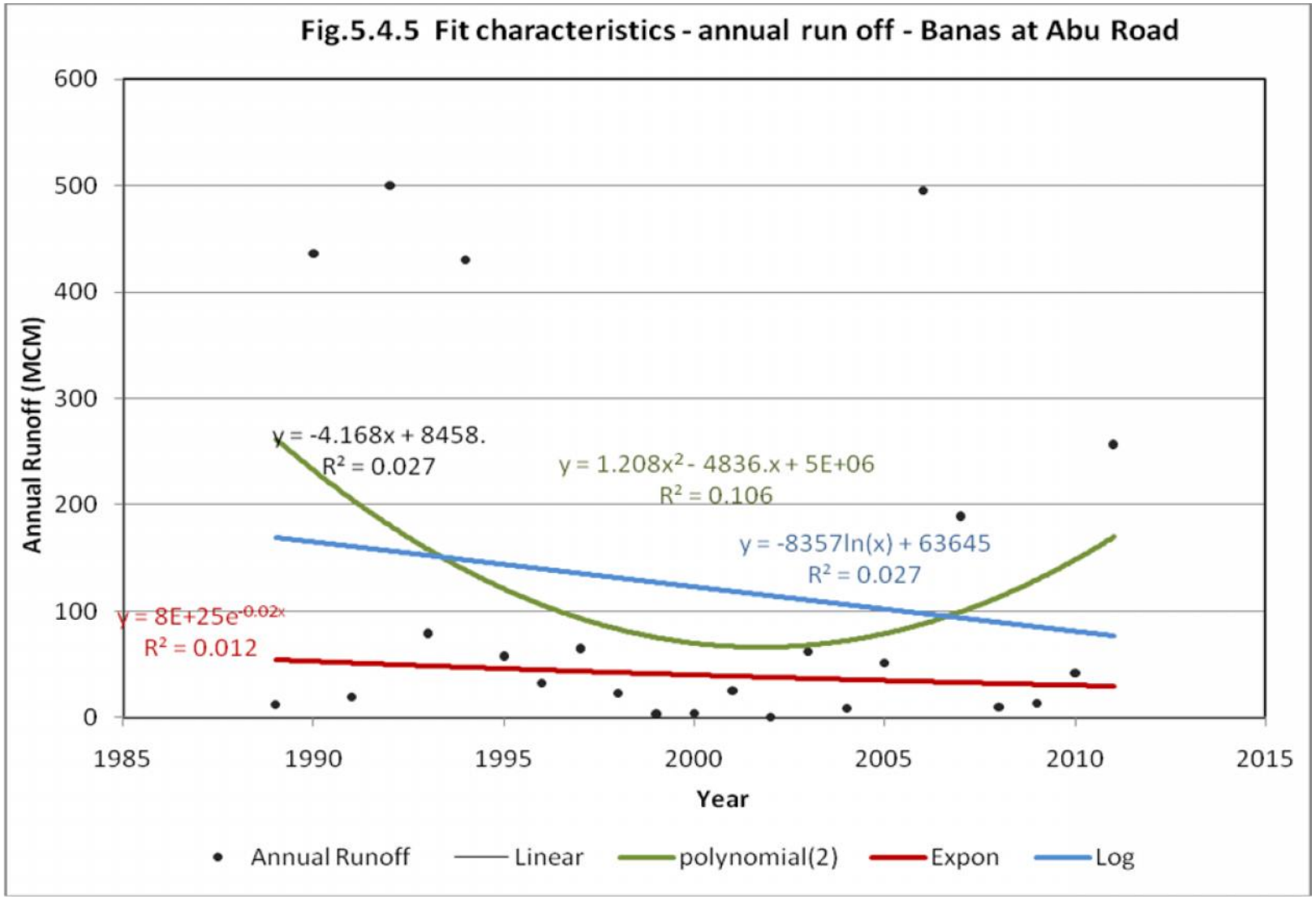
Year	Chitrasani	Abu Road	Kamalpur	Sarotry
1971				
1972				
1973			524	
1974			12	
1975			754	
1976			977	
1977			2360	
1978			416	
1979			194	
1980			180	
1981			129	
1982			261	
1983			108	
1984			134	
1985			9	
1986			0	
1987			0	
1988			46	
1989		13	34	35
1990	53	436	648	888
1991	11	20	1	66
1992	110	500	865	924
1993	38	79	984	237
1994	158	430	3275	2612
1995	33	58	58	135
1996	6	33	0	47
1997	19	65	226	209
1998	4	23	12	70
1999	0	4	0	19
2000	0	4	4	6
2001	6	26	4	27
2002	0	1	0	4
2003	12	63	112	114
2004	1	9	42	16
2005	6	52	11	112
2006	103	496	551	720
2007	47	190	214	325
2008	4	10	18	16
2009	5	14	42	6
2010	26	42	78	72
2011	123	257	96	523
MEAN	35	123	343	312
MEDIAN	12	42	96	72
STANDARD DEVAIATION	46.32	172.11	657.72	575.34
CO-EFFICIENT OF VARIATION	1.33	1.40	1.92	1.84

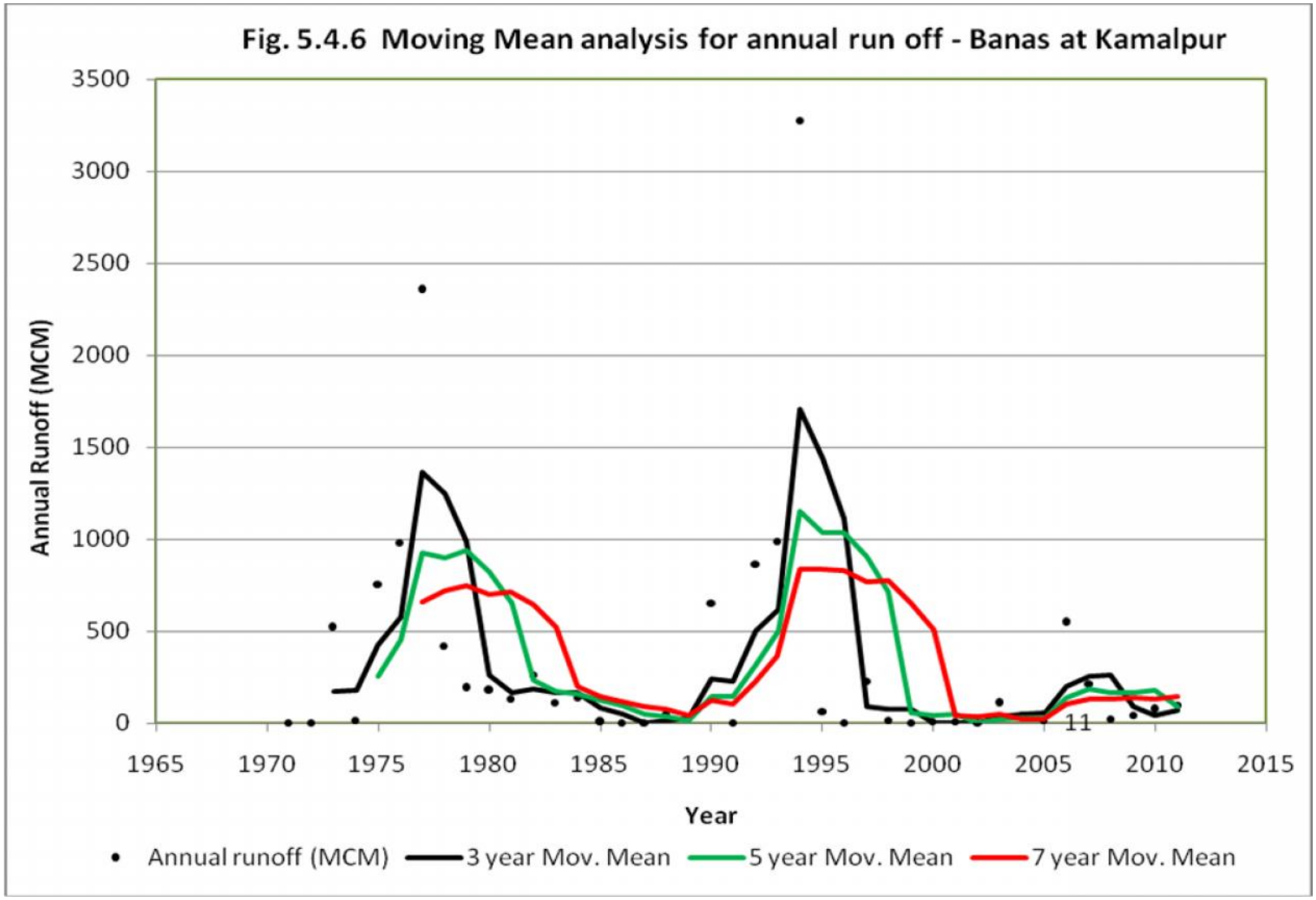

Fig.5.4.1 Superimposed Annual Runoff at various sites over Banas Basin
Annual Runoff in MCM
3500
3000
2500
2000
1500
1000
500
0
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
YEAR
Chitrasani
Abu Road
Kamalpur
Sarotry

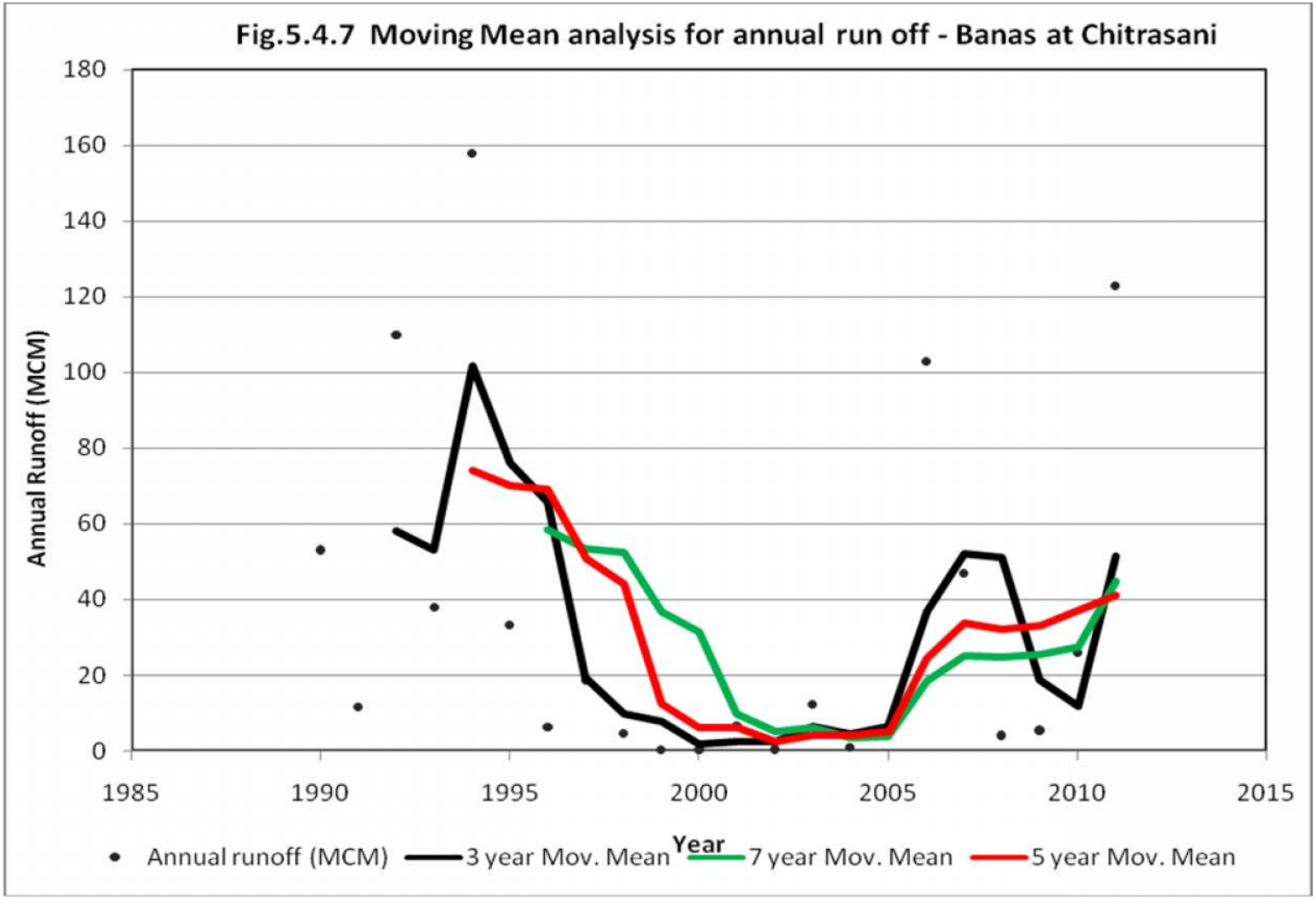

Fig.5.4.2 Fit characteristics - annual run off - Banas at Kamalpur
Annual Runoff (MCM)
3500
3000
2500
2000
1500
1000
500
0
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
y = -9.213x + 18670
R² = 0.029
y = -1831ln(x) + 13945
R² = 0.029
y = -0.500x² + 1984.x - 2E+06
R² = 0.038
11
Annual runoff (MCM)
Linear
Log
Polynomial(2)

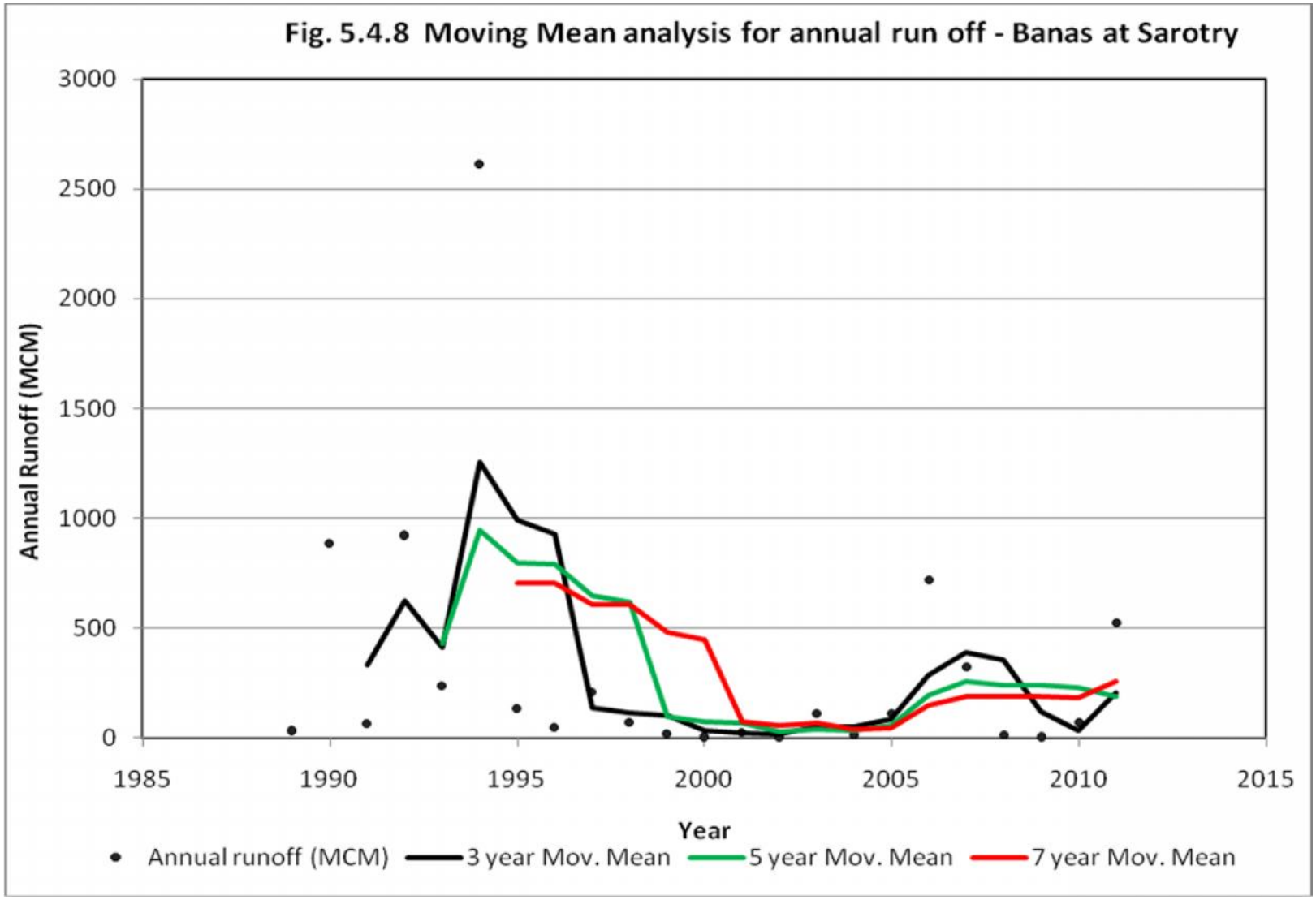

Fig.5.4.3 Fit characteristics - annual run off - Banas at Chitrasani
Annual Runoff (MCM)
180
160
140
120
100
80
60
40
20
0
1985
1990
1995
2000
2005
2010
2015
Year
y = -0.733x + 1502.
R² = 0.010
y = 0.563x² - 2253.x + 2E+06
R² = 0.21
y = -1477ln(x) + 11259
R² = 0.010
y = 1E+34e^-0.03x
R² = 0.015
Annual runoff (MCM)
Log
Polynomial(2)
Expon
Linear

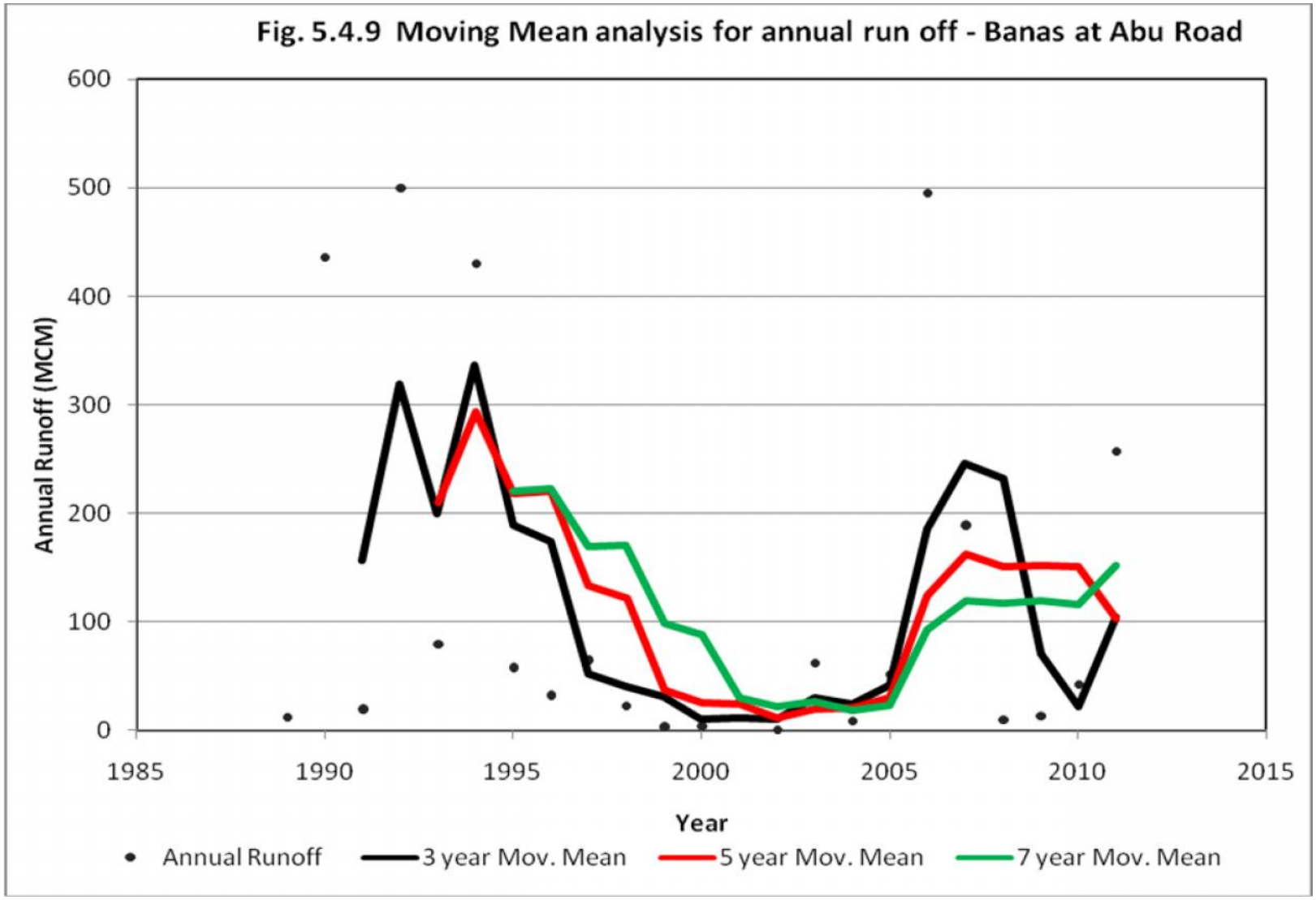

Fig.5.4.4 Fit characteristics - annual run off - Banas at Sarotry
Annual Runoff (MCM)
3000
2500
2000
1500
1000
500
0
1985
1990
1995
2000
2005
2010
2015
Year
y = -21.72x + 43770
R² = 0.065
y = -4349ln(x) + 33089
R² = 0.065
y = 2.015x² - 8085.x + 8E+06
R² = 0.085
y = 3E+60e^-0.06x
R² = 0.065
Annual runoff (MCM)
Linear
Expon
Log
Polynomial(2)


Fig.5.4.5 Fit characteristics - annual run off - Banas at Abu Road
Annual Runoff (MCM)
600
500
400
300
200
100
0
1985
1990
1995
2000
2005
2010
2015
Year
y = -4.168x + 8458.
R² = 0.027
y = 1.208x² - 4836.x + 5E+06
R² = 0.106
y = -8357ln(x) + 63645
R² = 0.027
y = 8E+25e^-0.02x
R² = 0.012
Annual Runoff
Linear
polynomial(2)
Expon
Log


Fig. 5.4.6 Moving Mean analysis for annual run off - Banas at Kamalpur
Annual Runoff (MCM)
3500
3000
2500
2000
1500
1000
500
0
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
Annual runoff (MCM)
3 year Mov. Mean
5 year Mov. Mean
7 year Mov. Mean


Fig.5.4.7 Moving Mean analysis for annual run off - Banas at Chitrasani
Annual Runoff (MCM)
180
160
140
120
100
80
60
40
20
0
1985
1990
1995
2000
2005
2010
2015
Year
Annual runoff (MCM)
3 year Mov. Mean
7 year Mov. Mean
5 year Mov. Mean


Fig. 5.4.8 Moving Mean analysis for annual run off - Banas at Sarotry
3000
2500
2000
1500
1000
500
0
Annual Runoff (MCM)
1985
1990
1995
2000
2005
2010
2015
Year
Annual runoff (MCM)
3 year Mov. Mean
5 year Mov. Mean
7 year Mov. Mean


Fig. 5.4.9 Moving Mean analysis for annual run off - Banas at Abu Road
600
500
400
300
200
100
0
Annual Runoff (MCM)
1985
1990
1995
2000
2005
2010
2015
Year
Annual Runoff
3 year Mov. Mean
5 year Mov. Mean
7 year Mov. Mean

5.5 Trend Analysis - Shetrunji Basin

5.5.1 Introduction

Trends are important indicators of the temporal variability of runoff as computed from observed discharge at site. By analyzing the time sequence of the runoff, we assess the magnitude and significance of the temporal variability. The present surface runoff trend study involves analysis of the temporal variability of data sets on the observed discharges in Shetrunji basin using available data of existing river gauging stations.

5.5.2 Methodology

In the analysis of the trends of runoff on Shetrunji River annual runoff is computed and analyzed. The analysis is carried out for one (1) river gauging stations with sufficiently long and continuous data sets that are fairly representatively distributed across Sherunji river Basin.

Overall one station has been considered in this study. The data set of river gauging station is 41years. Subsequently, time series are analysed on various statistical parameters, fitting of mathematical equations, observing moving means for various period so as to find out if there are any trends in the annual runoff data.

5.5.3 Time series analysis

Time series is defined as a sequence of values arrayed in order of their occurrence which can be characterized by statistical properties. Time series analysis may be used to test the variability, homogeneity and trend of a stream flow series or simply to give an upright list the characteristics of the series as graphically displayed. Significant movements of time series are the secular, periodic, cyclic and irregular trends. A time series may display a tendency to increase or decrease, over a specified period. Such a series provides an interesting illustration because if the trend is usually predominant, virtually no other movements are discernible.

Various methods exist for analysis of time series such as moving averages, residual series, residual mass curves and balance. Trends may also be revealed by determining if observed stream flow follows some mathematical equation as a function of time.

In this chapter, first statistical parameters have been computed for time series data of annual runoff at different sites in Shetrunji basin. It is also ascertained if any mathematical equation can be fitted to the time series to assess predictability. Finally, the data is analysed by the method of moving means for various periods.

5.5.4 Availability of annual run off Data

There is 1 G&D site in Shetrunji Basin. Availability of annual runoff data for this site is summarized in **Table -1** and graph of Annual runoff for the entire year is given in **Fig.5.5.1.**

Table-1: Availability of Data

Sl.No.	Site name	River/Tribu.	Data availability	Total years
1	Lowara	Shetrunji	1971-72 to 2011-12	41

The data is placed at **Annexure-1** and shown in line diagram in **Plate.2.5.2.**

5.5.5 Analysis

5.5.5.1 Statistical Analysis

Various statistical parameters of the time series of available data are given below in **Table-2**.

Table-2: Statistical parameters of Annual Runoff series at various sites

GD station	Data length (years)	Mean (MCM)	Median (MCM)	SD (MCM)	Coeff. Of variation
Lowara	41	280	177	312.56	1.12

5.5.5.2 Fit characteristics

In order to find out if any mathematical equation represents the time series as a function of time, fitting of various types of equations viz. linear, logarithmic, exponential and polynomial have been attempted. Results of such fits are given in the **Table- 3** and shown in **Fig 5.5.2.**

Table-3: Fit Characteristics

Sl.No.	**Site**	**Function Type**	**Fitted Equation**	**R^2**
1	Lowara	Linear	$y = 10.06x - 19758$	0.148
		Logarithmic	$y = 19992 \ln(x) - 15158$	0.148
		Polynomial	$y = 0.824x^2 - 3271x + 3E+06$	0.260

5.5.5.3 Moving Mean Analysis

In statistics, a moving mean (average), also called rolling average, rolling mean or running average, is a type of finite impulse response filter used to analyze a set of data points by creating a series of averages of different subsets of the full data set.

The first element of the moving average is obtained by taking the average of the initial fixed subset of the number series. Then the subset is modified by "shifting forward", that is excluding the first number of the series and including the next number following the original subset in the series. This creates a new subset of numbers, which is averaged. This process is repeated over the entire data series. The plot line connecting all the (fixed) averages is the moving average. A moving average is a set of numbers, each of which is the average of the corresponding subset of a larger set of data points. A moving average may also use unequal weights for each data value in the subset to emphasize particular values in the subset.

A moving average is commonly used with time series data to smooth out short-term fluctuations and highlight longer-term trends or cycles.

In the present analysis, moving means have been computed for 3, 5 and 7 year periods for various sites of Shetrunji River Basin and shown in **Fig. 5.5.3**.

5.5.6 Interpretation

5.5.6.1 Fitting of various statistical/mathematical models viz linear, logarithmic, exponential and polynomial reveals that values of R^2 range from 0.148 to 0.260 for Lowara. The value of R^2 is much less than1, indicating absence of any significant trend.

5.5.6.2 There is only one site having 41 years of annual runoff data. Moving mean analysis shows elements of periodicity in the data. As we increase the period of moving mean, the yearly variations are smoothened out and periodicity begins to be evident. A longer time series data is required to conclude existence of periodicity.

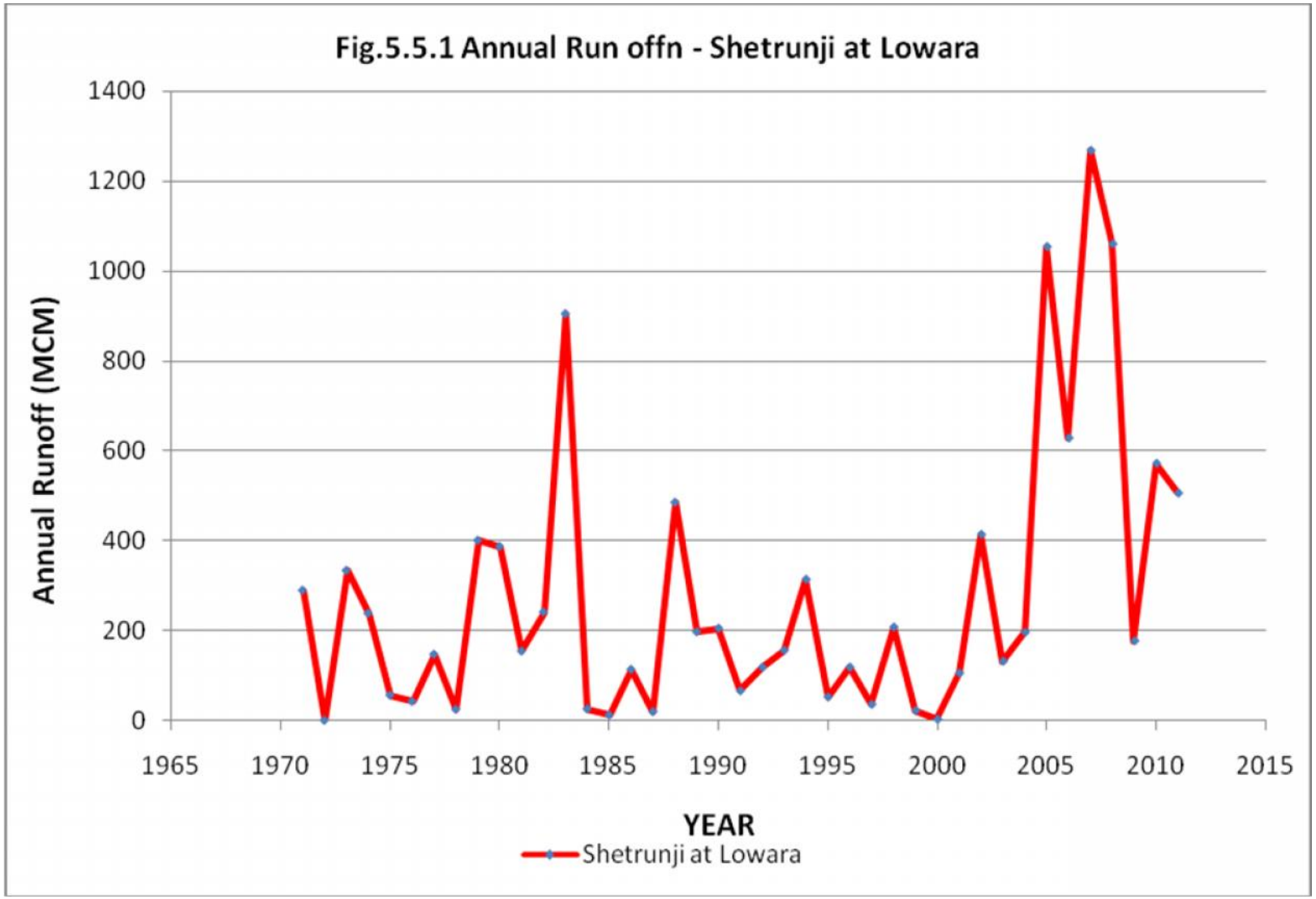
5.5.7 Conclusion

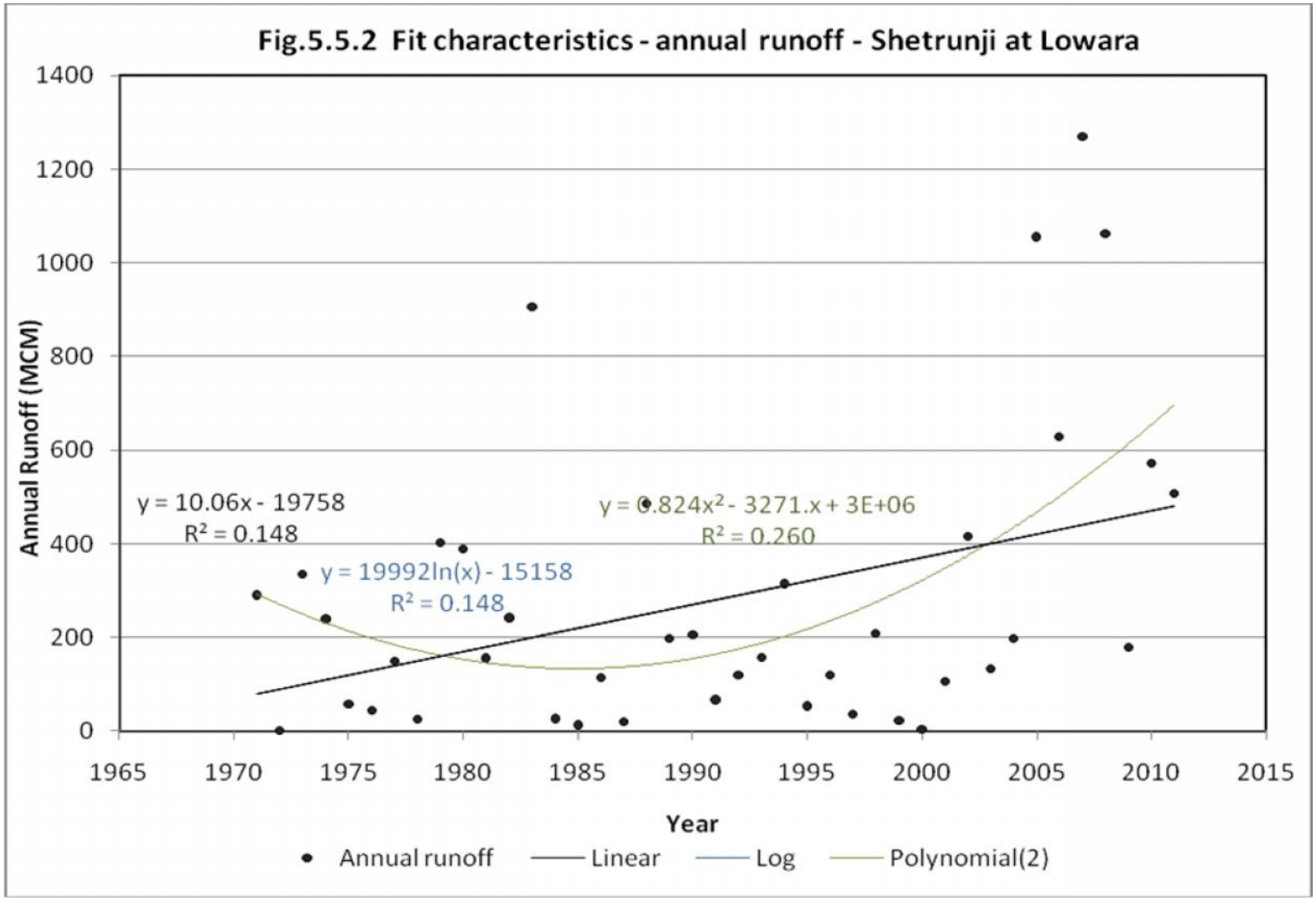
Statistically speaking, the annual runoff of river Shetrunji River in general, appears to be a random variable; however moving mean analysis shows rising trend from year 2000 onwards. A longer set of time series data may help identify trends in annual runoff, if any on definitive basis.

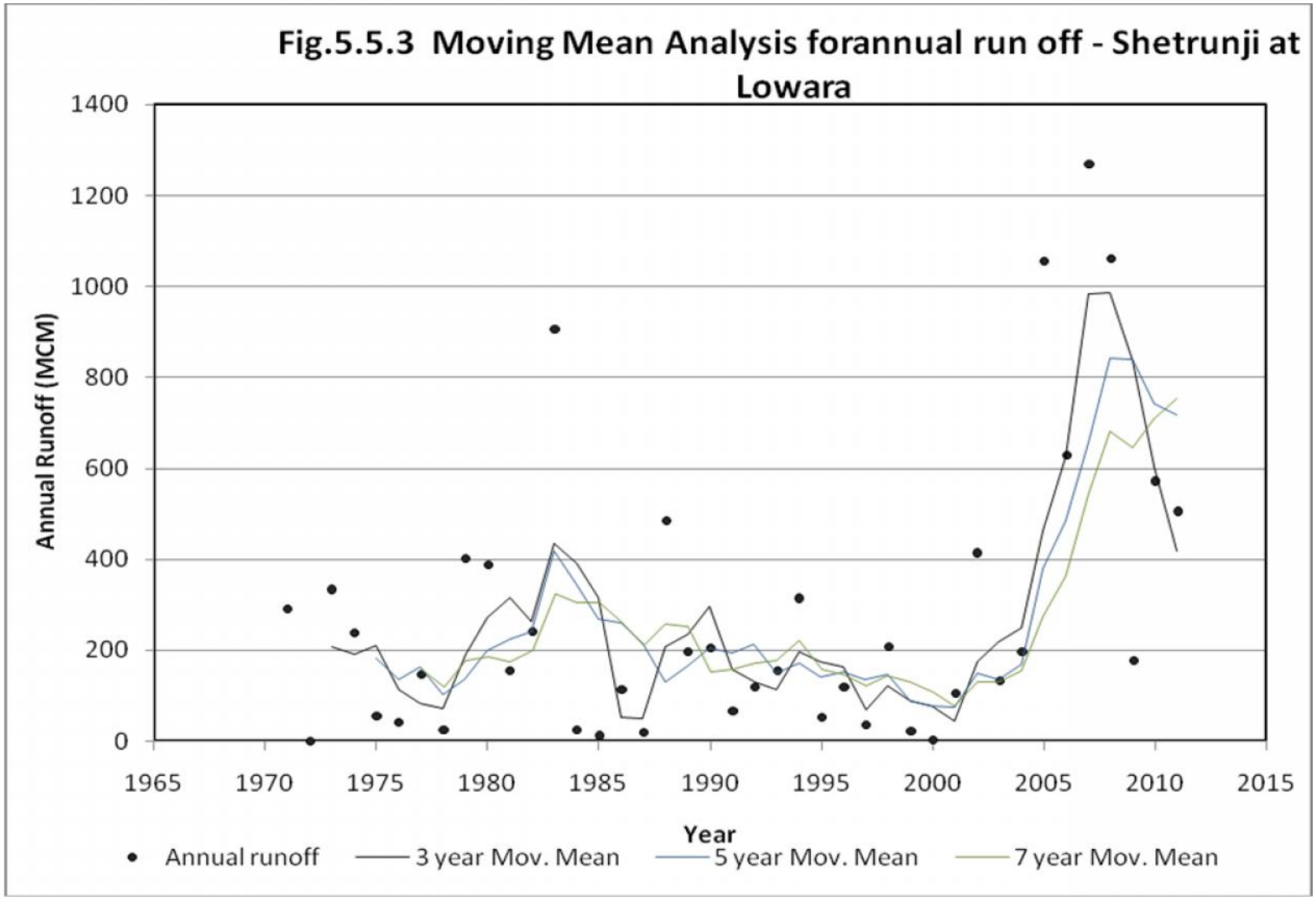
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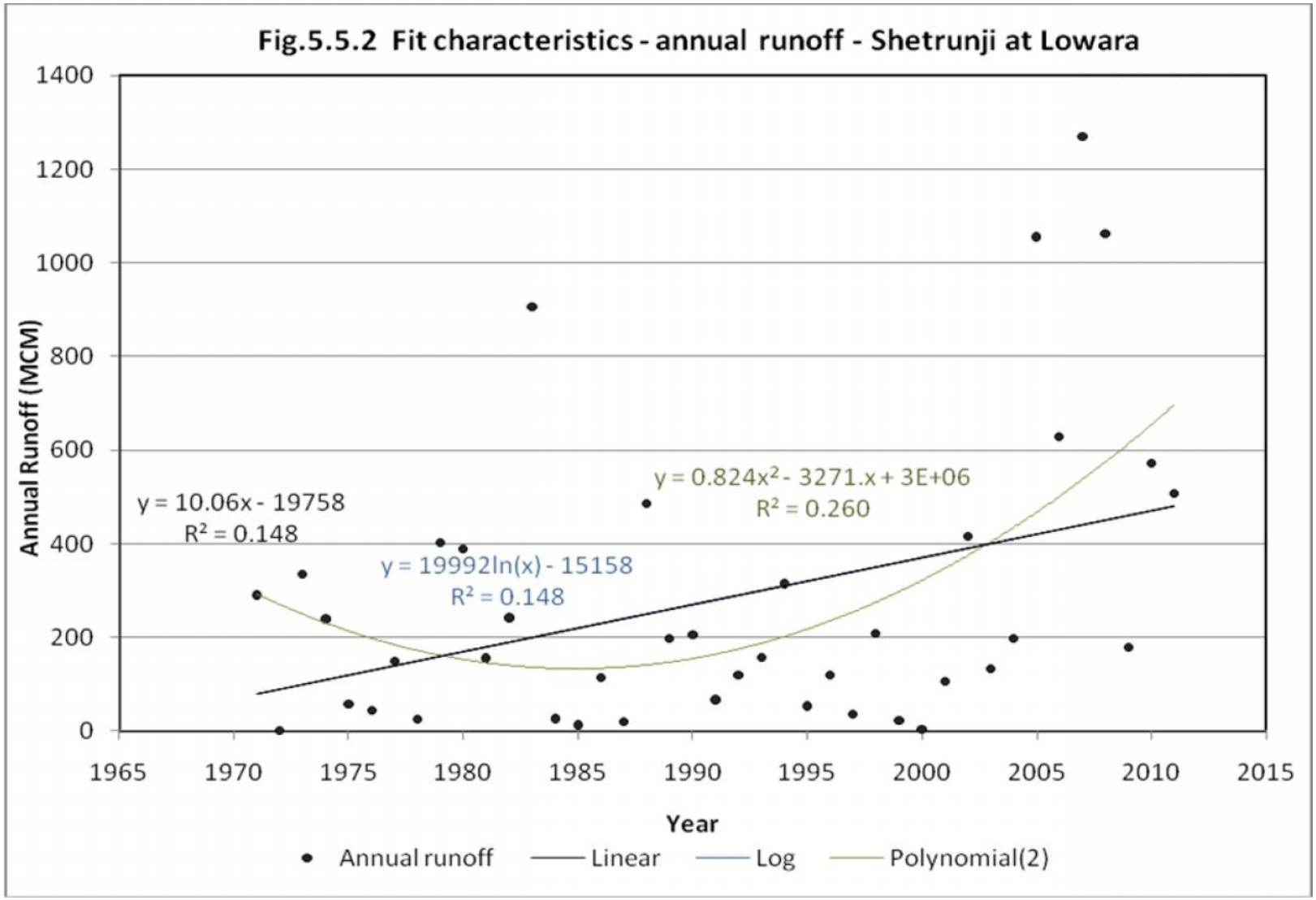
Annual Runoff (MCM) data at site in Shetrunji basin

Year	Shetrunji at Lowara
1971	290
1972	0
1973	334
1974	238
1975	56
1976	42
1977	147
1978	24
1979	401
1980	387
1981	154
1982	241
1983	906
1984	26
1985	12
1986	113
1987	19
1988	485
1989	197
1990	205
1991	66
1992	118
1993	156
1994	314
1995	52
1996	118
1997	35
1998	208
1999	21
2000	2
2001	105
2002	414
2003	132
2004	196
2005	1055
2006	629
2007	1269
2008	1061
2009	177
2010	572
2011	506
MEAN	280
MEDIAN	177
STANDARD DEVAIATION	312.56
CO-EFFICIENT OF VARIATION	1.12


Fig.5.5.1 Annual Run offn - Shetrunji at Lowara
Annual Runoff (MCM)
1400
1200
1000
800
600
400
200
0
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
YEAR
Shetrunji at Lowara


Fig.5.5.2 Fit characteristics - annual runoff - Shetrunji at Lowara
Annual Runoff (MCM)
1400
1200
1000
800
600
400
200
0
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
y = 10.06x - 19758
R² = 0.148
y = 19992ln(x) - 15158
R² = 0.148
y = 0.824x² - 3271.x + 3E+06
R² = 0.260
Annual runoff
Linear
Log
Polynomial(2)


Fig.5.5.3 Moving Mean Analysis forannual run off - Shetrunji at Lowara
Annual Runoff (MCM)
1400
1200
1000
800
600
400
200
0
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
Annual runoff
3 year Mov. Mean
5 year Mov. Mean
7 year Mov. Mean


Fig.5.5.2 Fit characteristics - annual runoff - Shetrunji at Lowara
Annual Runoff (MCM)
1400
1200
1000
800
600
400
200
0
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
y = 10.06x - 19758
R² = 0.148
y = 0.824x² - 3271.x + 3E+06
R² = 0.260
y = 19992ln(x) - 15158
R² = 0.148
Annual runoff
Linear
Log
Polynomial(2)

5.6 Trend Analysis - Bhadar Basin

5.6.1 Introduction

Trends are important indicators of the temporal variability of runoff as computed from observed discharge at site. By analyzing the time sequence of the runoff, we assess the magnitude and significance of the temporal variability. The present surface runoff trend study involves analysis of the temporal variability of data sets on the observed discharges in Bhadar basin using available data of existing river gauging stations.

5.6.2 Methodology

In the analysis of the trends of runoff on Bhadar River, annual runoff is computed and analyzed. The analysis is carried out for one (1) river gauging stations with sufficiently long and continuous data sets that are fairly representatively distributed across Bhadar river Basin.

Overall one station has been considered in this study. The length of the data sets of river gauging station is 41 years. Subsequently, time series are analysed on various statistical parameters, fitting of mathematical equations, observing moving means for various period so as to find out if there are any trends in the annual runoff data.

5.6.3 Time series analysis

Time series is defined as a sequence of values arrayed in order of their occurrence which can be characterized by statistical properties. Time series analysis may be used to test the variability, homogeneity and trend of a stream flow series or simply to give an upright list the characteristics of the series as graphically displayed. Significant movements of time series are the secular, periodic, cyclic and irregular trends. A time series may display a tendency to increase or decrease, over a specified period. Such a series provides an interesting illustration because if the trend is usually predominant, virtually no other movements are discernible. Various methods exist for analysis of time series such as moving averages, residual series, residual mass curves and balance. Trends may also be revealed by determining if observed stream flow follows some mathematical equation as a function of time.

In this chapter, first statistical parameters have been computed for time series data of annual runoff at different sites in Bhadar basin. It is also ascertained if any mathematical equation can be fitted to the time series to assess predictability. Finally, the data is analysed by the method of moving means for various periods.

5.6.4 Availability of annual run off Data

There is one G&D site in Bhadar Basin. Availability of annual runoff data for this site is summarized in **Table -1** and annual runoff graph for the entire data series is given in **Fig. 5.6.1.**

Table-1: Availability of Data

Sl.No.	Site name	River/Tribu.	Data availability	Total years
1	Ganod	Bhadar	1971-72 to 2011-12	41

The data is placed at **Annexure-1** and shown in line diagram in **Plate. 2.6.2.**

5.6.5 Analysis

5.6.5.1 Statistical Analysis

Various statistical parameters of the time series of available data are given below in **Table-2**.

Table-2: Statistical parameters of Annual Runoff series at various sites

GD station	Data length (years)	Mean (MCM)	Median (MCM)	SD (MCM)	Coefficient Of Variation
Ganod	41	463	199	602.29	1.3

5.6.5.2 Fit characteristics

In order to find out if any mathematical equation represents the time series as a function of time, fitting of various types of equations viz. linear, logarithmic, exponential and polynomial have been attempted. Results of such fits are given in the **Table- 3** and shown in **Fig.5.6.2.**

Table-3: Fit Characteristics

Sl.No.	Site	Function Type	Fitted Equation	R^2
1	Ganod	Linear	$y = -1.558x + 3570$	0.001
		Logarithmic	$y = -3127 \ln(x) + 24224$	0.001
		Polynomial	$y = 0.438x^2 - 1749x + 2E+06$	0.009

5.6.5.3 Moving Mean Analysis

In statistics, a moving mean (average), also called rolling average, rolling mean or running average, is a type of finite impulse response filter used to analyze a set of data points by creating a series of averages of different subsets of the full data set.

The first element of the moving average is obtained by taking the average of the initial fixed subset of the number series. Then the subset is modified by "shifting forward", that is excluding the first number of the series and including the next number following the original subset in the series. This creates a new subset of numbers, which is averaged. This process is repeated over the entire data series. The plot line connecting all the (fixed) averages is the moving average. A moving average is a set of numbers, each of which is the average of the corresponding subset of a larger set of data points. A moving average may also use unequal weights for each data value in the subset to emphasize particular values in the subset.

A moving average is commonly used with time series data to smooth out short-term fluctuations and highlight longer-term trends or cycles.

In the present analysis, moving means have been computed for 3, 5 and 7 year periods for various sites of Bhadar River Basin and shown in **Fig. 5.6.3.**

5.6.6 Interpretation

5.6.6.1 Fitting of various statistical/mathematical models viz linear, logarithmic, exponential and polynomial reveals that values of R^2 range from 0.001 to 0.009 for Ganod. The values of R^2 are quite close to 0 indicating absence of any significant trend.

5.6.6.2 Moving mean analysis of 41 year data at the only site in Bhadar basin reveals elements of cyclicalness. As the period of moving mean is increased, periodicity with a relatively longer base begin to appear. As is evident from the moving mean plot, a longer time series may help establish such periodical trend.

5.6.7 Conclusion

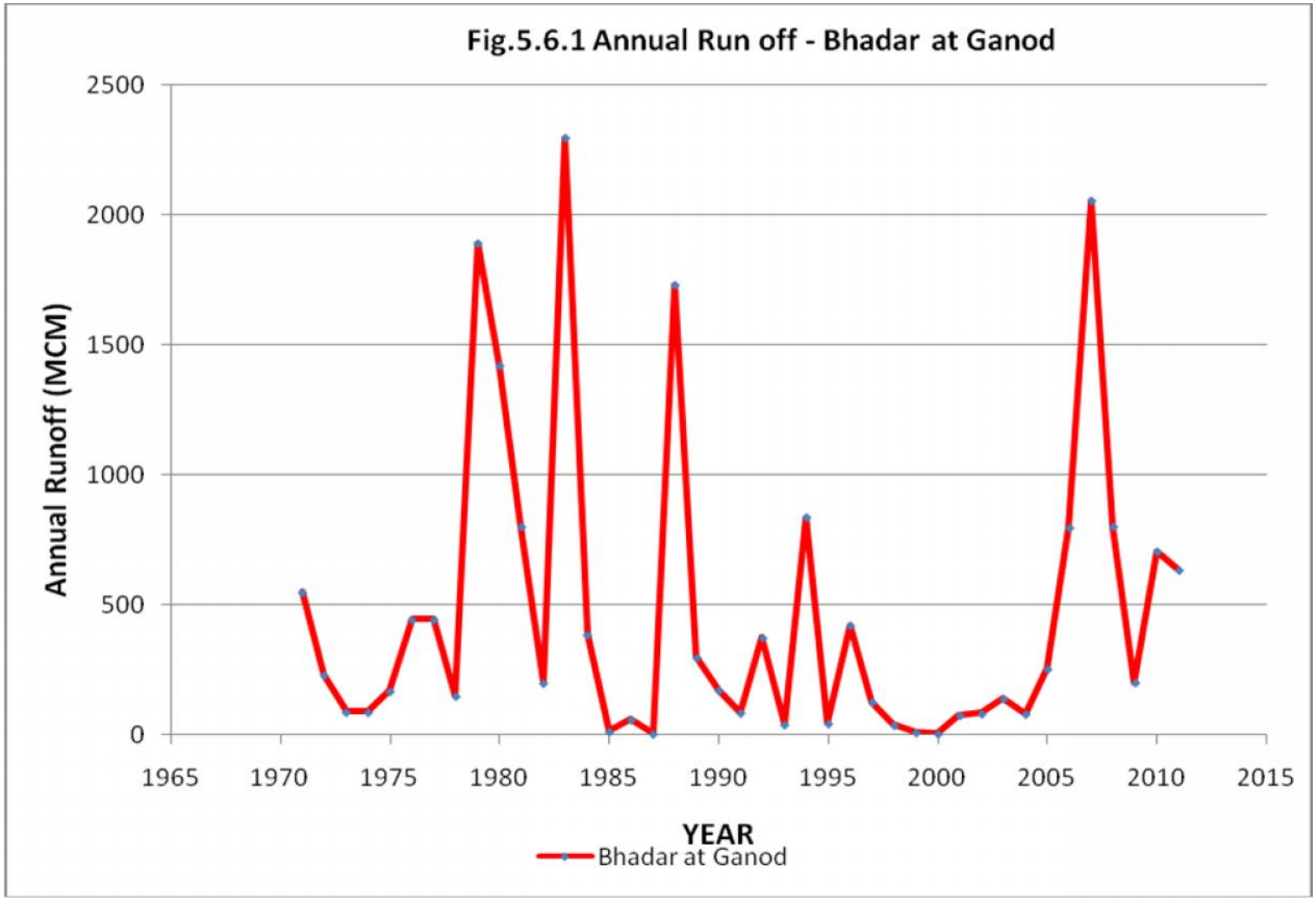
Statistically speaking, the annual runoff of river Bhadar River in general, appears to be a random variable; however elements of cyclicalness cannot be ruled out on the strength of moving mean analysis. A longer set of time series data may help identify trends in annual runoff, if any.

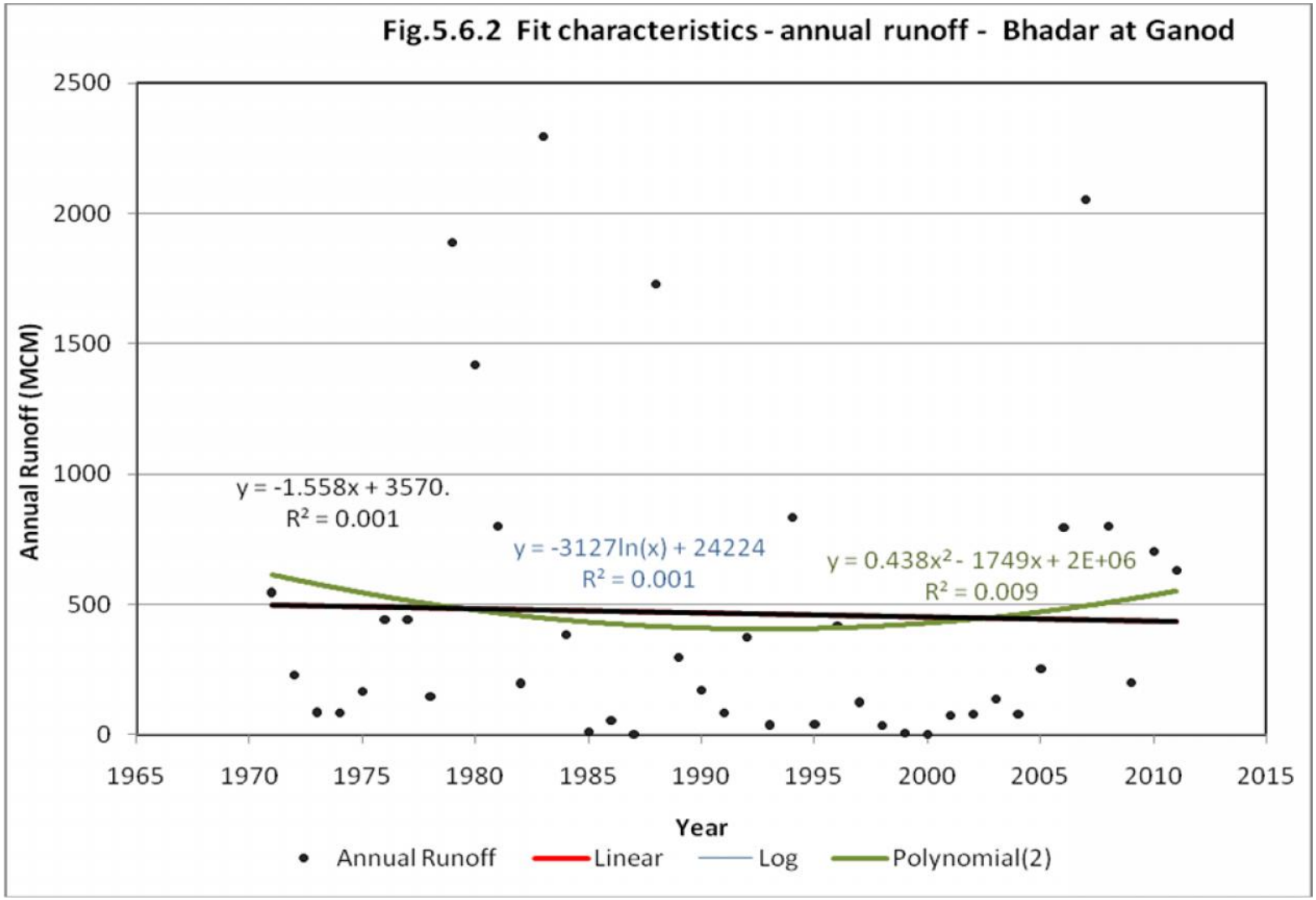
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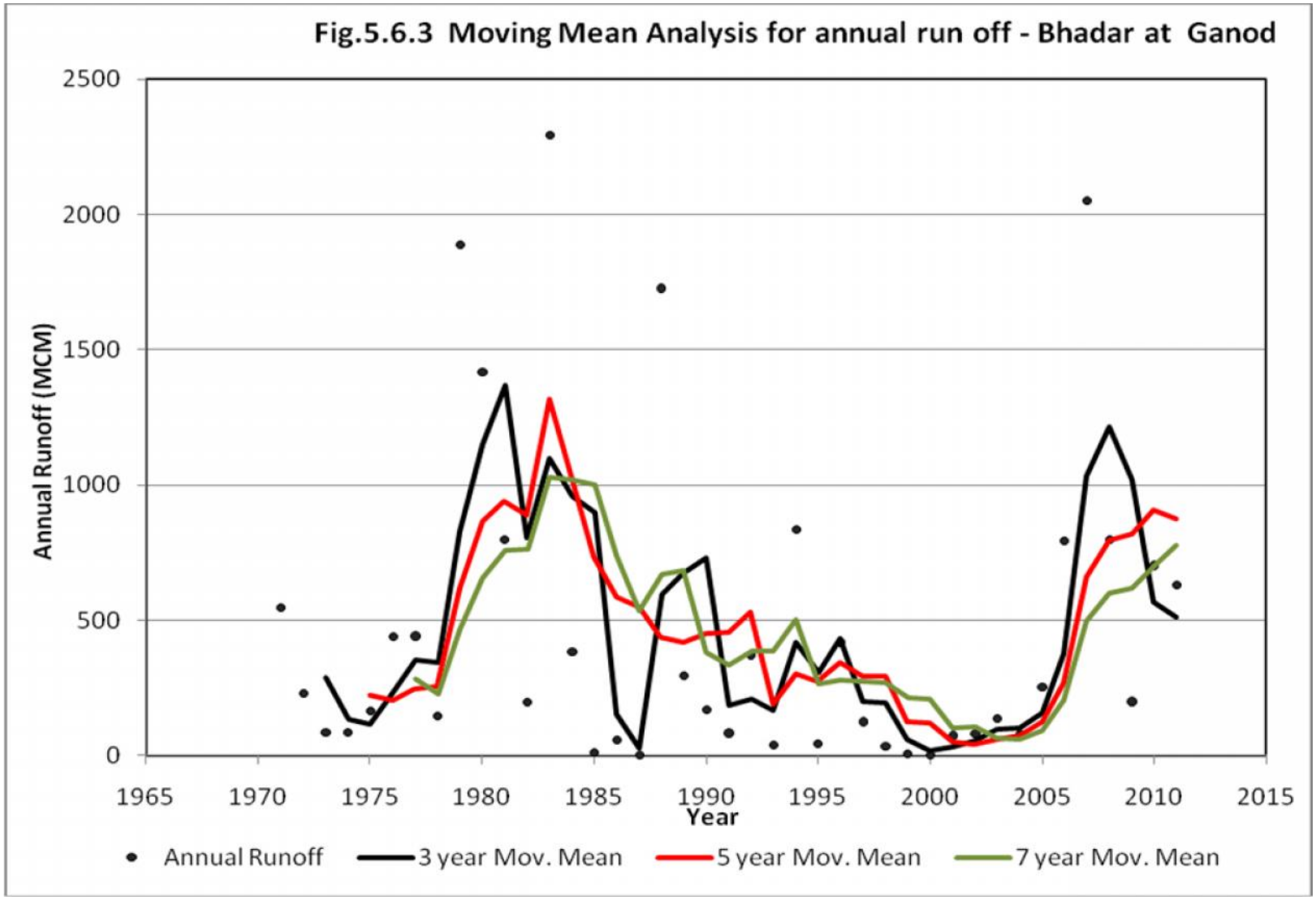
Annexure - 1

Annual Runoff at site over Bhadar basin

Year/Basin	Bhadar
Station	Ganod
1971	546
1972	229
1973	86
1974	86
1975	166
1976	442
1977	442
1978	148
1979	1888
1980	1419
1981	799
1982	198
1983	2293
1984	383
1985	12
1986	57
1987	3
1988	1728
1989	295
1990	170
1991	83
1992	373
1993	38
1994	835
1995	42
1996	419
1997	125
1998	36
1999	8
2000	3
2001	74
2002	80
2003	138
2004	79
2005	252
2006	795
2007	2052
2008	800
2009	200
2010	703
2011	632
MEAN	463
MEDIAN	199
STANDARD DEVAIATION	602.29
CO-EFFICIENT OF VARIATION	1.30


Fig.5.6.1 Annual Run off - Bhadar at Ganod
Annual Runoff (MCM)
2500
2000
1500
1000
500
0
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
YEAR
Bhadar at Ganod


Fig.5.6.2 Fit characteristics - annual runoff - Bhadar at Ganod
Annual Runoff (MCM)
2500
2000
1500
1000
500
0
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
y = -1.558x + 3570.
R² = 0.001
y = -3127ln(x) + 24224
R² = 0.001
y = 0.438x² - 1749x + 2E+06
R² = 0.009
Annual Runoff
Linear
Log
Polynomial(2)


Fig.5.6.3 Moving Mean Analysis for annual run off - Bhadar at Ganod
Annual Runoff (MCM)
2500
2000
1500
1000
500
0
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
Annual Runoff
3 year Mov. Mean
5 year Mov. Mean
7 year Mov. Mean

5.7 Trend Analysis - Machhu Basin

5.7.1 Introduction

Trends are important indicators of the temporal variability of runoff as computed from observed discharge at site. By analyzing the time sequence of the runoff, we assess the magnitude and significance of the temporal variability. The present surface runoff trend study involves analysis of the temporal variability of data sets on the observed discharges in Machhu basin using available data of existing river gauging stations.

5.7.2 Methodology

In the analysis of the trends of runoff on Machhu River, annual runoff is computed and analyzed. The analysis is carried out for one (1) river gauging station with sufficiently long and continuous data sets that are fairly representatively distributed across Machhu river Basin.

Overall one station has been considered in this study. The length of the data sets of river gauging station is 41 years. Subsequently, time series are analysed on various statistical parameters, fitting of mathematical equations, observing moving means for various period so as to find out if there are any trends in the annual runoff data.

5.7.3 Time series analysis

Time series is defined as a sequence of values arrayed in order of their occurrence which can be characterized by statistical properties. Time series analysis may be used to test the variability, homogeneity and trend of a stream flow series or simply to give an upright list the characteristics of the series as graphically displayed. Significant movements of time series are the secular, periodic, cyclic and irregular trends. A time series may display a tendency to increase or decrease, over a specified period. Such a series provides an interesting illustration because if the trend is usually predominant, virtually no other movements are discernible.

Various methods exist for analysis of time series such as moving averages, residual series, residual mass curves and balance. Trends may also be revealed by determining if observed stream flow follows some mathematical equation as a function of time.

In this chapter, first statistical parameters have been computed for time series data of annual runoff in Machhu basin. It is also ascertained if any mathematical equation can be fitted to the time series to assess predictability. Finally, the data is analysed by the method of moving means for various periods.

5.7.4 Availability of annual runoff Data

There are one G&D site in Machhu Basin. Availability of annual runoff data for these sites is summarized in **Table -1** and Graph of annual run off for entire data series is given in **Fig. 5.7.1.**

Table-1: Availability of Data

Sl.No.	Site name	River/Tribu.	Data availability	Total Years
1	Gungan	Machhu	1971-72 to 2011-12	41

The data is placed at **Annexure-1** and shown in line diagram in **Plate 2.7.2**.

5.7.5 Analysis

5.7.5.1 Statistical Analysis

Various statistical parameters of the time series of available data are given below in

Table-2.

Table-2: Statistical parameters of Annual Runoff series at various sites

GD station	Data length (years)	Mean (MCM)	Median (MCM)	SD (MCM)	Coefficient. Of Variation
Gungan	41	186	49	220.24	1.18

5.7.5.2 Fit characteristics

In order to find out if any mathematical equation represents the time series as a function of time, fitting of various types of equations viz. linear, logarithmic, exponential and polynomial have been attempted. Results of such fits are given in the **Table- 3** and shown in **Fig. 5.7.2.**

Table-3: Fit Characteristics

Sl.No.	**Site**	**Function Type**	**Fitted Equation**	**R^2**
1	Gungan	Linear	$y = 2.230x - 4255$	0.014
		Logarithmic	$y = 4419 \ln(x) - 33389$	0.014
		Polynomial	$y = 0.381x^2 - 1514x + 2E+06$	0.062

5.7.5.3 Moving Mean Analysis

In statistics, a moving mean (average), also called rolling average, rolling mean or running average, is a type of finite impulse response filter used to analyze a set of data points by creating a series of averages of different subsets of the full data set.

The first element of the moving average is obtained by taking the average of the initial fixed subset of the number series. Then the subset is modified by "shifting forward", that is excluding the first number of the series and including the next number following the original subset in the series. This creates a new subset of numbers, which is averaged. This process is repeated over the entire data series. The plot line connecting all the (fixed) averages is the moving average. A moving average is a set of numbers, each of which is the average of the corresponding subset of a larger set of data points. A moving average may also use unequal weights for each data value in the subset to emphasize particular values in the subset.

A moving average is commonly used with time series data to smooth out short-term fluctuations and highlight longer-term trends or cycles.

In the present analysis, moving means have been computed for 3, 5 and 7 year periods for various sites of Machhu River Basin and shown in **Fig. 5.7.3.**

5.7.6 Interpretation

5.7.6.1 Fitting of various statistical/mathematical models viz linear, logarithmic, exponential and polynomial reveals that values of R^2 range from 0.014 to 0.062 for Gungan. The values of R^2 are quite close to 0 indicating absence of any significant trend.

5.7.6.2 Moving mean analysis has been carried out with 3 year, 5 year and 7 year moving means. It is seen from the moving mean plot, that no conclusion at present can be drawn regarding existence of any cyclic trend.

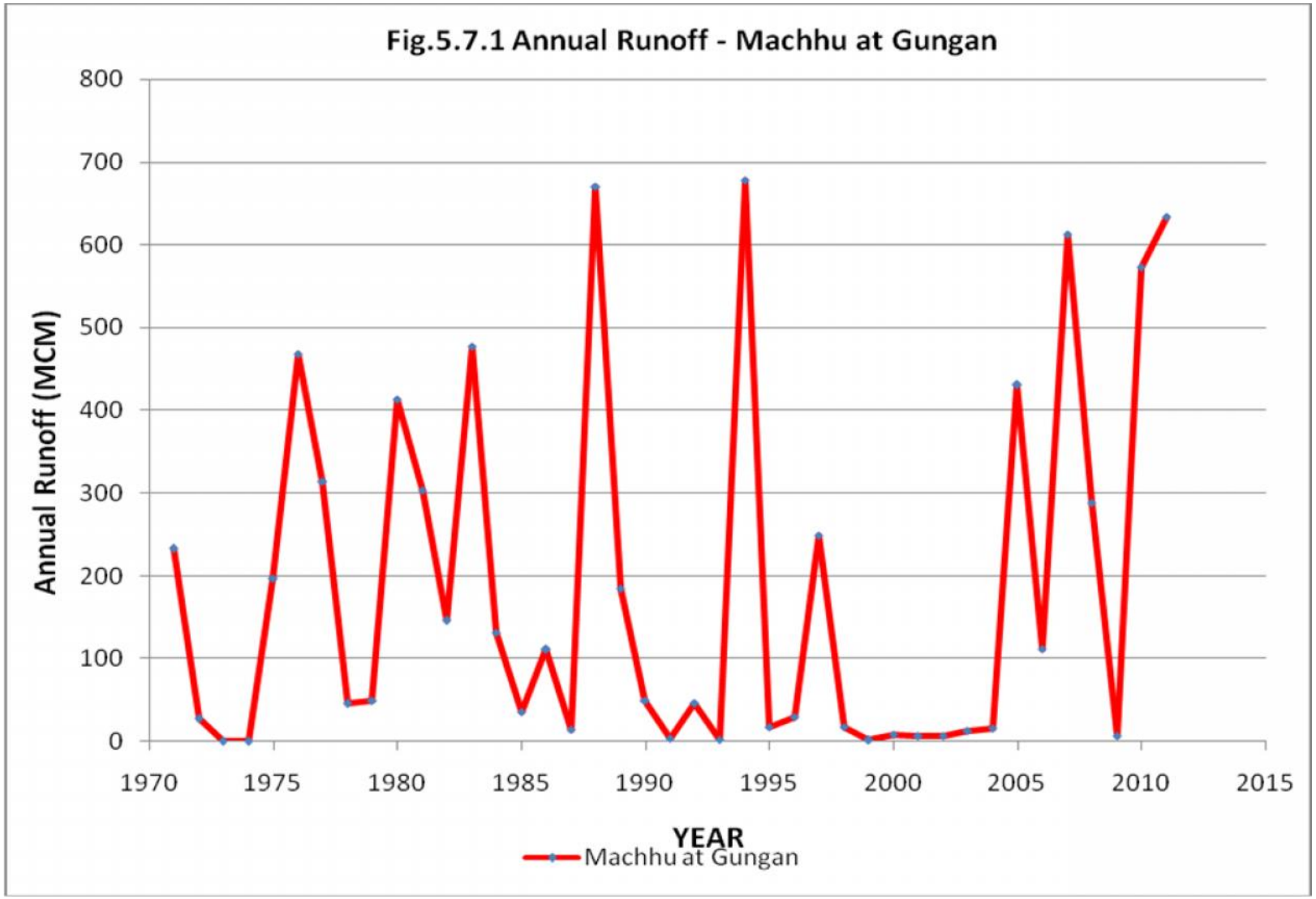
5.7.7 Conclusion

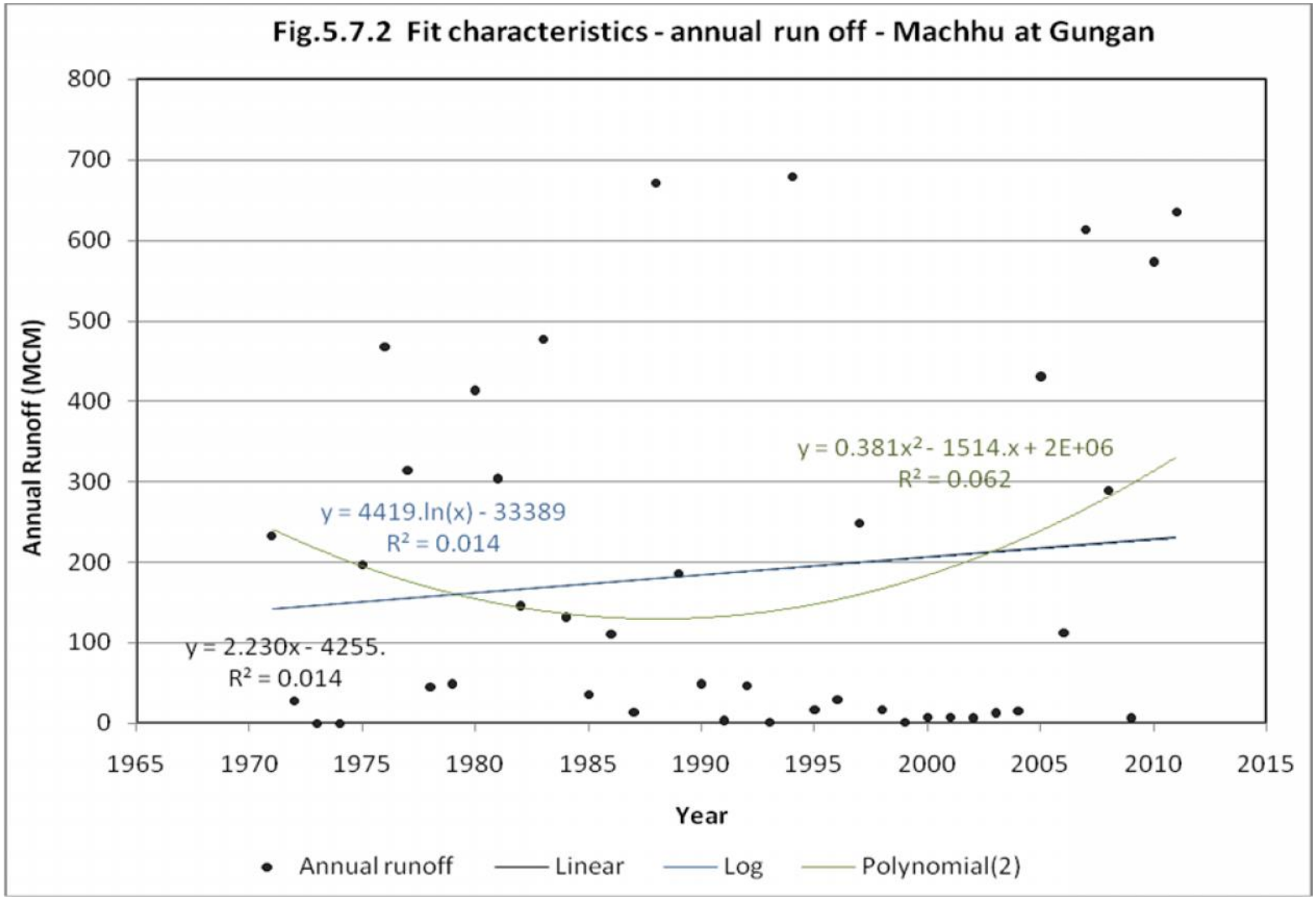
Statistically speaking, the annual runoff of river Machhu River, and its four important tributaries Beti, Asoi, Machhori and Maha, in general, appears to be a random variable; however elements of cyclicalness cannot be ruled out on the strength of moving mean analysis. A longer set of time series data may help identify trends in annual runoff, if any.

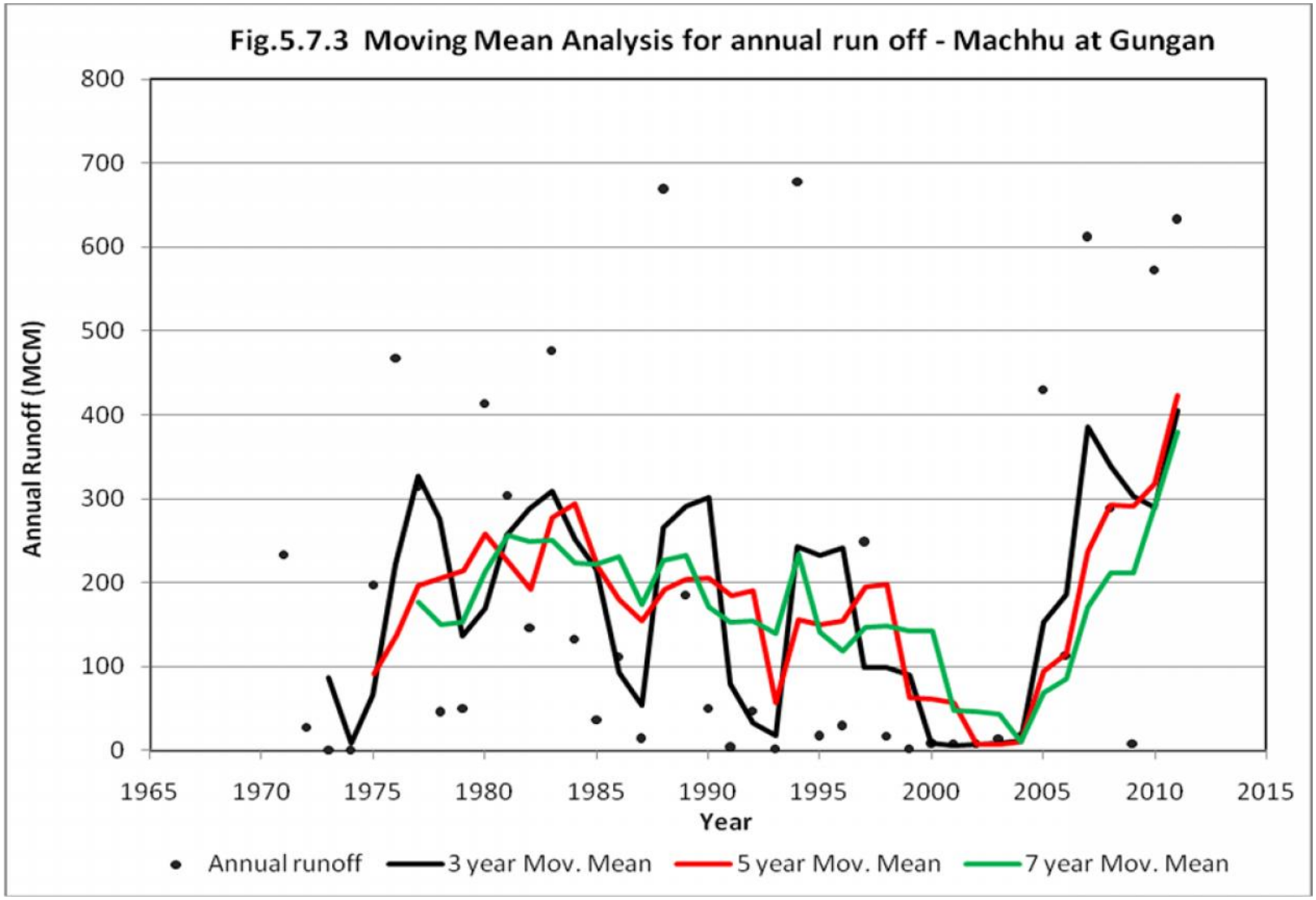
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Annual Runoff at site over Machhu basin

Year/Basin	Machhu
Station	Gungan
1971	233
1972	27
1973	0
1974	0
1975	197
1976	468
1977	314
1978	46
1979	49
1980	413
1981	304
1982	146
1983	477
1984	132
1985	36
1986	111
1987	14
1988	670
1989	185
1990	49
1991	4
1992	47
1993	2
1994	678
1995	17
1996	29
1997	249
1998	17
1999	1
2000	8
2001	7
2002	7
2003	13
2004	16
2005	431
2006	112
2007	613
2008	289
2009	7
2010	573
2011	634
MEAN	186
MEDIAN	49
STANDARD DEVAIATION	220.24
CO-EFFICIENT OF VARIATION	1.18


Fig.5.7.1 Annual Runoff - Machhu at Gungan
Annual Runoff (MCM)
800
700
600
500
400
300
200
100
0
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
YEAR
Machhu at Gungan


Fig.5.7.2 Fit characteristics - annual run off - Machhu at Gungan
Annual Runoff (MCM)
800
700
600
500
400
300
200
100
0
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
y = 0.381x² - 1514.x + 2E+06
R² = 0.062
y = 4419.ln(x) - 33389
R² = 0.014
y = 2.230x - 4255.
R² = 0.014
Annual runoff
Linear
Log
Polynomial(2)


Fig.5.7.3 Moving Mean Analysis for annual run off - Machhu at Gungan
Annual Runoff (MCM)
800
700
600
500
400
300
200
100
0
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
Annual runoff
3 year Mov. Mean
5 year Mov. Mean
7 year Mov. Mean

5.8 Trend Analysis -Rupen Basin

5.8.1 Introduction

Trends are important indicators of the temporal variability of runoff as computed from observed discharge at site. By analyzing the time sequence of the runoff, we assess the magnitude and significance of the temporal variability. The present surface runoff trend study involves analysis of the temporal variability of data sets on the observed discharges in Rupen basin using available data of existing river gauging stations.

5.8.2 Methodology

In the analysis of the trends of runoff on Rupen River, annual runoff is computed and analyzed. The analysis is carried out for one (1) river gauging station with sufficiently long and continuous data sets that are fairly representatively distributed across Rupen River Basin.

Overall one station has been considered in this study. The length of the data sets of river gauging station is 22 years. Subsequently, time series are analysed on various statistical parameters, fitting of mathematical equations, observing moving means for various period so as to find out if there are any trends in the annual runoff data.

5.8.3 Time series analysis

Time series is defined as a sequence of values arrayed in order of their occurrence which can be characterized by statistical properties. Time series analysis may be used to test the variability, homogeneity and trend of a stream flow series or simply to give an upright list the characteristics of the series as graphically displayed. Significant movements of time series are the secular, periodic, cyclic and irregular trends. A time series may display a tendency to increase or decrease, over a specified period. Such a series provides an interesting illustration because if the trend is usually predominant, virtually no other movements are discernible. Various methods exist for analysis of time series such as moving averages, residual series, residual mass curves and balance. Trends may also be revealed by determining if observed stream flow follows some mathematical equation as a function of time.

In this chapter, first statistical parameters have been computed for time series data of annual runoff in Rupen basin. It is also ascertained if any mathematical equation can be fitted to the time series to assess predictability. Finally, the data is analysed by the method of moving means for various periods.

5.8.4 Availability of annual run off Data

There is one G&D site in Rupen Basin. Availability of annual runoff data for these sites is summarized in **Table -1** and the graph of annual runoff for the entire data is given in **Fig. 5.8.1.**

Table-1: Availability of Data

Sl.No.	Site name	River/Tribu.	Data availability	Total Years
1	Sapawada	Rupen	1990-91 to 2011-12	22

The data is placed at **Annexure-1** and shown in line diagram in **Plate 2.8.2**

5.8.5 Analysis

5.8.5.1 Statistical Analysis

Various statistical parameters of the time series of available data are given below in **Table-2**.

Table-2: Statistical parameters of Annual Runoff series at various sites

GD station	Data length (years)	Mean (MCM)	Median (MCM)	SD (MCM)	Coefficient. Of Variation
Sapawada	22	75	31	81.07	1.08

5.8.5.2 Fit characteristics

In order to find out if any mathematical equation represents the time series as a function of time, fitting of various types of equations viz. linear, logarithmic, exponential and polynomial have been attempted. Results of such fits are given in the **Table- 3** and shown in **Fig.5.8.2.**

Table-3: Fit Characteristics

Sl.No.	Site	Function Type	Fitted Equation	R^2
1	Sapawada	Linear	$y = 0.626x - 1178$	0.002
		Logarithmic	$y = 1249 \ln(x) - 9422$	0.002
		Polynomial	$y = 0.274x^2 - 1096x + 1E+06$	0.018

5.8.5.3 Moving Mean Analysis

In statistics, a moving mean (average), also called rolling average, rolling mean or running average, is a type of finite impulse response filter used to analyze a

set of data points by creating a series of averages of different subsets of the full data set.

The first element of the moving average is obtained by taking the average of the initial fixed subset of the number series. Then the subset is modified by "shifting forward", that is excluding the first number of the series and including the next number following the original subset in the series. This creates a new subset of numbers, which is averaged. This process is repeated over the entire data series. The plot line connecting all the (fixed) averages is the moving average. A moving average is a set of numbers, each of which is the average of the corresponding subset of a larger set of data points. A moving average may also use unequal weights for each data value in the subset to emphasize particular values in the subset.

A moving average is commonly used with time series data to smooth out short-term fluctuations and highlight longer-term trends or cycles.

In the present analysis, moving means have been computed for 3, 5 and 7 year periods for various sites of Rupen River Basin and shown in **Fig.5.8.3.**

5.8.6 Interpretation

5.8.6.1 Fitting of various statistical/mathematical models viz linear, logarithmic, exponential and polynomial reveals that values of R^2 range from 0.002 to 0.018 for Sapawada. The values of R^2 are quite close to 0 indicating absence of any significant trend.

5.8.6.2 Moving mean analysis has been carried out with 3 year, 5 year and 7 year moving means. It is seen from the moving mean plot, that no conclusion at present can be drawn regarding existence of any cyclic trend.

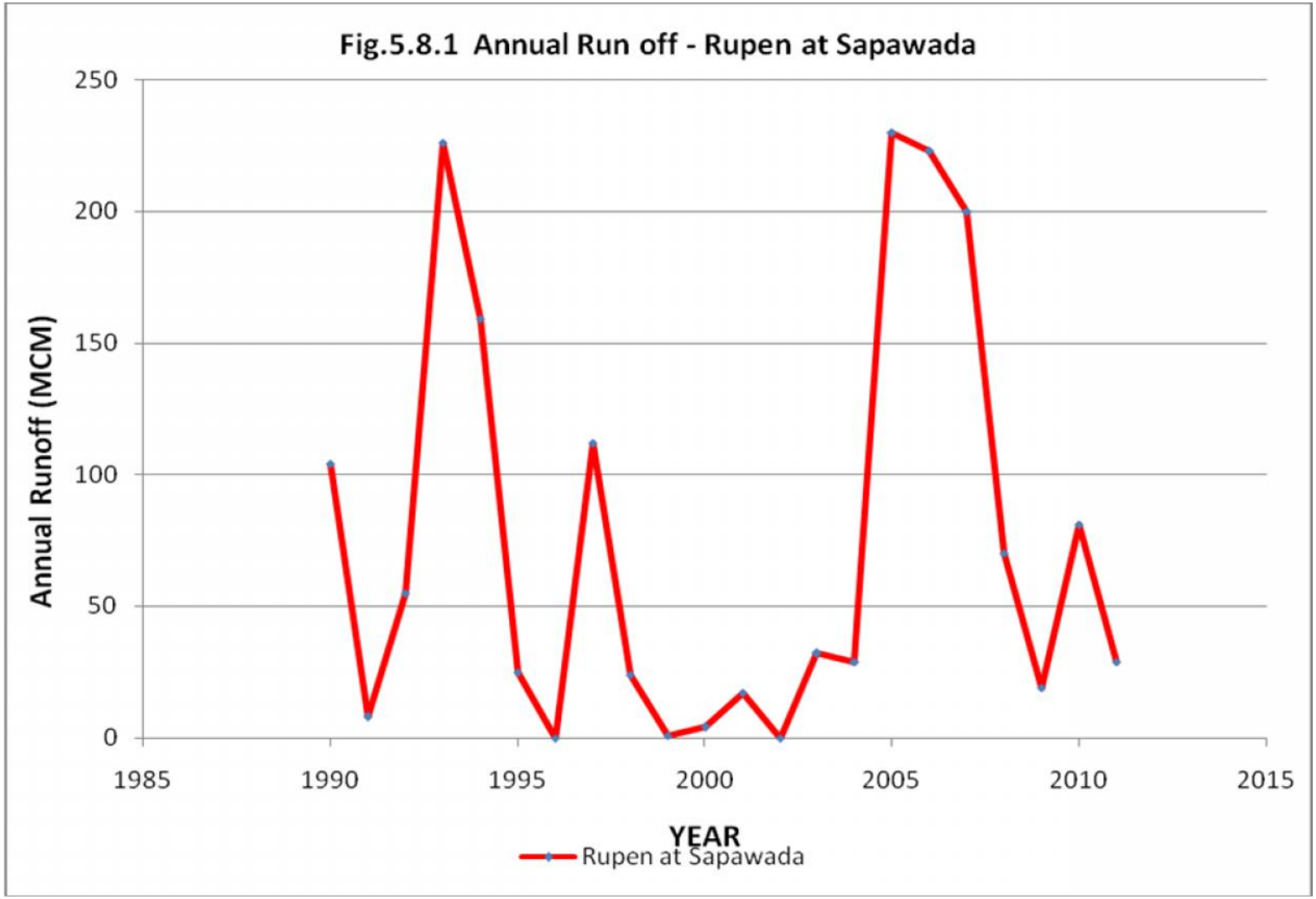
5.8.7 Conclusion

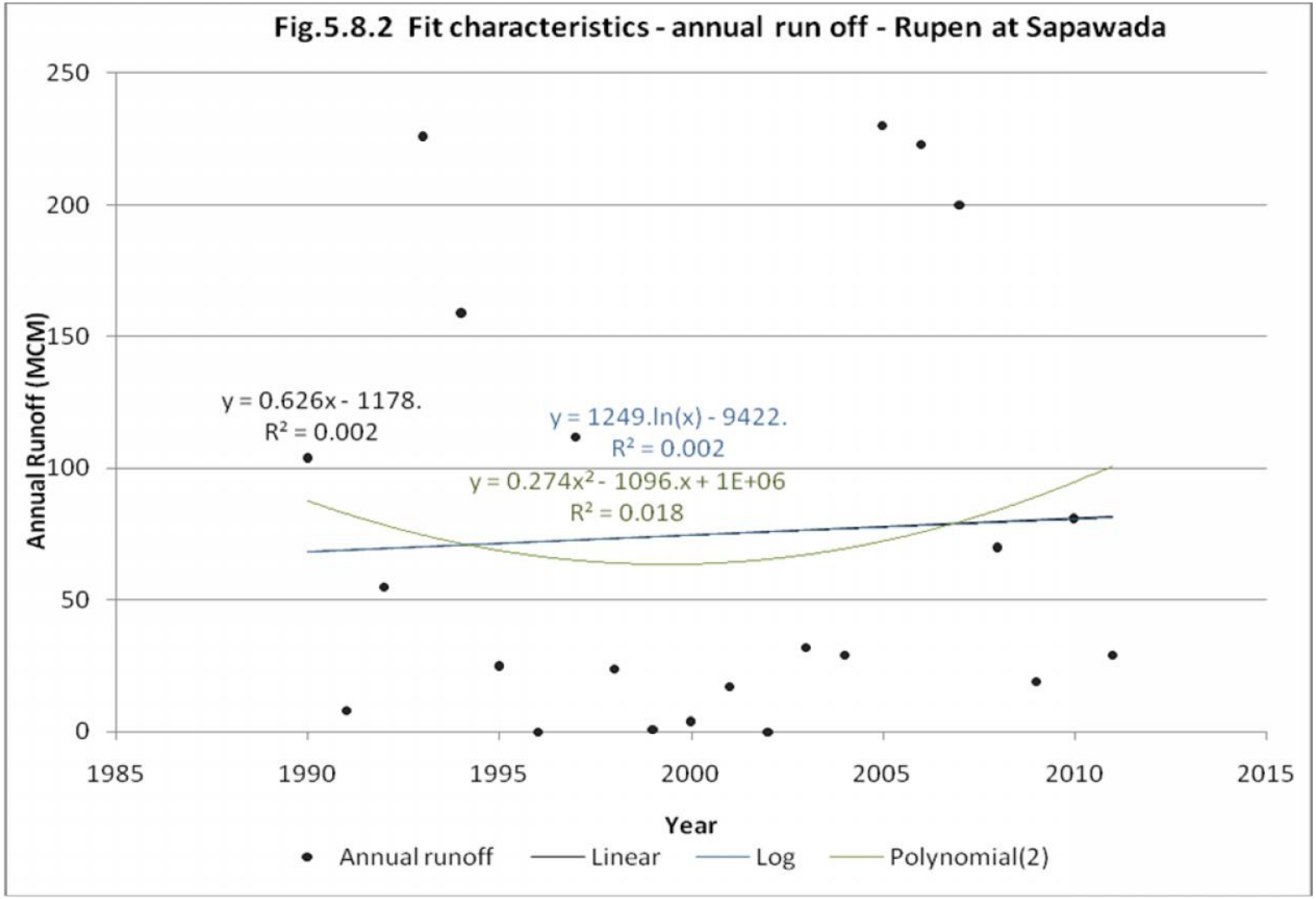
Statistically speaking, the annual runoff of Rupen River, in general, appears to be a random variable; however elements of cyclicalness cannot be ruled out on the strength of moving mean analysis. A longer set of time series data may help identify trends in annual runoff, if any.

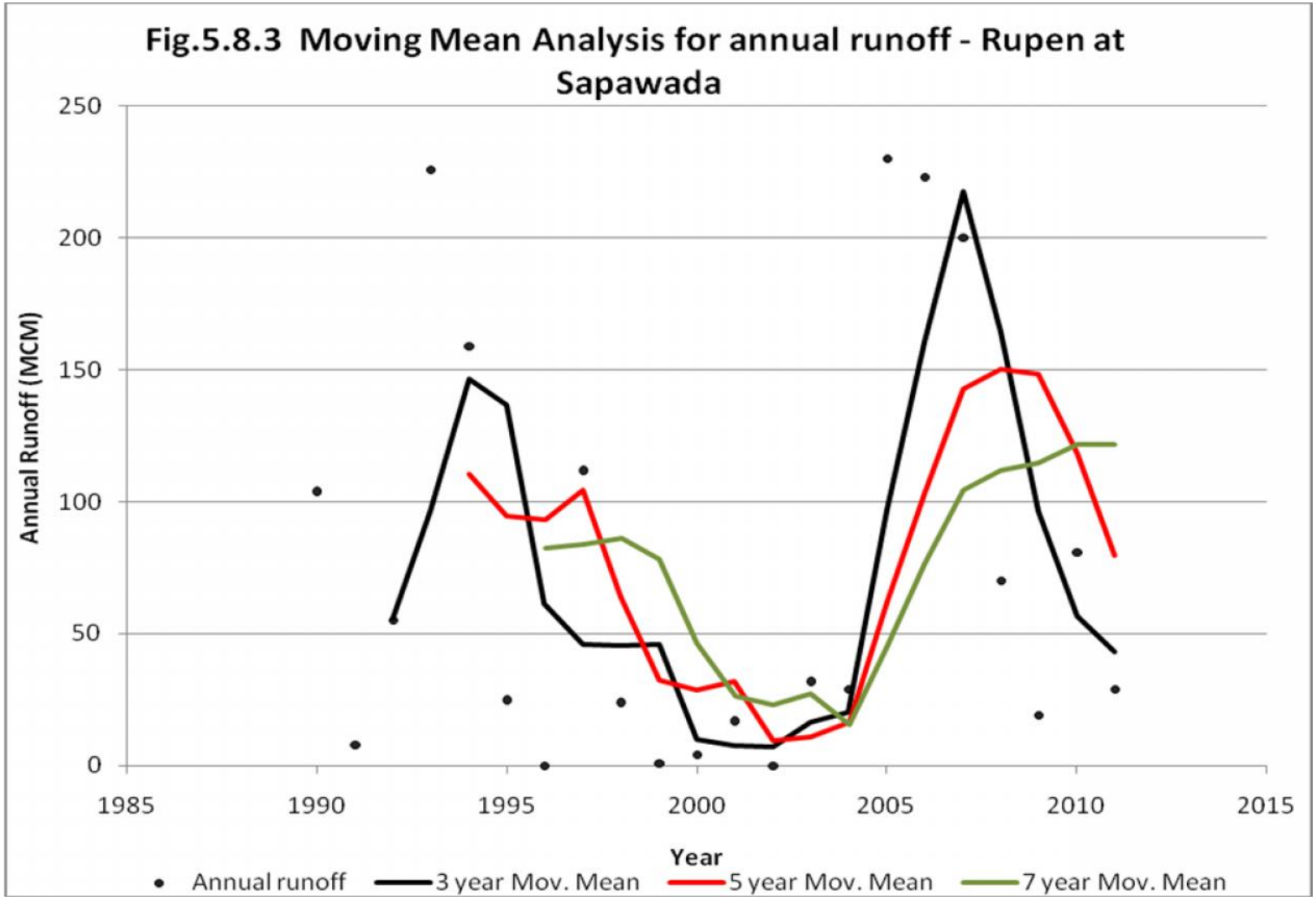
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Annual Runoff(in MCM)data of site over Rupen basin

Year	Rupen at Sapawada
1990	104
1991	8
1992	55
1993	226
1994	159
1995	25
1996	0
1997	112
1998	24
1999	1
2000	4
2001	17
2002	0
2003	32
2004	29
2005	230
2006	223
2007	200
2008	70
2009	19
2010	81
2011	29
MEAN	75
MEDIAN	31
STANDARD DEVAIATION	81.07
CO-EFFICIENT OF VARIATION	1.08


Fig.5.8.1 Annual Run off - Rupen at Sapawada
250
200
150
100
50
0
Annual Runoff (MCM)
1985
1990
1995
2000
2005
2010
2015
YEAR
Rupen at Sapawada


Fig.5.8.2 Fit characteristics - annual run off - Rupen at Sapawada
250
200
150
100
50
0
Annual Runoff (MCM)
y = 0.626x - 1178.
R² = 0.002
y = 1249.ln(x) - 9422.
R² = 0.002
y = 0.274x² - 1096.x + 1E+06
R² = 0.018
1985
1990
1995
2000
2005
2010
2015
Year
Annual runoff
Linear
Log
Polynomial(2)


Fig.5.8.3 Moving Mean Analysis for annual runoff - Rupen at Sapawada
Annual Runoff (MCM)
250
200
150
100
50
0
1985
1990
1995
2000
2005
2010
2015
Year
Annual runoff
3 year Mov. Mean
5 year Mov. Mean
7 year Mov. Mean