FLOOD REPORT-2014

Preface

The Flood Forecasting Division Lahore (FFD), since its establishment is serving the nation by issuing flood forecasts during each flood season (15^{th} June -15^{th} October). Similarly FFD monitored flood season 2014 carefully through its Hydro meteorological bulletins, Warnings / Advisories, and then informing different Government agencies, press and electronic media, in order to minimize mass destruction. The compilation of flood report after each flood season is a regular feature observed by FFD Lahore. Flood report for the year 2014 has been prepared under the able guidance and kind instructions of Director General, Meteorological Services. It contains all the details pertaining to flood forecasting like monsoon lows tracks, rainfall during wet spells, flood peaks, monthly and seasonal Isohyetal maps, normal Isopercental maps, flood limits and flood evaluation report .

Chief Meteorologist
Flood Forecasting Division
Lahore

- **Introduction**

Pakistan is definitely a flood prone country. Each year it gets medium to high floods in any one river and high to exceptionally high floods within five to fifteen years in addition to Flash and urban flooding as per the return period is concerned . All these activities mostly occur in the summer monsoon period .I n this regards Pakistan Meteorological Department establishes The flood early Warning center at Flood Forecasting division Lahore and start their function from 15th June till 15th October each year ,working round the clock and issue flood forecast for Rim stations of each River and at discharge points Downstream daily to all stockholders at federal, Provincial and districts levels.

- **Flood Forecasting System.**

Flood forecasting and weather forecasting even though quite inter related yet are two different types of activities .Routine forecasting of the general weather conditions over an area or city or long a route is purely a meteorological activity ,while the flood forecasting falls in the domain of hydrometeorology, a subject involving the assessment of the rain generating systems , computations of the mean areal precipitations over the catchments, computations of the runoff and finally routing of the flood wave downstream with due considerations to all the inflows & outflows entering or leaving the channel.

The Flood forecasting system is based on;

1: Real time Hydro- Meteorological data from Up and Down stream River basins

2: Regional and Global Meteorological Data

3: Rainfall Prediction model

4: Rainfall Runoff Model

5: Flood routing at downstream

6:Flood products (Flood forecast, Significant /Warnings)

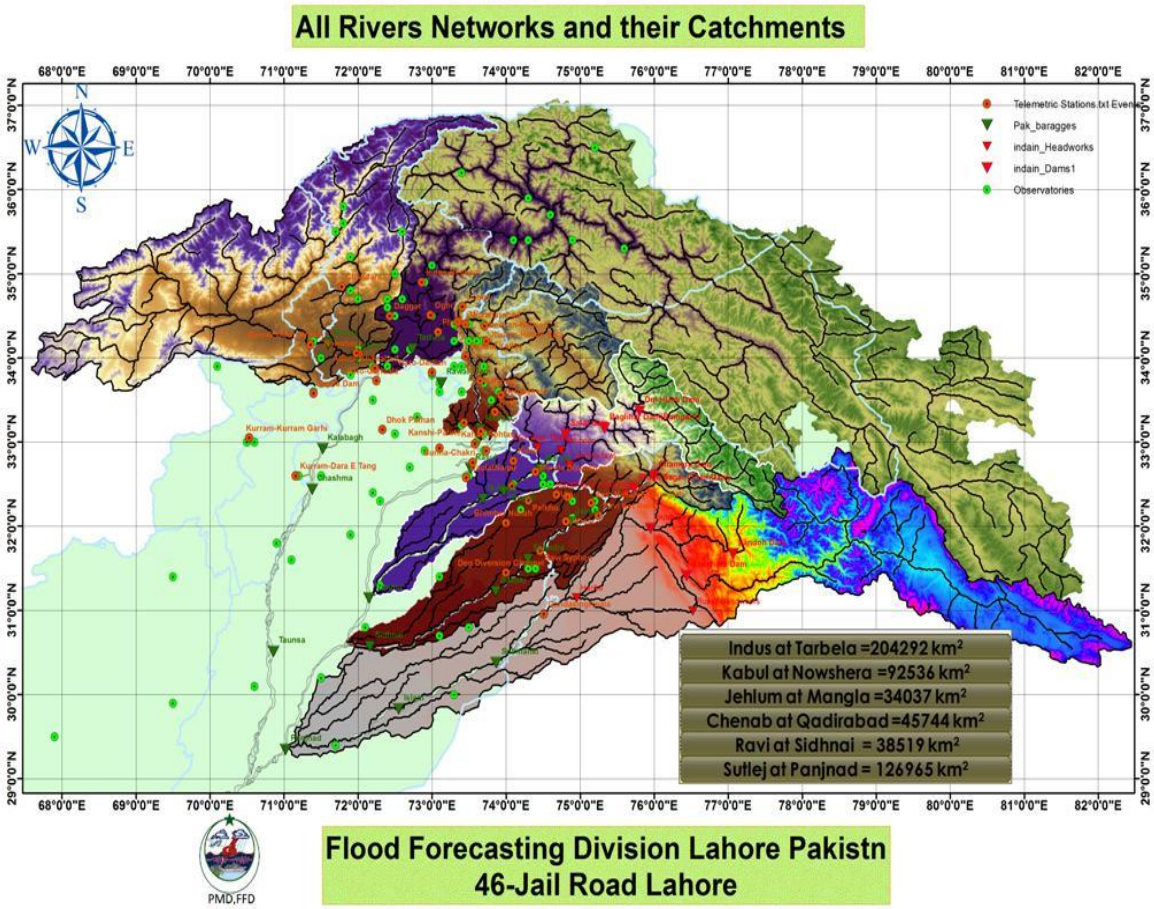
7:Dissemination of Flood Forecast/Information//Warnings

8:Radar Network

9:Telemetery and Observatory Network

10:Media Center

The areas where torrential rains generate riverine floods mostly lye across the borders ,such as River Basin of Chenab, Ravi , Sutlej and some parts of Jhelum and Kabul Rivers .Each basin has its own geographical Characteristics and respond capacity to the storm .The Floods generation in Eastern Rivers including Chenab is not dependent on the rain storms in Pakistan region but it entirely depends upon the Rain in Cross boundary territory with very small contribution from downstream.



Therefore on account of these physiographical limitations of the upper catchments flood forecasts are made in two stages, the qualitative forecast and the quantitative forecast.

- **QUALITATIVE FORECAST:**

A qualitative forecast is issued when flood is imminent, but the rainfall in the catchments area has not yet started. This is thus not the runoff forecast in quantitative terms, but instead qualitative expression of the expected flood conditions. Such, "Exceptionally High ", or "High flood" are used to depict the expected flood conditions as best as is qualitatively possible.

- **QUANTITATIVE FORECAST:**

This forecast is issued on the basis of real time rainfall data from the upper catchments of the rivers. This forecast therefore can only be issued after the rain has actually started in the catchments. Flood generating rain storms normally last from 12 to 36 hours, the flood forecasting therefore become a continuous process. Consequently there may be two or three flood forecasts issued with progressively higher peak values. The last forecast (which would have the minimum lead time) is then issued after the rains have finally stopped. This forecast would be indicating the peak finally expected.

- **TIME TO PEAK:**

An important factor in computing the time to peak after the rainfall is the position of the rainfall centroid in the catchments i.e. if the rainfall has occurred close to a rim station, peak would occur in a relatively shorter time. For example in case of river Chenab if the rainfall has occurred just above Marala the peak would occur after about 6-hours only, on the other hand in case the rainfall occurs mostly in Jammu and Kashmir Valley then the peak to arrive may take from 18 to 24 hours. This factor alone determines the lead time of the forecast.

- **USE OF INDIAN FLOOD INFORMATION IN FLOOD FORECASTING:**

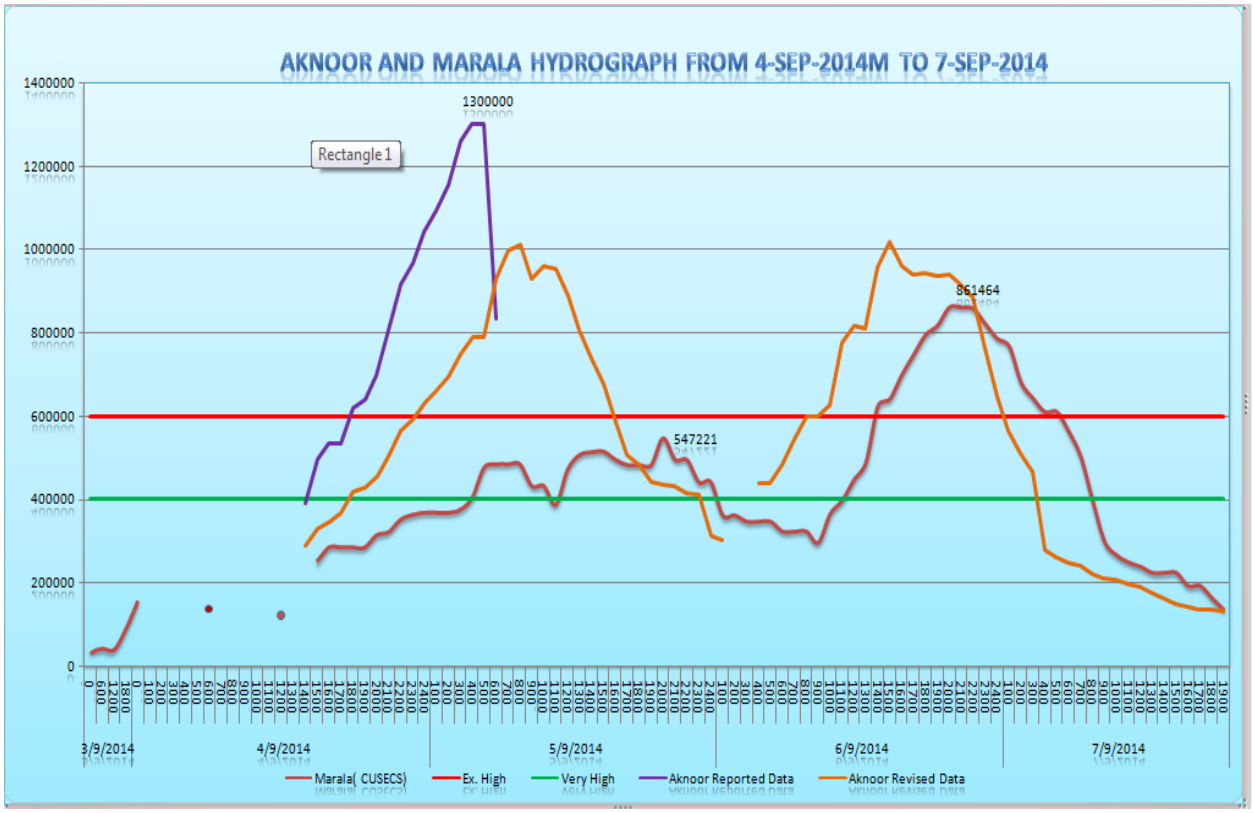
The impression that the flood forecasting system is entirely based upon the Indian flood reports is a wrong impression. This wrong concept has given rise to lack of trust in the PMD's flood forecasting on one hand and undue reliance on the Indian reports on the other. The actual situation vis-à-vis Indian flood reports is as follows.

In case of rivers Chenab, these informations have a limited use, since by the time report from India is received the flood has either already reached the rim station or is about to arrive, thus providing practically no time for the early warning.

In case of river Sutlej and Ravi however Indian flood information do form the basis of the early warning system in conjunction with the consideration of general meteorological conditions and the satellite and radar data.

During flood season 2014 for the first flood wave, the Information received from India through Pakistan commissioner for Indus water misguided the hydro-meteorologists. The hydrograph indicates that Chenab and Jammu Tawi at Aknoor is discharging a flow of 1300000cs. A .request was made by Chief Met FFD to Indus Commissioner of Pakistan for verifying the data which seemed contrary to the facts at midnight .In respond of the verified data of 1000000 cs at Aknoor was received while Marala received only 547221cs.

The 2nd wave was observed quite better and found satisfactory and accordingly.



➢ FORECAST METHODOLOGY:

Major floods almost always occur under the effect of a Monsoon depression emerging out of the Bay of Bengal. Then as the Monsoon depression draws closer (on arriving over Rajasthan) it either continue to move straight West Northwestwards (causing heavy & wide spread rains in Sindh) or may re-curve to North-Northeasterly direction towards the upper catchments of the rivers and some time it does not reach Rajasthan but re- curve before reaching Rajasthan and Weakens. On account of these meteorological facts and in view of the physiographic features of the upper catchments the following forecasting sequence is followed.

(a) Approaching Monsoon depression/low is tracked and mention of its position is made every day in the daily forecast.

(b) When the depression has reached Rajasthan (India) heavy rain forecast is made for the area under the direct threat of the depression/low.

(c) If it is ascertained that this depression is moving towards catchment area and the floods in the upper catchments are imminent, while the rains as such have not yet started in the catchment then "Qualitative flood forecast" is issued.

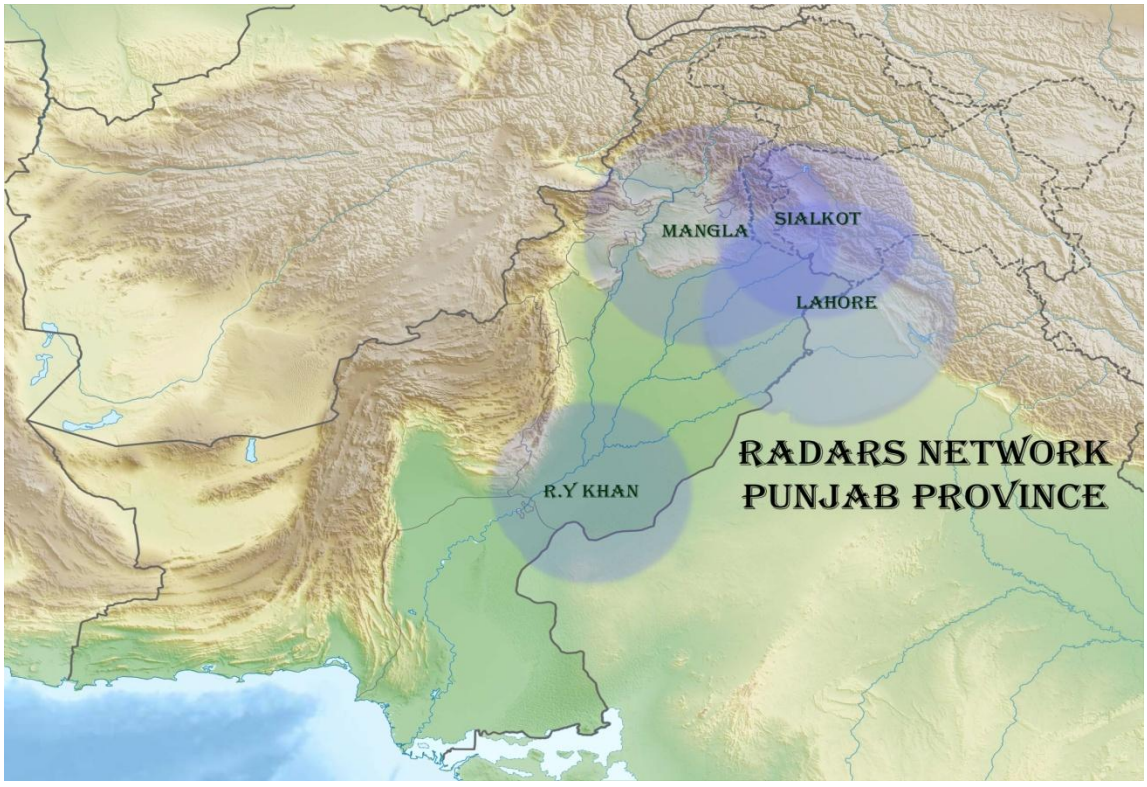
(d) When the rain has started in the catchment a number of Quantitative flood forecasts are issued based essentially on Radar information. In case of river Jhelum it is based upon the telemetric rain & river data.

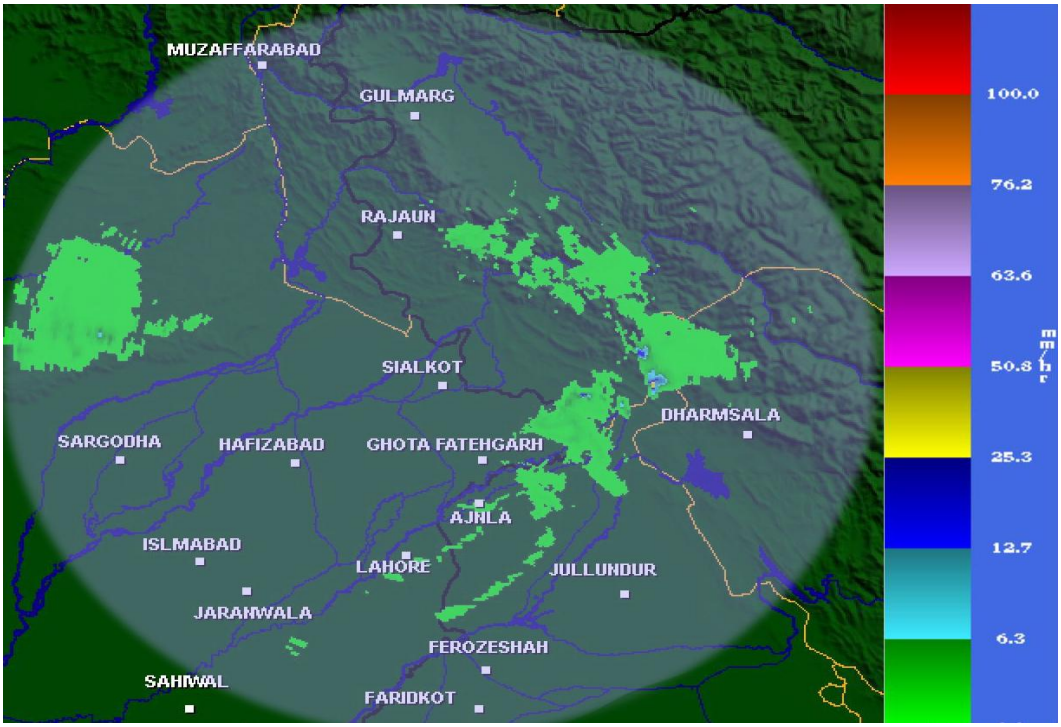
➢ RADAR NETWORK.

Flood Forecasting Division, Lahore is a specialized unit regarding flood forecasting and warning system. The prime duty of this unit is to issue flood forecast and warnings at the crucial hours for the benefit and in the interest of public service. The procedure involving this system includes the real-time data which include the radar observations, the radars are installed at Lahore, Sialkot and Mangla. The radars have been installed to monitor the rainfall situation over the upper catchment of rivers particularly Sutlej, Ravi, Chenab and Jhelum rivers which are originating from Indian held Kashmir. This data is very vital and no ground observation is available usually.

Floods in Pakistan generally depend upon the current base flow of river sites, intensity and duration of rainfall of very high topographies. These parameters are monitored by Doppler quantitative weather radars for timely forecast of different river sites and especially weather system across the border. Without these Radars, manual data collection from these terrains is not possible. Therefore cross boundary rainfall and timely river flow data becomes dependent.

Then there is another important consideration given to the Radar observation. In case of heavy thunderstorm associated with rainfall, it may give a false reading depending upon the distance of the system from the Radar. The Meteorologist has to keep a close watch on the development of the weather system and may asses how much thundery activities may also not be represented due to power attenuation of the Radar beam, its reflectivity and the curvature of the earth also plays some part in under reading the actual rainfall. Therefore almost care is taken while reading the Radar rainfall. In fact it is a very dedicate subject and only the expertise of a Meteorologist can judge a Radar observation in its true perspective.





Radar systems are built with some components which are consumable and new generation technologies makes old systems obsolete in international market and need to be replaced. The existing software was not designed to fulfill the requirements of latest numerical forecast models. An essential input of these models is missing in shape of grid rain fall data, which is important to increase the probability of exact forecast of river flows and over all rain fall forecasting.

1 Highlights

- Monsoon remained inactive over the most parts of the country except 1st week of September when torrential rains were observed over Kashmir alongwith north & northeast Punjab.
- A total number of five monsoon lows originated from the Bay of Bengal. However, one of them was able to reach in the vicinity of Pakistan.
- The seasonal precipitation (July 2014 to September 2014) Isopercental pattern is the indicative of above normal rainfall in Kashmir north and northeast Kashmir.
- Nine rain bearing spells occurred during the monsoon season, 2014.
- The supply of Hydro-Meteorological data from WAPDA, Punjab, Sindh and KP ,Irrigation departments, Pakistan Commissioner for Indus Water (PCIW) & Drainage Authorities remained satisfactory. However no discharge data from Baluchistan Irrigation Department was received.
- The concerned federal and provincial authorities along with press and electronic media were also daily briefed and informed about the prevailing weather/flood conditions through Fax, SMS, Email & Internet as well.
- 21 Significant Flood Forecasts /warnings were issued by FFD during Monsoon season 2014, whenever the situation demanded.
- Overall accuracy of forecast issued by FFD during the season 2014 has been calculated as 98.3%.

2 Tracks of Lows during Monsoon Season 2014:

It a well known fact that Very High to Exceptionally high Floods are generated by Monsoon low and depression which reach the catchment but due to some environmental conditions not all of them reach Pakistan territory. During the monsoon season 2014 ,five monsoon lows developed over Bay of Bengal. Out of which only one has generated floods in Pakistan. The path followed by each low is shown in figure below.

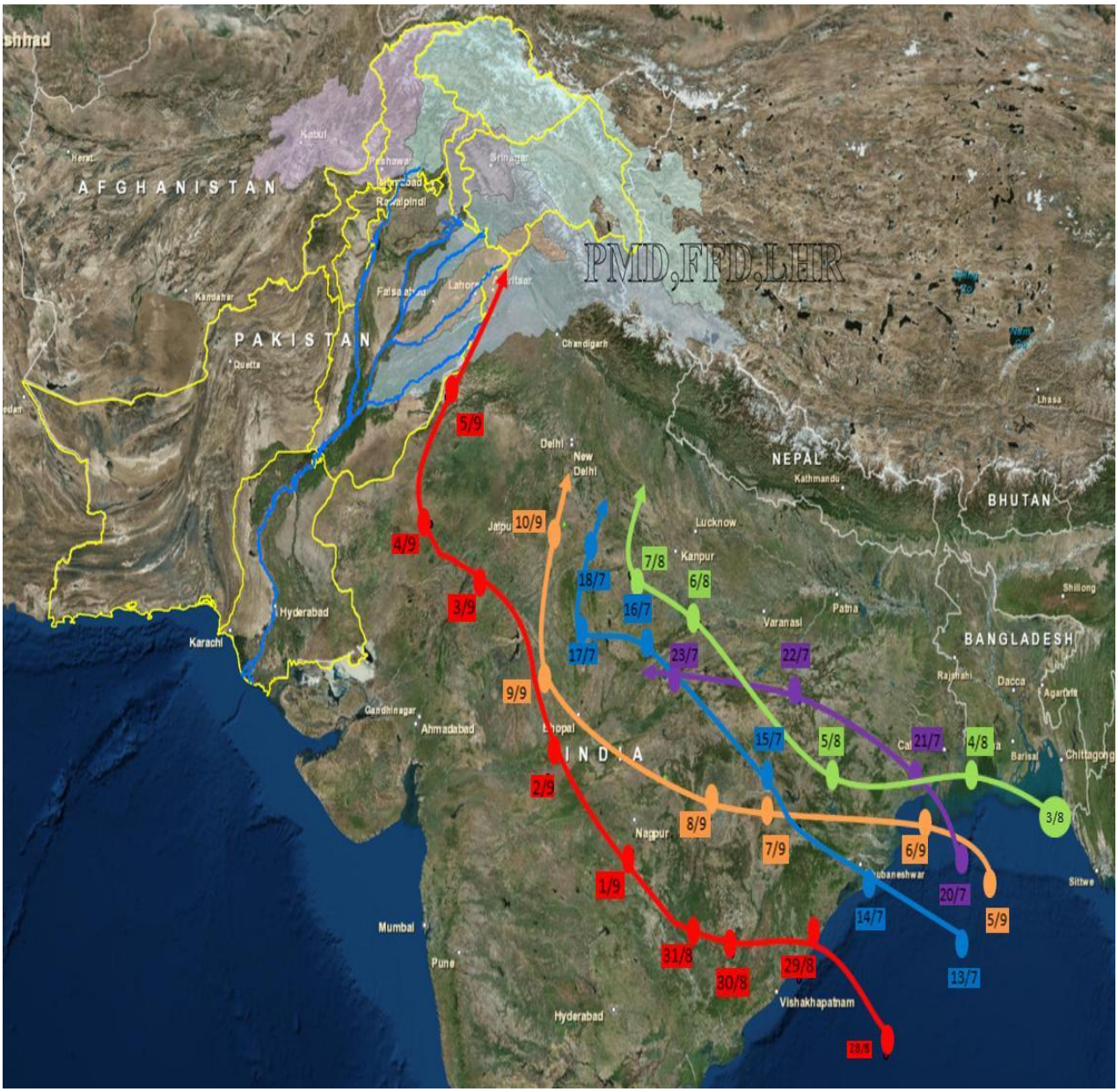


Figure 1: Tracks of Monsoon Lows / depressions during Flood Season-2014

3 Significant Hydrometeorological Events during the month of June, 2014:

Only one rainfall spell occurred during the period.

3.1 Meteorological Events:

- No Monsoon low developed over Bay of Bengal during the month of June 2014.
- The rainfall which occurred over Pakistan during June, 2014 was due to the accentuation of seasonal low over Balochistan,
- Passing of westerly wave in the North of the country
- Influx of weak monsoon current from Arabian Sea.

3.1.1 Wet Spell of June 2014 , 22June to 26 June 2014:

The only wet spell of June 2014 which lasted for five days was mainly caused by the interaction of western disturbance and the moist current from the Arabian Sea. Rainfall distribution during the spell is given below:

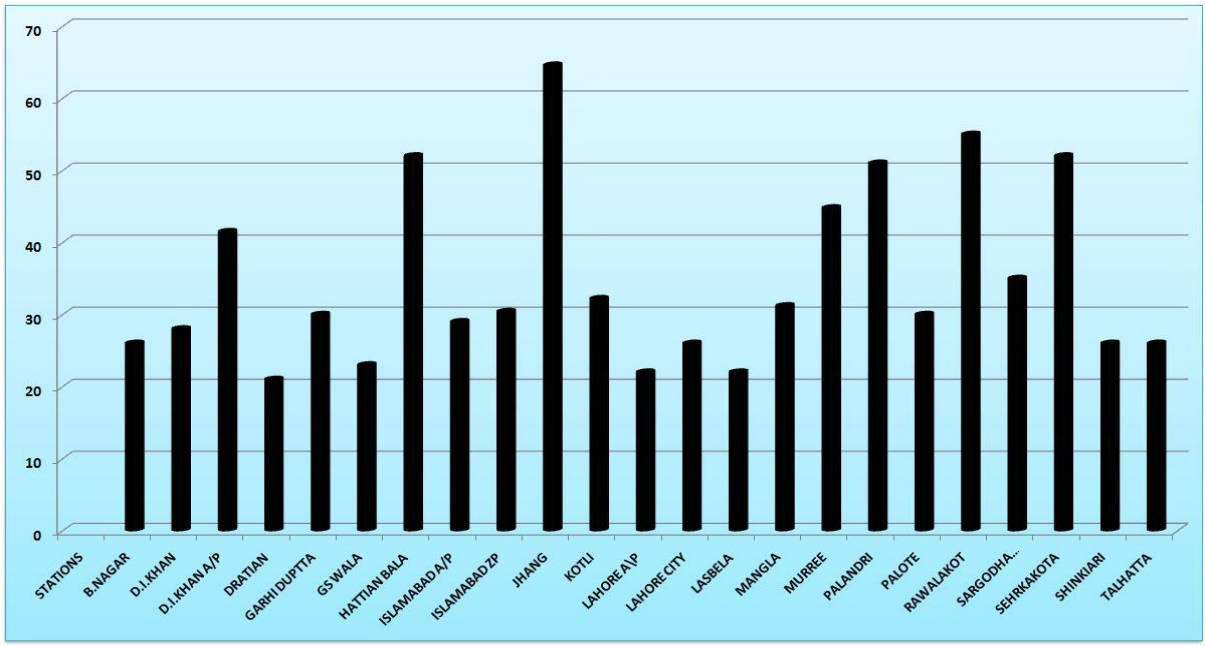


Figure 2: Significant Rainfall (22 June-26 June 2014)

3.2 Isohyetal pattern of the Spell , 22June to 26June-2014

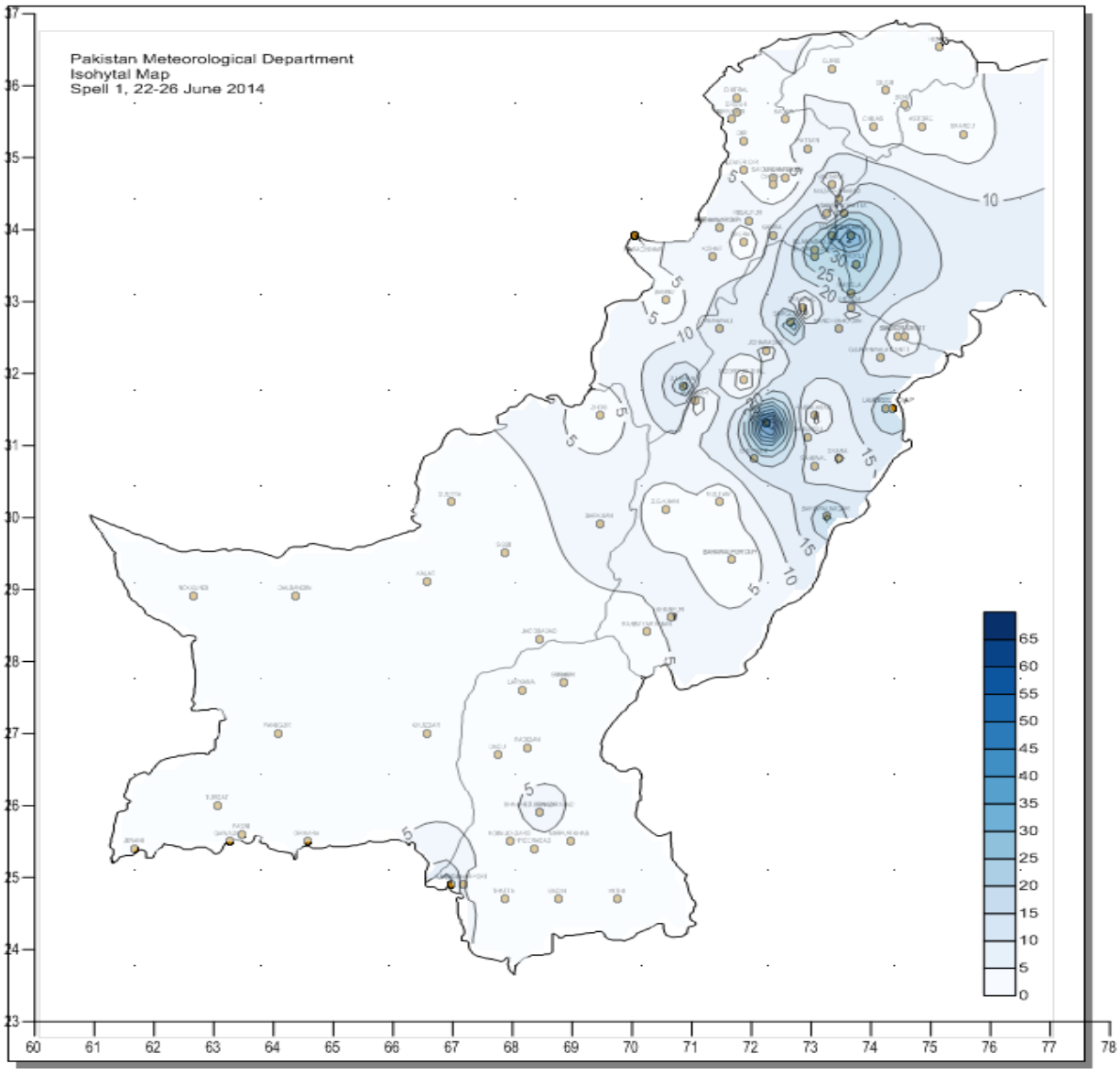


Figure 3: Isohyetal pattern of the Spell (22-June to 26-June-2014)

3.3 Rivers Position during June 2014:

All the rivers, hill torrents and Nullahs maintained their normal flows during the period. However due to snow melting by heat wave, base flow of River Kabul at Nowshera was mostly observed in the state of Medium flood level.

4 Significant Hydrometeorological Events during the month of July 2014:

Four rainfall spells occurred during the month of July-2014.

4.1 Meteorological Events:

First spell occurred from 1st to 4th July 2014. It was mainly due to a trough of westerly wave passing over the Northern parts of the country, accentuation of seasonal low into well marked and moist current from Arabian Sea which was penetrating into sub mountain areas of Punjab and Kashmir. The second spell of July was observed during 16th to 18th July 2014 also caused due to the interaction of westerly wave passing over the Northern parts of the country and the moist influx from Arabian sea upto 7000 feet above ground level. Third spell of the Month of July was observed from 24th to 26th July 2014. It was also caused due to interaction of westerly wave and moist current from Arabian sea as well as Bay of Bengal. Fourth and final spell of the Month of July was observed from 28th to 30th July 2014. It was also caused due to interaction of westerly wave and moist current from Arabian sea. Scattered to widespread rains with moderate to heavy falls at isolated places occurred over North Punjab, Khyber Pakhtunkhwa , and Kashmir. Rainfall also occurred over Northeast Balochistan during these spells.

4.1.1 First Wet Spell of July2014 (01-07-2014 to 04-07-2014):

First spell of July 2014 which was 2nd of the flood season 2014 lasted for 4 days. It was mainly due to the passage of westerly wave, accentuation of seasonal low and incursion of moist current from Arabian Sea. The significant rainfall during the spell is shown below:

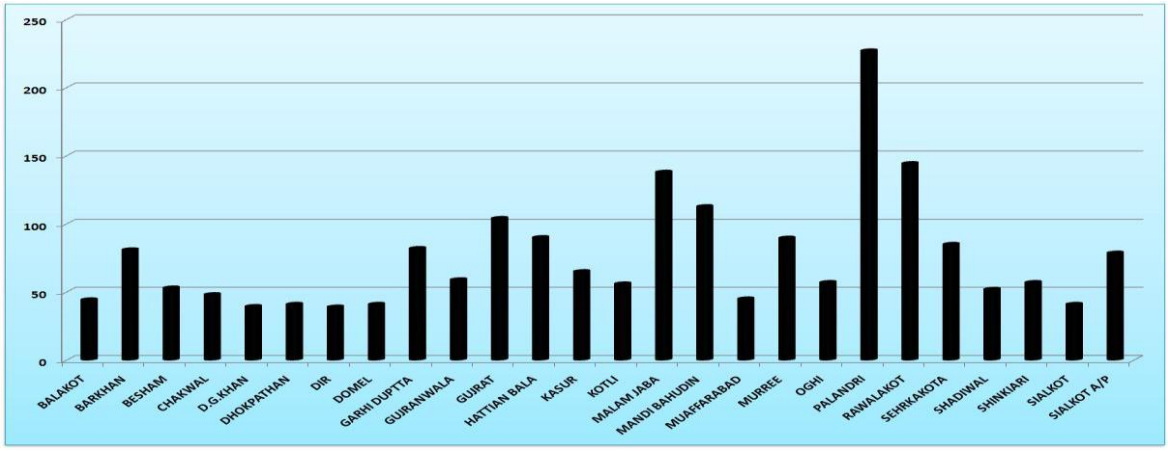


Figure 4: Significant Rainfall during **1st** Wet spell of July (01st July – 04th July)

4.1.2 Isohyetal pattern of the Spell (01-July to 04-July-2014):

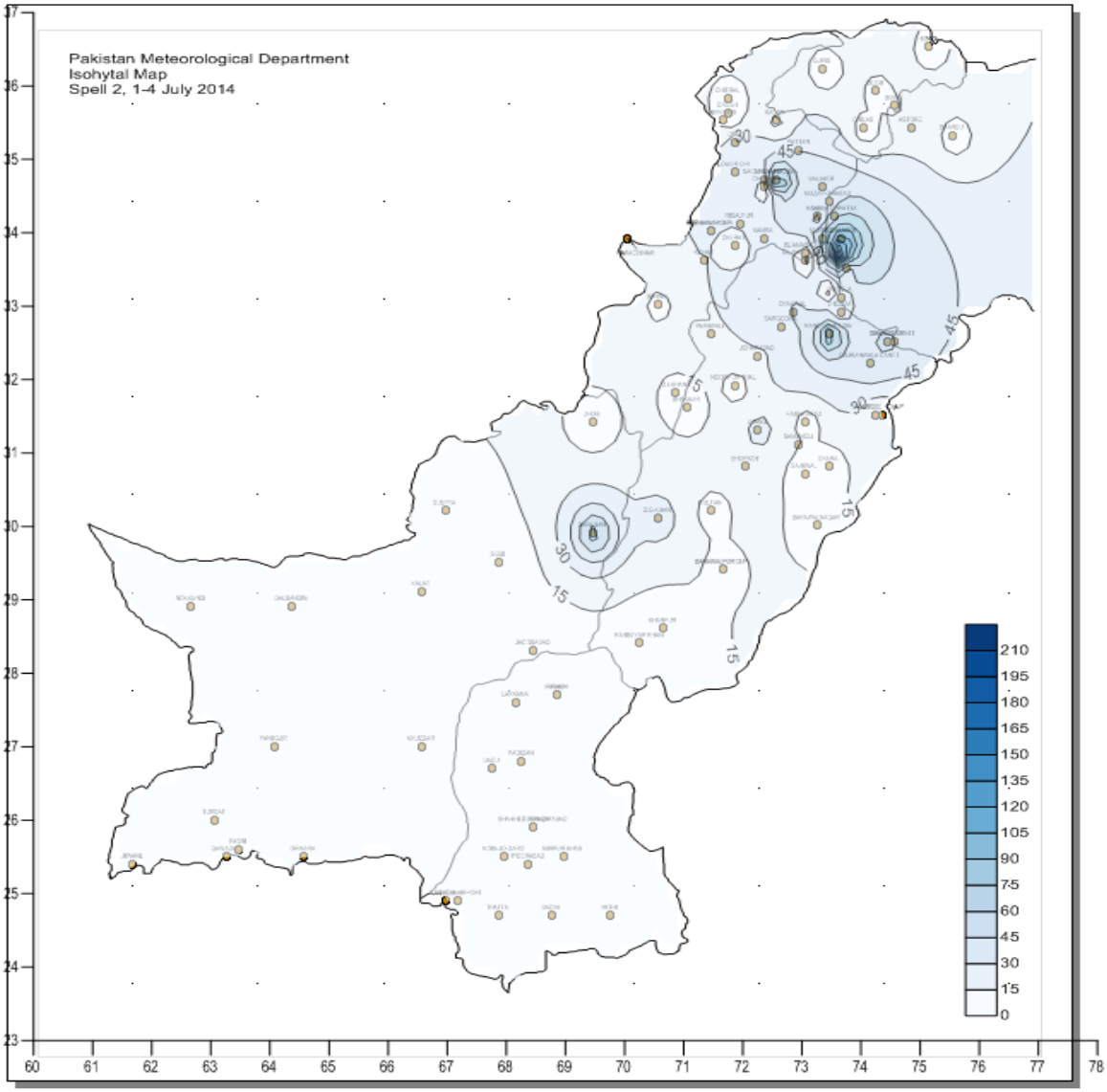


Figure 5: Isohyetal pattern of the Spell (01st July – 04th July)

4.1.3 Rivers Position Due to the Spell:

River Kabul at Nowshera remained in state of Medium flood level during the period while river Indus at Tarbela (upstream) & River Chenab at Marala (upstream) and river Jhelum at Mangla (upstream) attained Low flood level during the period. Hydrographs recorded during the period are shown as:

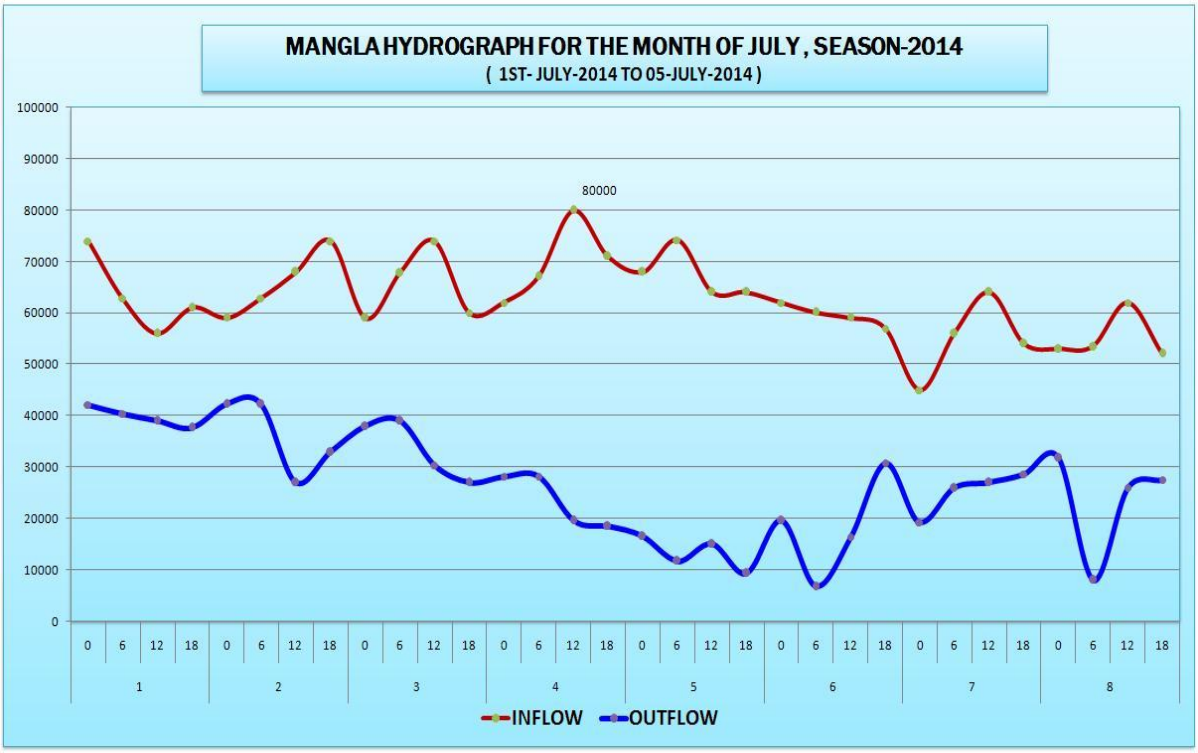


Figure 6: Mangla Hydrograph

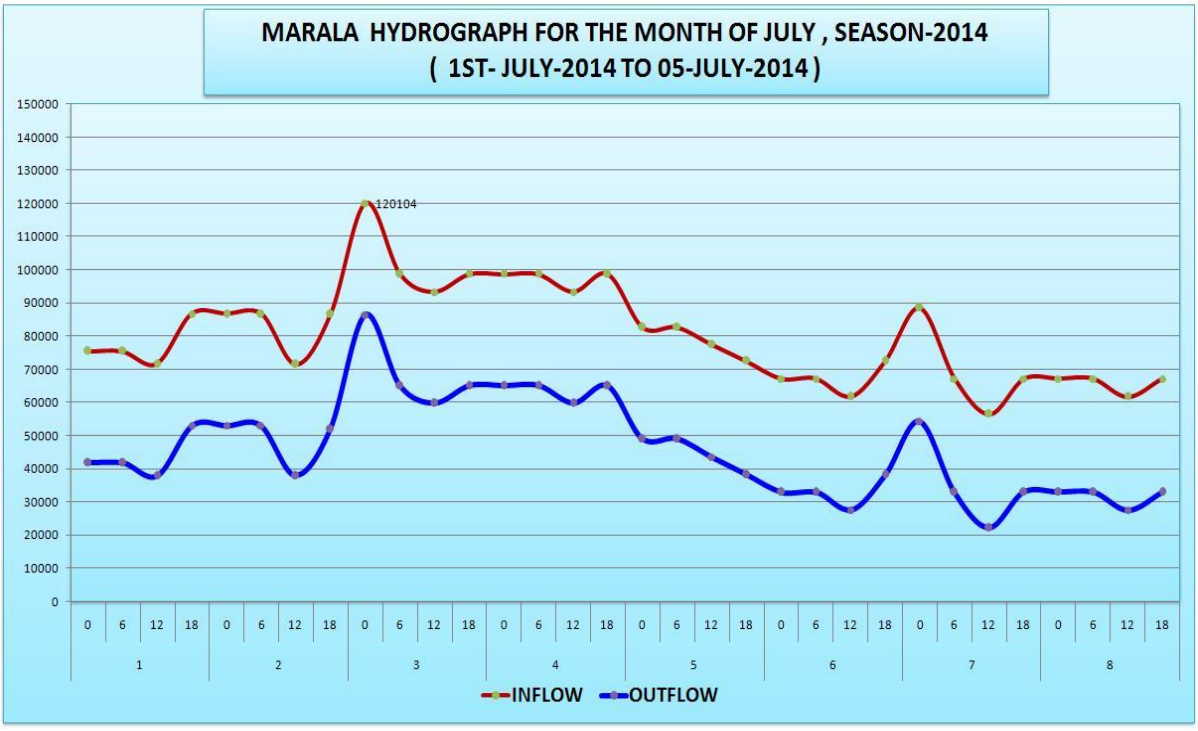


Figure 7: Marala Hydrograph

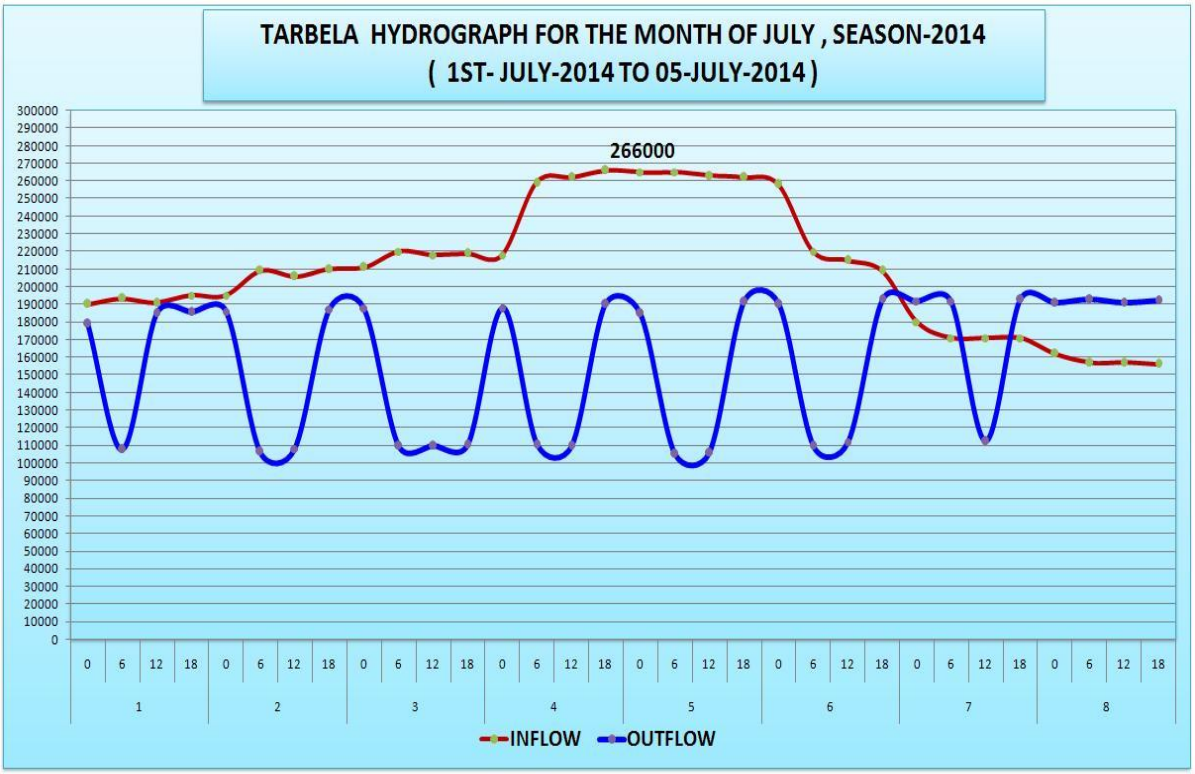


Figure 8: Tarbela Hydrograph

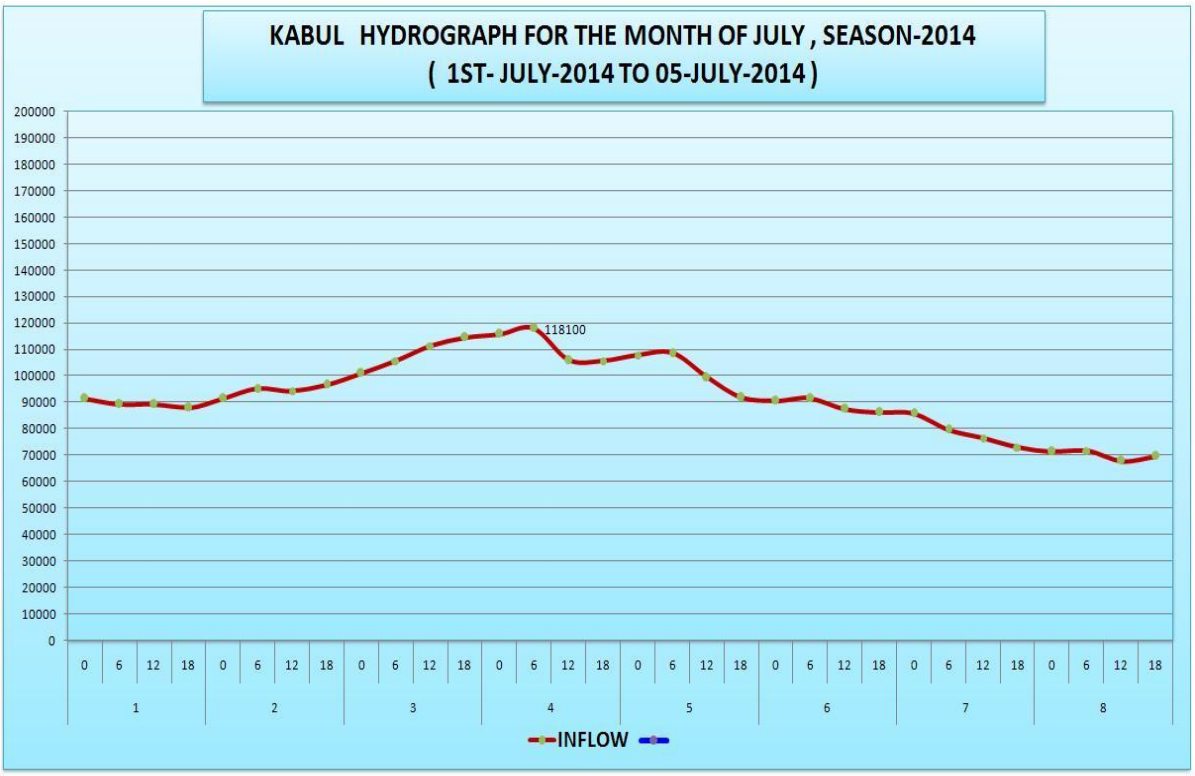


Figure 9: Kabul Hydrograph

4.1.4 Second Wet Spell of July 2014 (16-07-2014 to 18-07-2014):

This spell lasted for 3 days. The rainfall of moderate to heavy intensity was recorded in Kashmir. Rainfall of moderate intensity also observed over north & northeast Punjab alongwith Khyber Pakhtunkhwa as shown below:

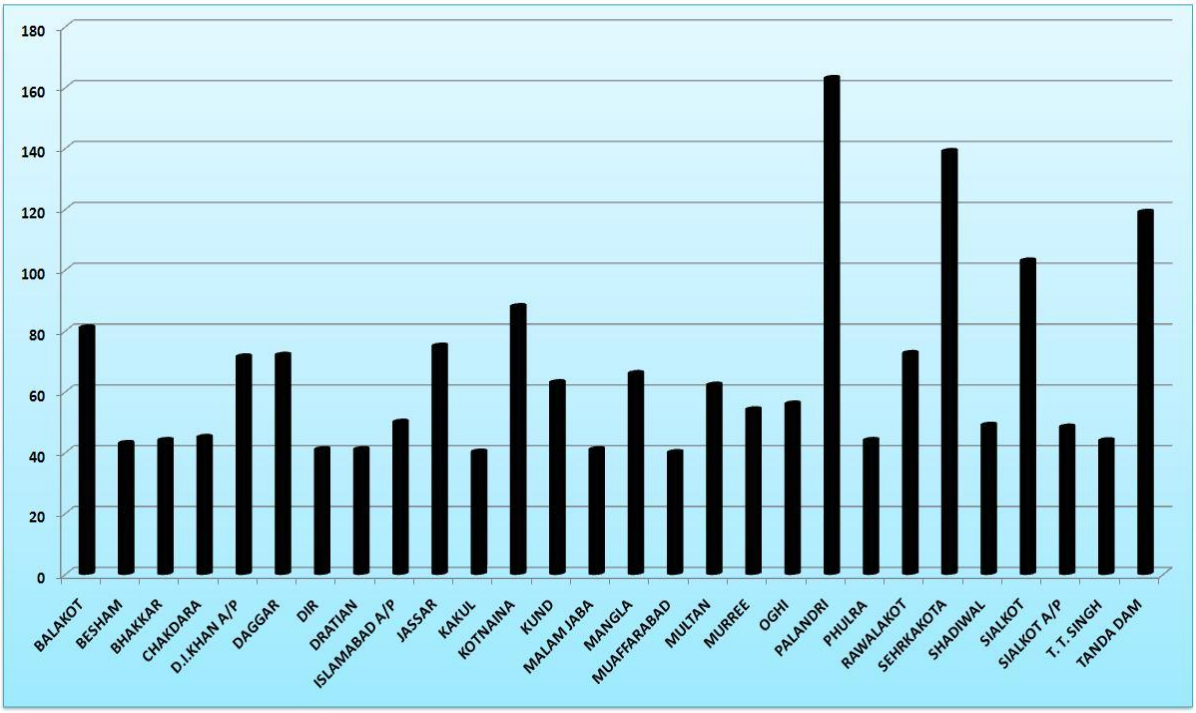


Figure 10: Significant Rainfall during second Wet spell of July-2014(16-18 July)

4.1.5 Isohyetal pattern of the Spell (16-July to 18-July-2014):

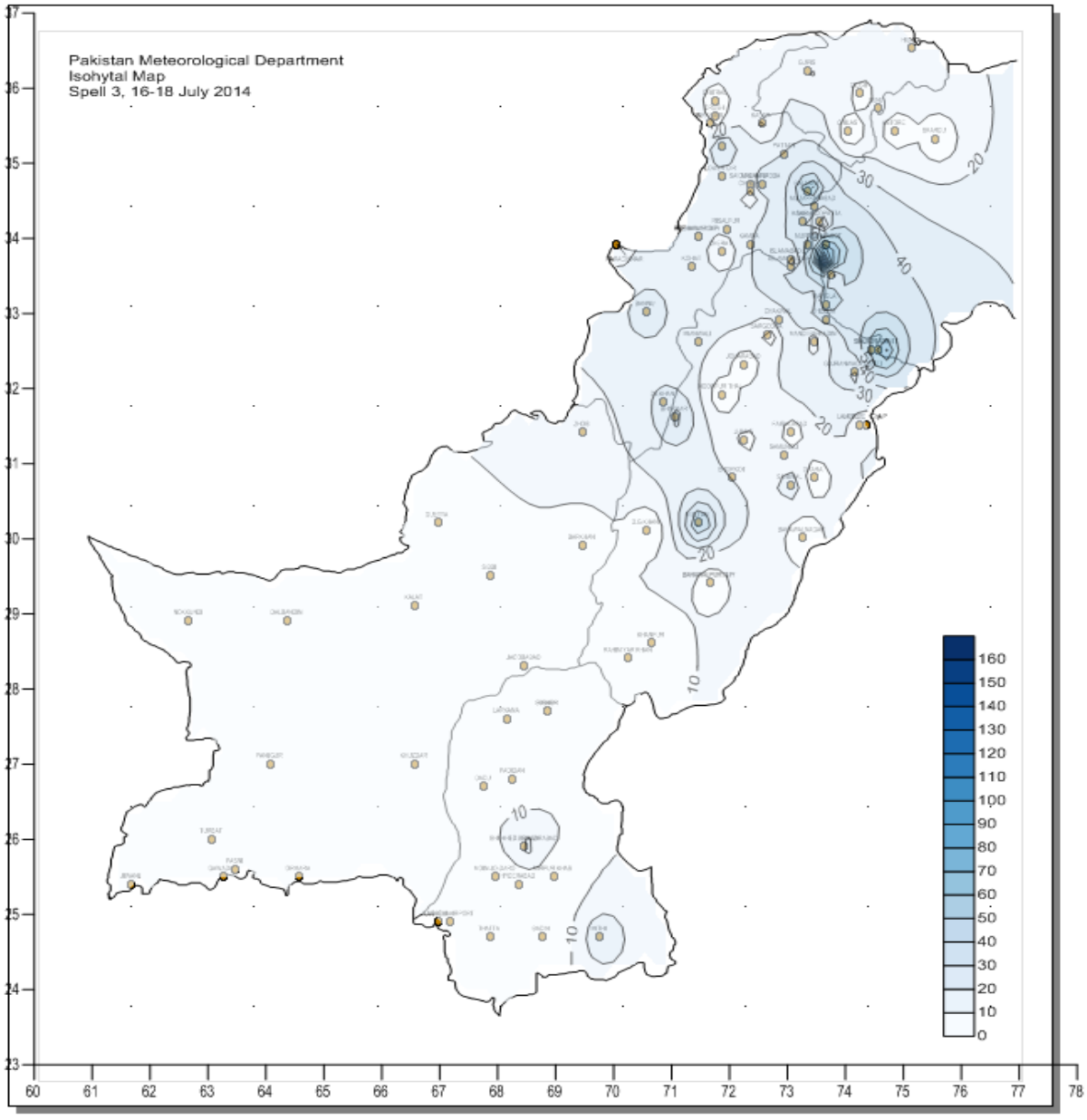


Figure 11: Isohyetal pattern of the Spell (16-July to 18-July-2014)

River Kabul at Nowshera attained medium flood level while river Indus at Tarbela upstream recorded low flood level. All the other rivers remained below low flood level. Hydrographs of river Kabul at Nowshera and River Indus at Tarbela are shown below.

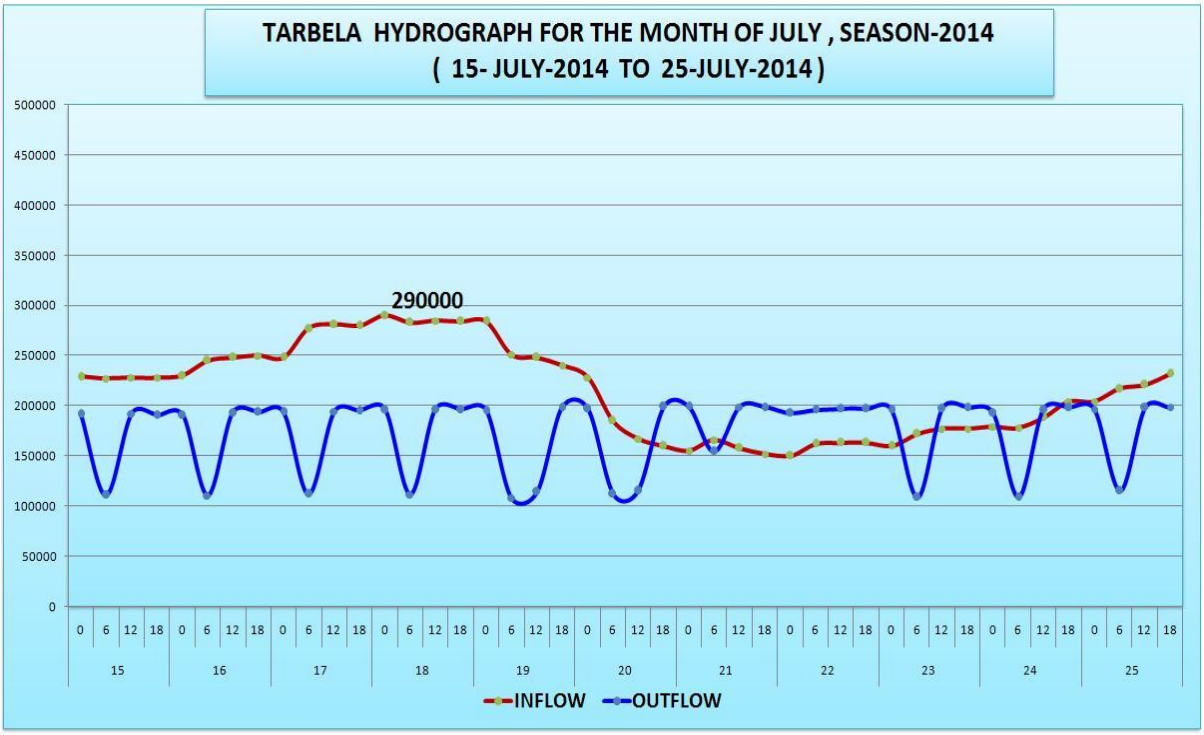


Figure 12: Tarbela Hydrograph

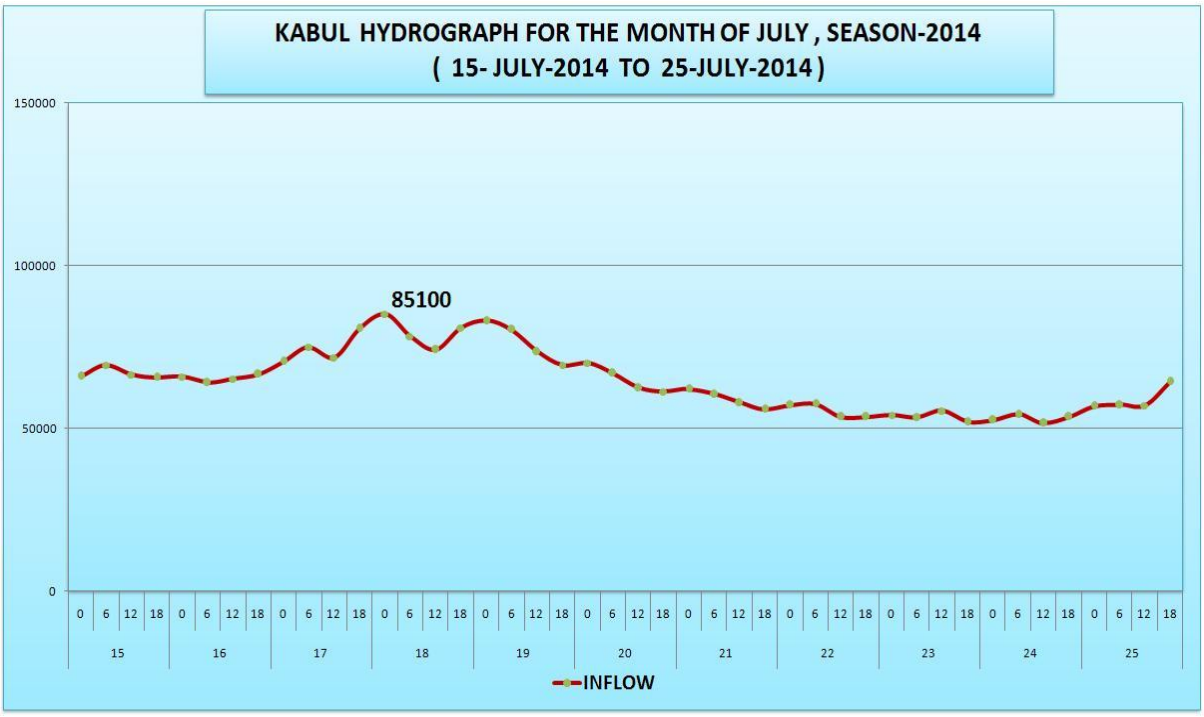


Figure 13: Kabul Hydrograph

4.1.6 Third Wet Spell of July 2014 (24-07-2014 to 26-07-2014):

This spell lasted for three days. The Significant rainfall (MM) of moderate to heavy intensity was recorded over north Punjab and Kashmir as shown below:

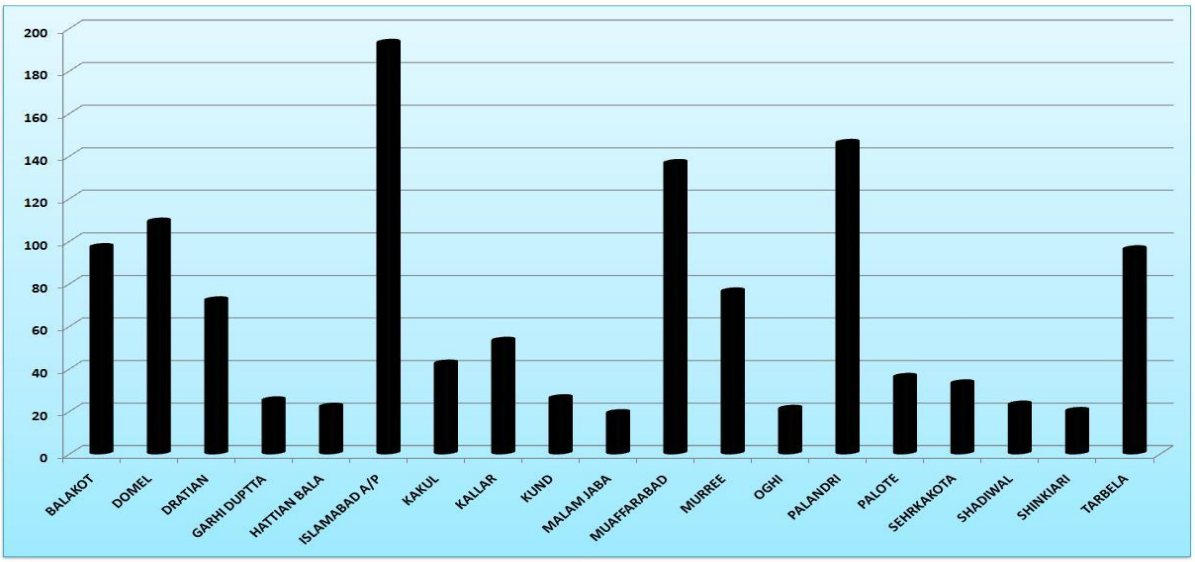


Figure 14: Significant Rainfall during third Wet spell of July-2014(24-26 July)

4.1.7 Isohyetal pattern of the Spell (24-July to 26-July-2014):

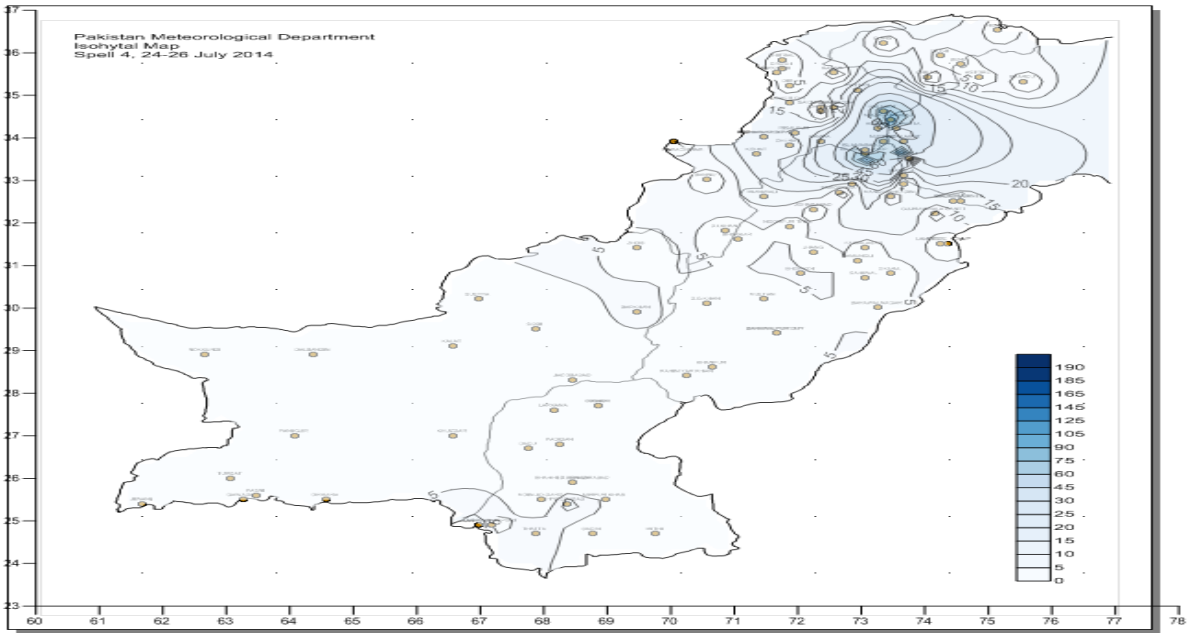


Figure 15: Isohyetal pattern of the Spell (24-July to 26-July-2014)

4.1.8 Rivers Position Due to 3rd Spell:

River Jhelum at Mangla upstream recorded low flood level and river Indus at Kalabagh reported low flood level during the spell as shown below.

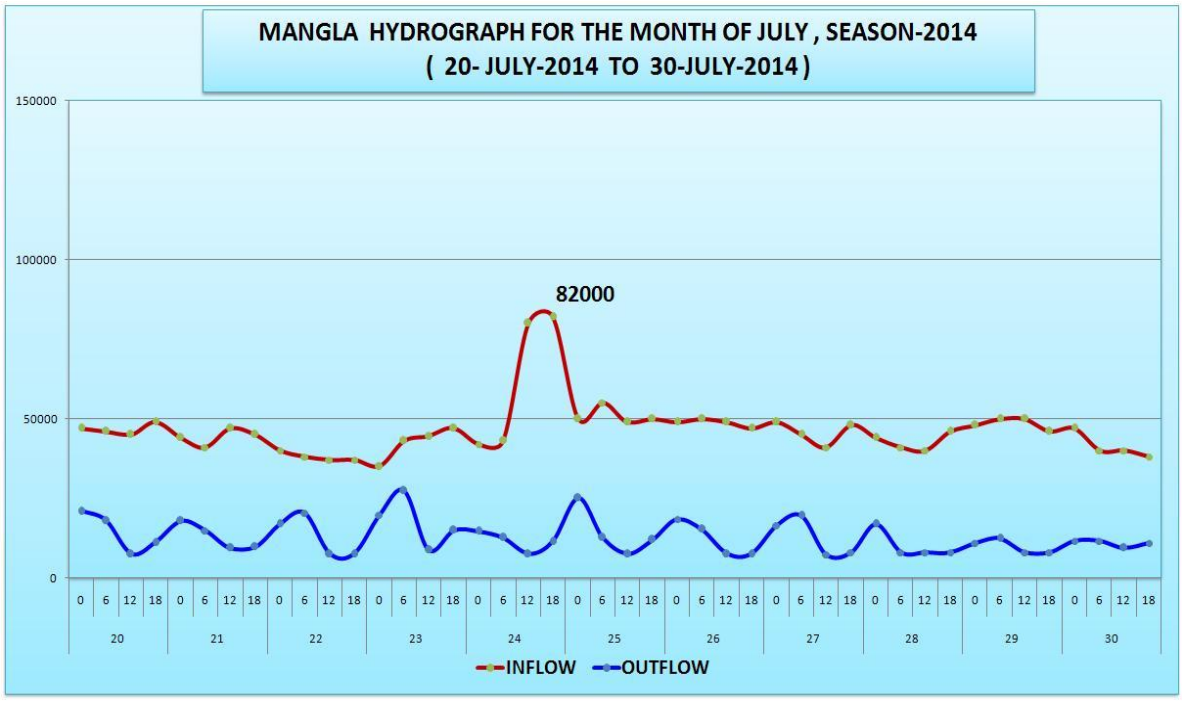


Figure 16: Mangla Hydrograph

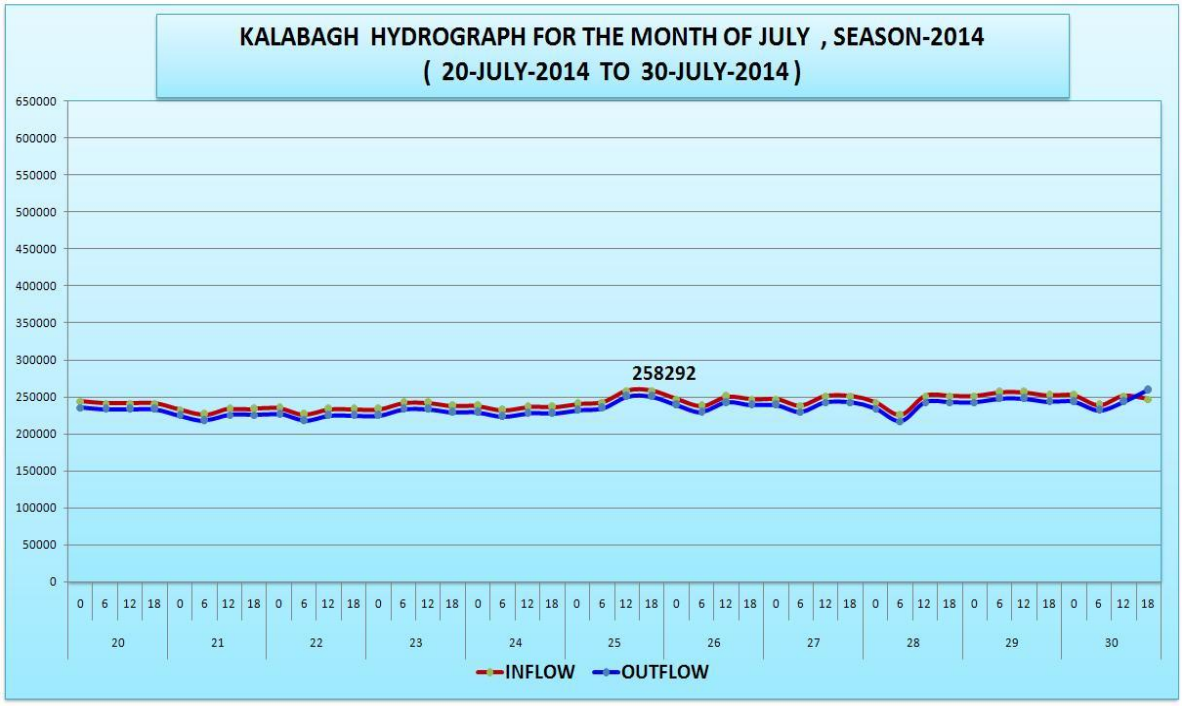


Figure 17: Kalabagh Hydrograph

4.1.9 Fourth Wet Spell of July 2014 (28-07-2014 to 30-07-2014):

This spell also lasted for three days. The rainfall of light to moderate intensity was recorded over north and northeast Punjab. Significant rainfall recorded is shown below.

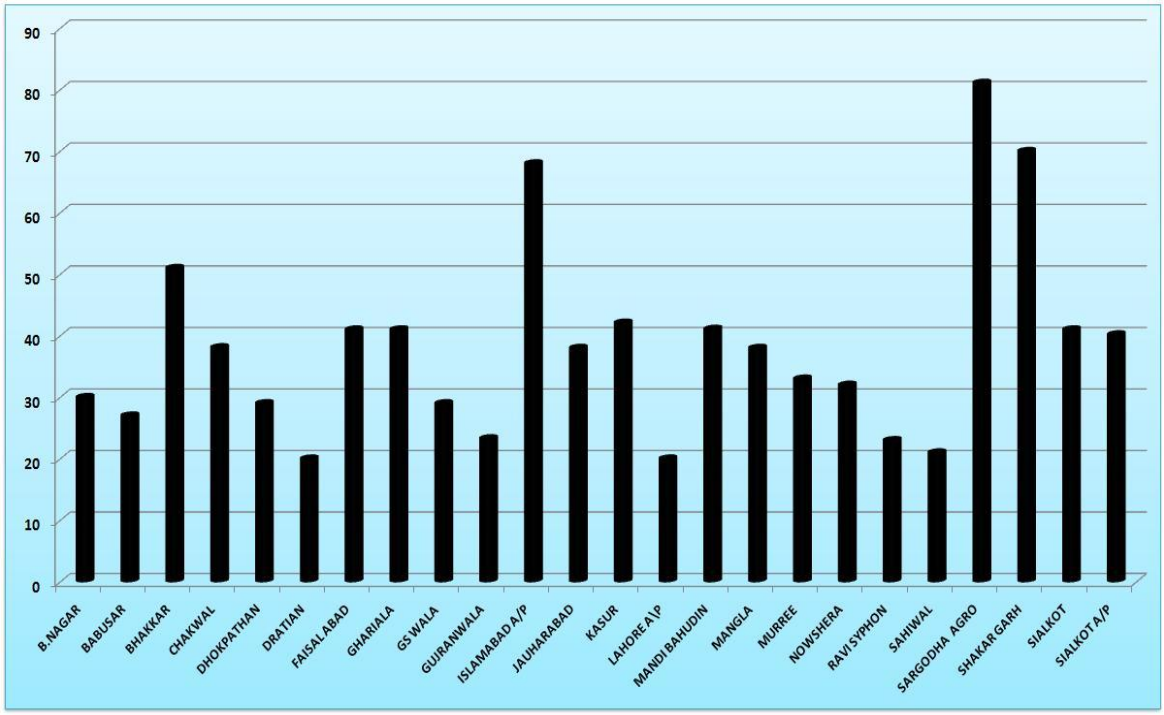


Figure 18: Significant Rainfall during 4th Wet spell of July-2014(28-30 July)

4.1.10 Isohyetal pattern of the Spell (28-July to 30-July-2014):

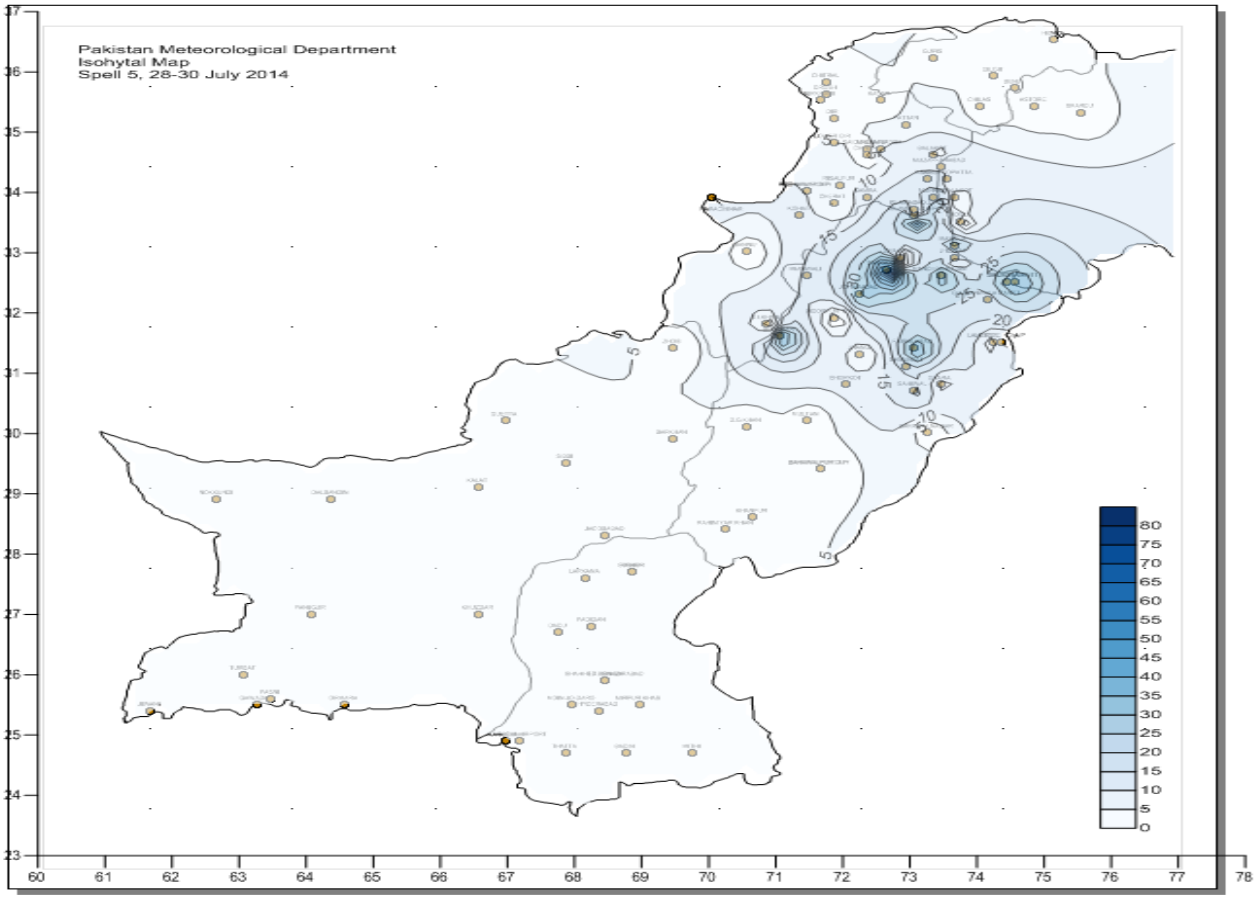


Figure 19: Isohyetal pattern of the Spell (28-July to 30-July-2014)

4.1.11 Rivers Position Due to 4th Spell of July:

River Indus at Tarbela upstream recorded low flood level as shown below.

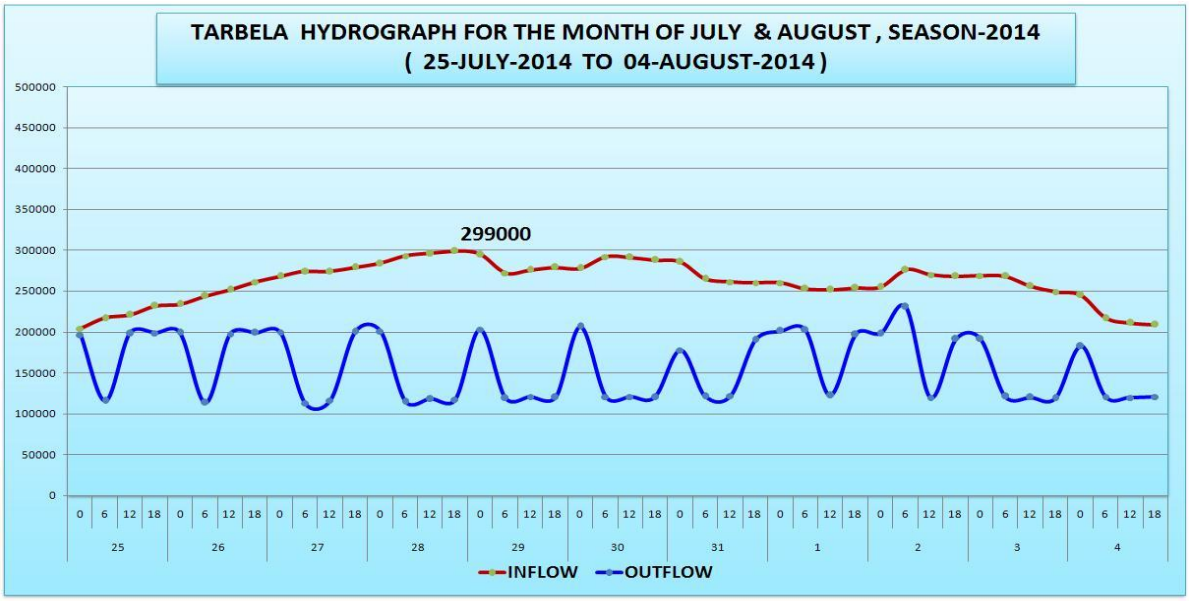


Figure 20: Tarbela Hydrograph

4.1.12 Rainfall Pattern for the Month of July 2014:

Isohyetal map of July 2014 indicates that the region of maximum rainfall (More than 500 MM) lay over Kashmir and adjoining north Punjab.

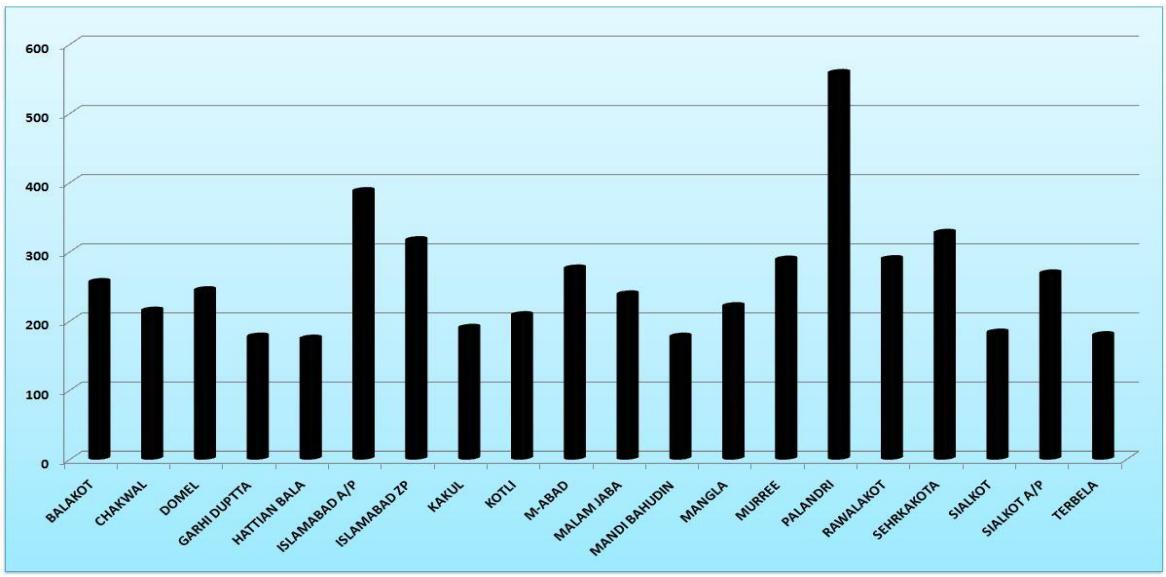


Figure 21: Significant Rainfall during July-2014

4.1.13 Isohyetal pattern of the Month of July -2014.

Isohyetal pattern of the rain recorded during July 2014 is shown below.

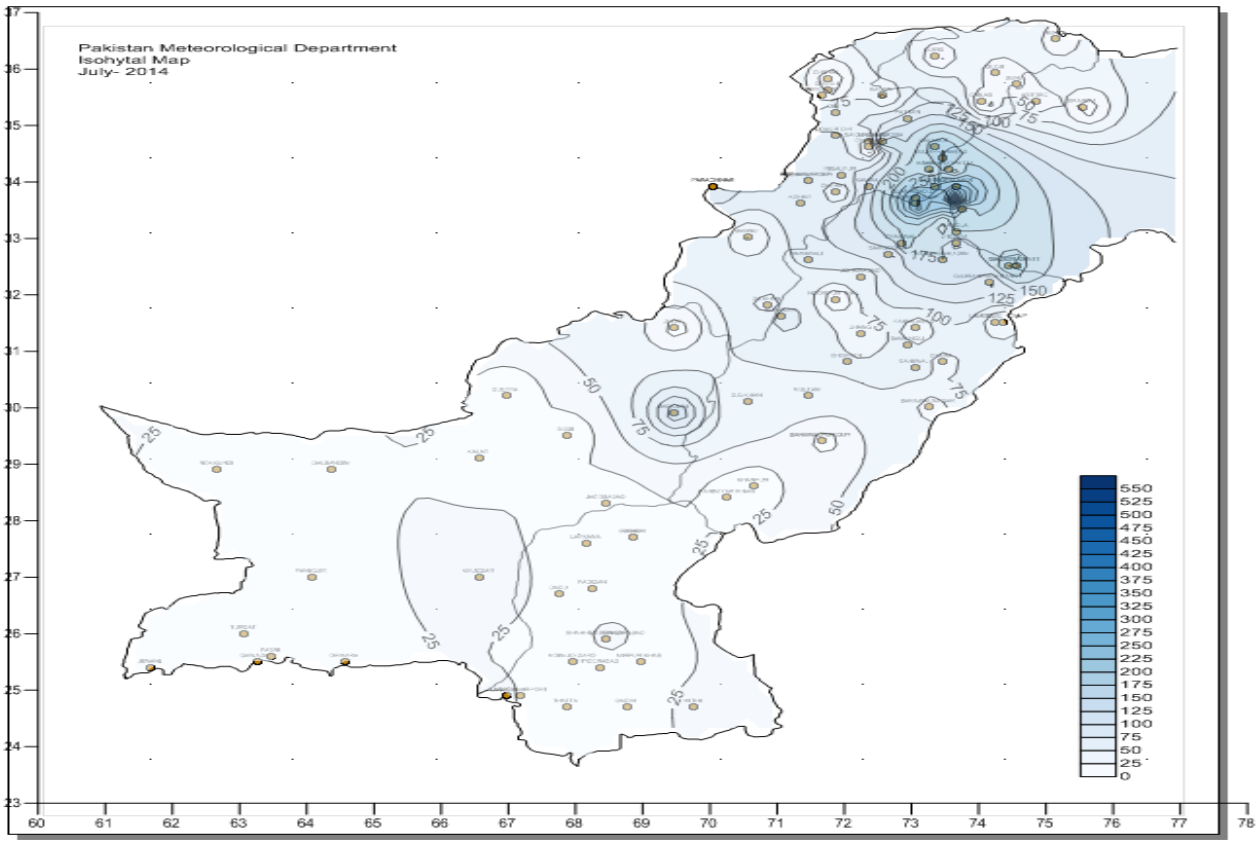


Figure 22: (Isohyetal Map of July 2014)

5 Significant Hydrometeorological Events during the month of August 2014:

5.1 Meteorological Events:

Three rainy spells of moderate intensity occurred during the month of August. First spell occurred from 1st to 3rd August 2014. This spell was caused by the trough of westerly wave accentuation of seasonal low and moist current from the Arabian Sea and Bay of Bengal. Second wet spell of the August observed from 8th to 10th August 2014. This spell was also caused by the moving trough of westerly wave accentuation of seasonal low and moist current from the Arabian Sea. Third and final spell occurred from 15th to 17th August 2014. This spell caused also by the passage of westerly wave and accentuation of seasonal low and moderate moist current from Arabian Sea. During August two monsoon lows developed over the Bay of Bengal and one of them reached in the vicinity of the country during the 1st week of September.

5.1.1 First Wet Spell of August (01-08-2014 to 03-08-2014):

The rainfall during the first spell of August which was 6th of the season occurred during 1st to 3rd August 2014 . Light to Moderate Rainfall was observed in this spell over north and northeast Punjab alongwith Kashmir. Significant rainfall during the spell is shown in figure 23,

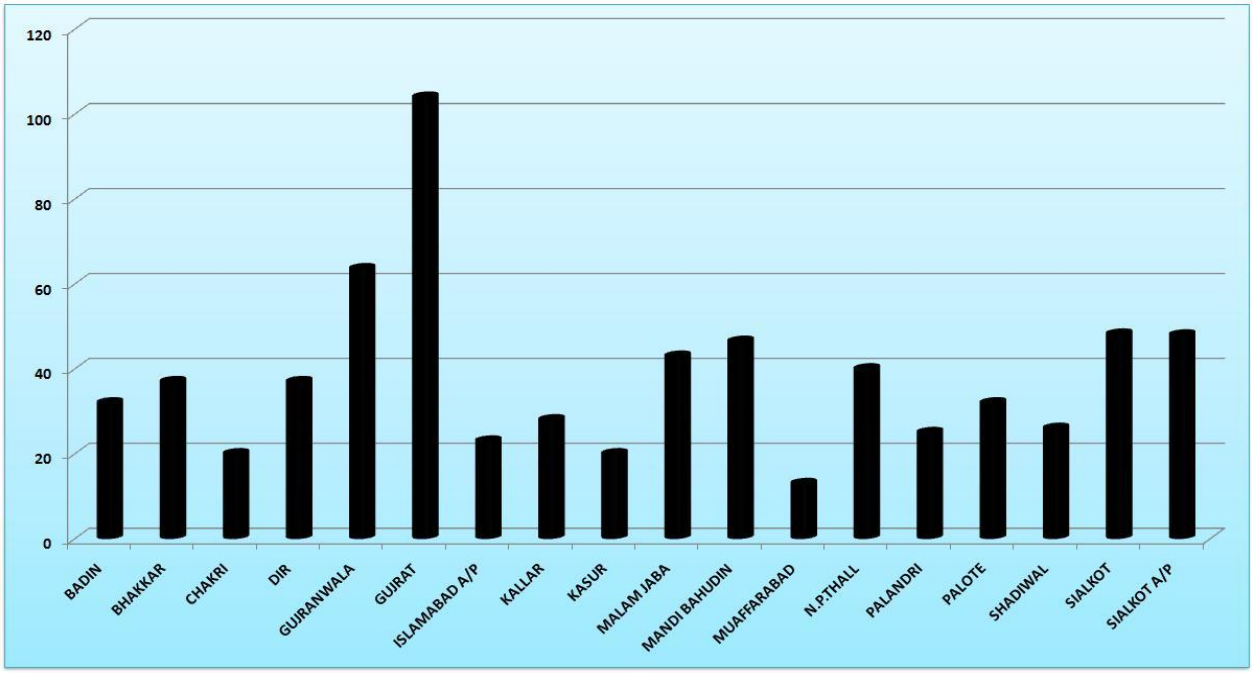


Figure 23: Significant Rainfall during 1st Wet spell of August-2014 (01 Aug-3 Aug)

5.1.2 Isohyetal pattern of the Spell (01-Aug to 3-Aug-2014):

Isohyetal pattern of the spell is as under:

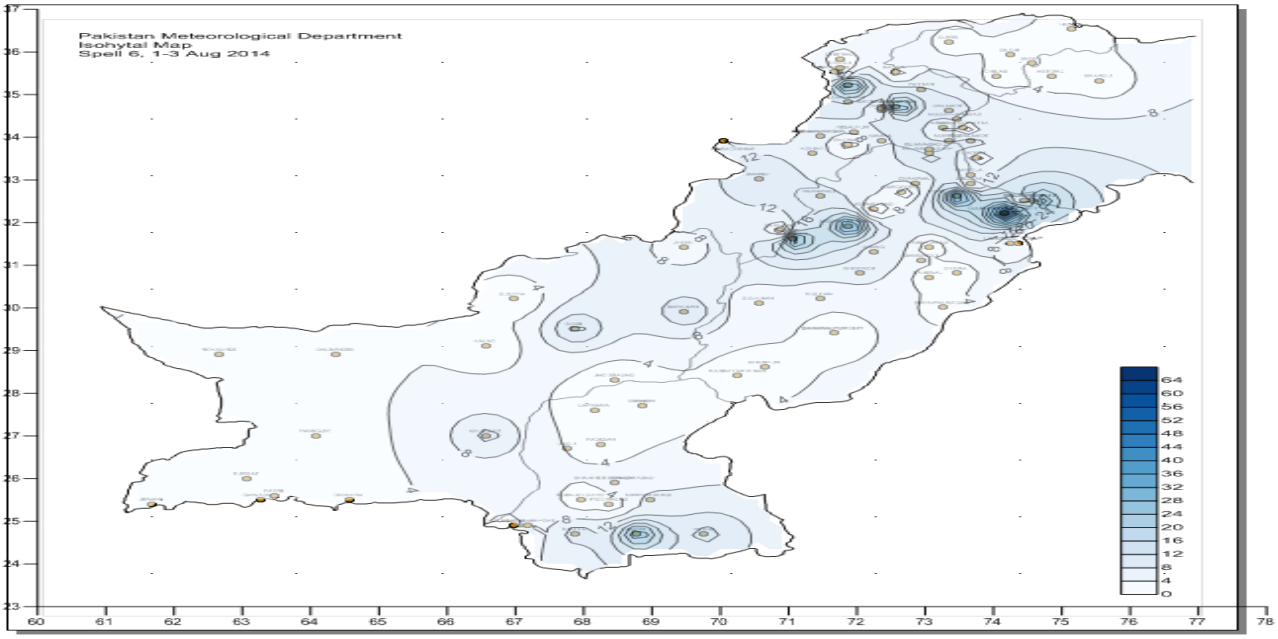


Figure 24: (Isohyetal Map of 1-Aug to 03-Aug 2014)

Rivers Position during the Spell: Due to this spell river Chenab at Marala (upstream) attained a High flood situation, while medium flood situation was observed in river Chenab at Khanki and Qadirabad. Low flood peaks (Upstream) were also recorded in rivers Jhelum at Mangla, Kabul at Nowshera, Indus at Tarbela, Kalabagh & Chashma

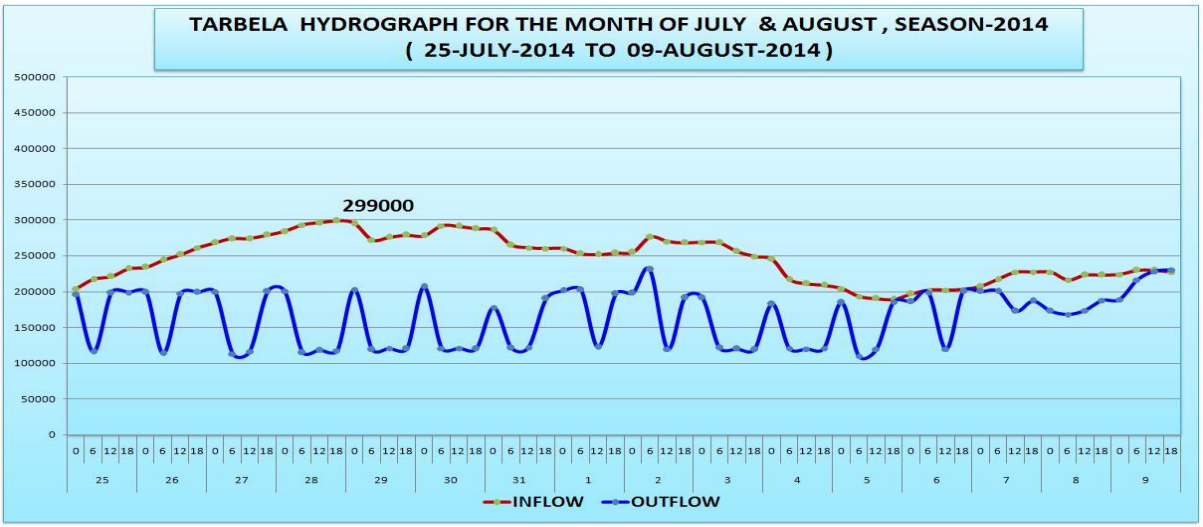


Figure 25: Tarbela Hydrograph

5.1.3 Second Wet Spell of August (08-08-2014 to 10-08-2014):

Moderate to heavy rainfall recorded over Kashmir north & northeast Punjab as shown in the figure 26 .

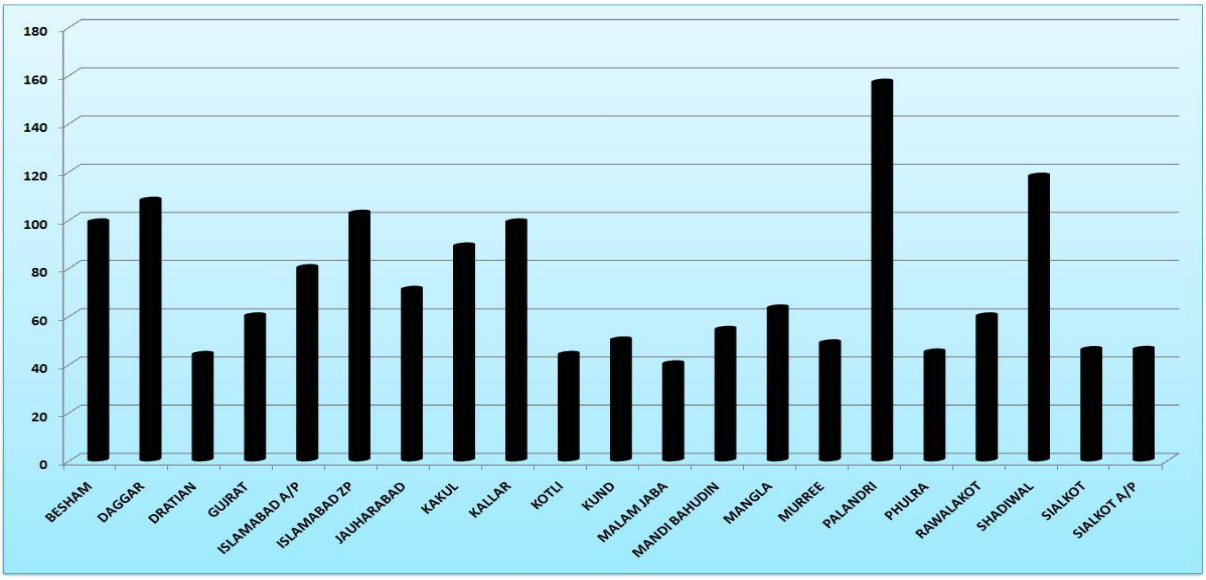


Figure 26: Significant Rainfall during 2nd Wet spell of August-2014(08 Aug-10 Aug)

5.1.4 Isohyetal pattern of the Spell (08-Aug to 10-Aug-2014):

Isohyetal pattern of the spell is as under:

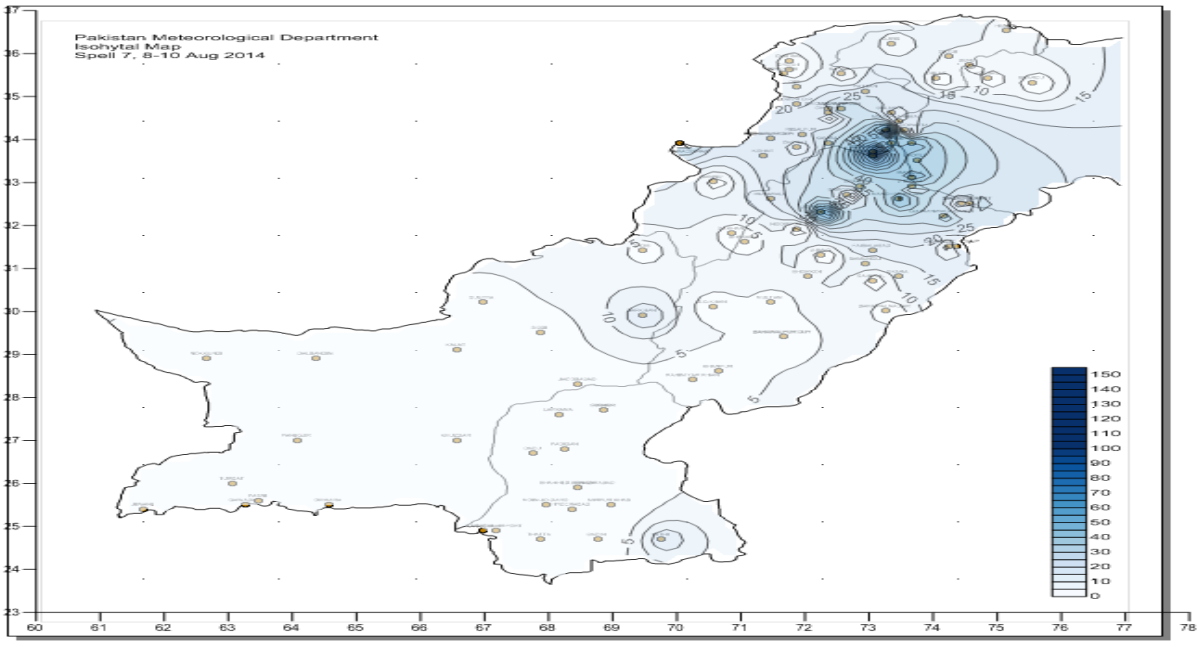


Figure 27: Isohyetal pattern of the Spell (08-Aug to 10-Aug-2014)

5.1.5 Isohyetal pattern of the Spell (15-Aug to 17-Aug-2014):

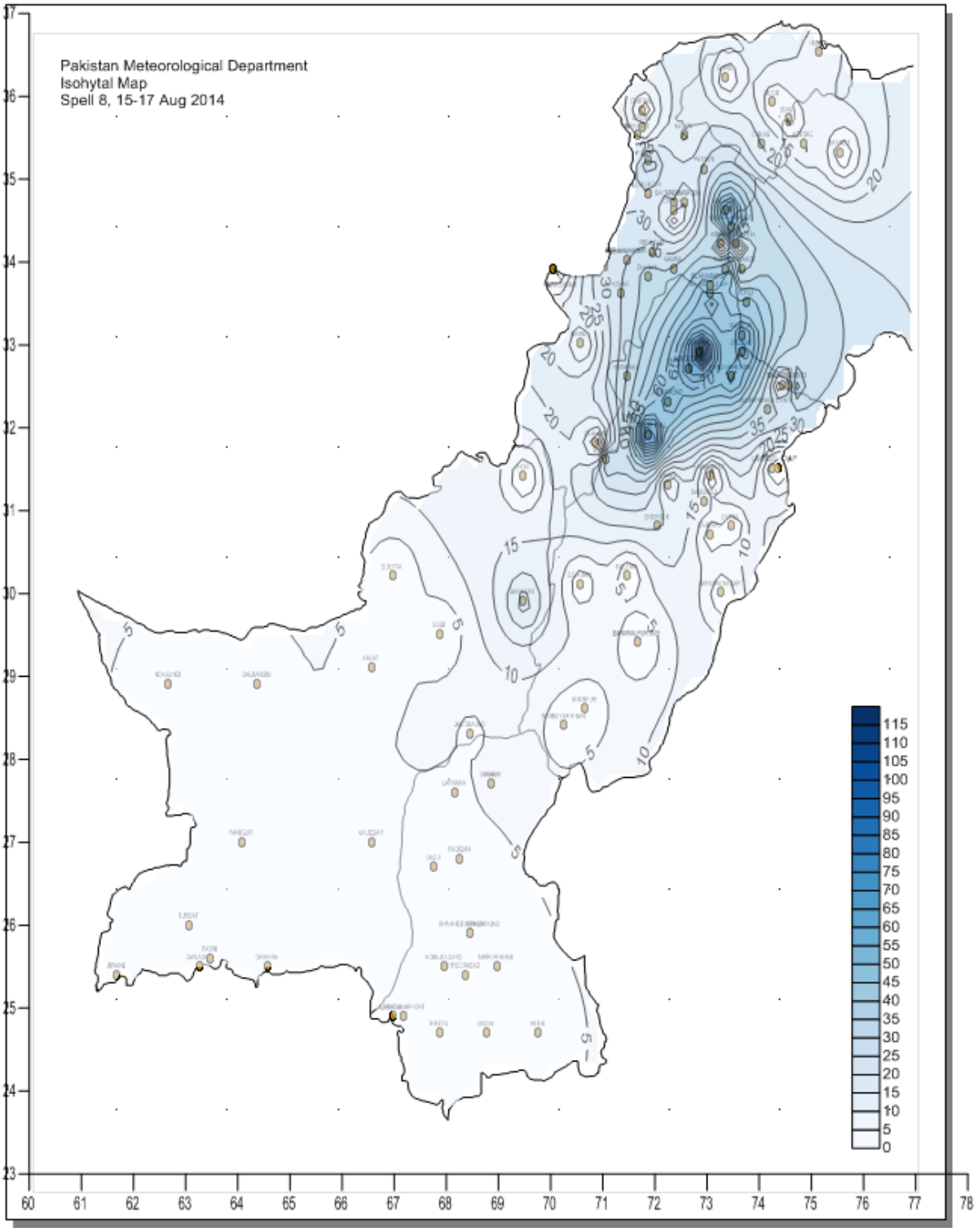


Figure 29: Isohyetal pattern of the Spell (15-Aug to 17-Aug-2014)

5.1.6 Rivers Position during the Spell:

Low flood (upstream as well as downstream) was observed in river Kabul at Nowshera river Chenab at Marala, Khanki and Qadirabad only at upstream in River Ravi at Balloki. All the other rivers remained in their normal state.

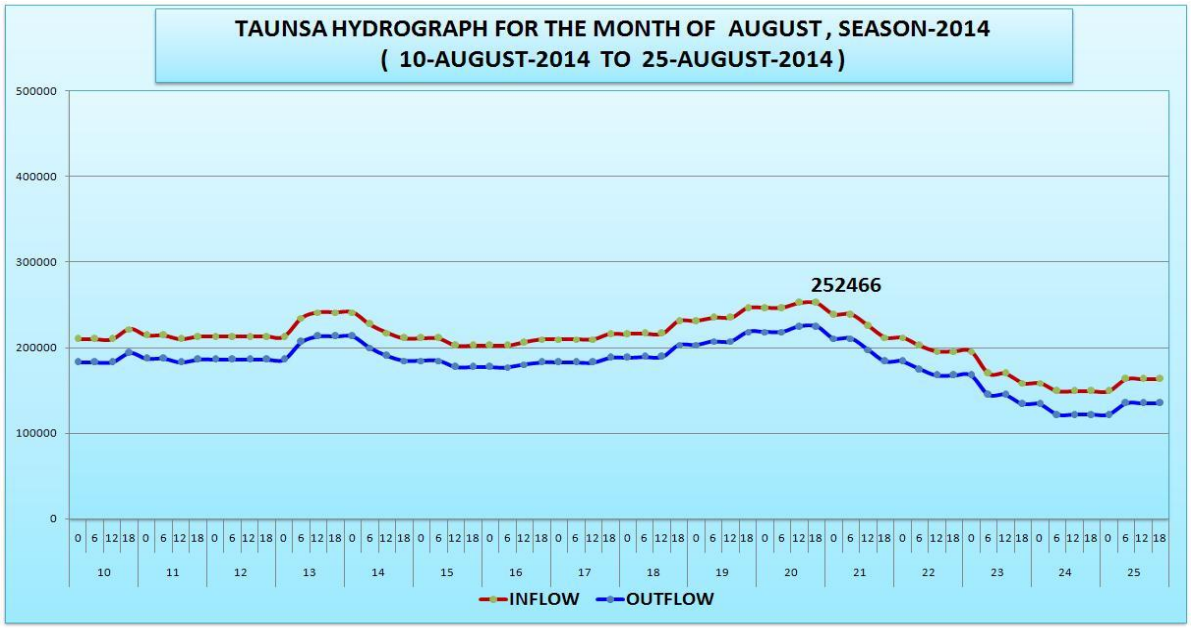


Figure 30: Taunsa Hydrograph

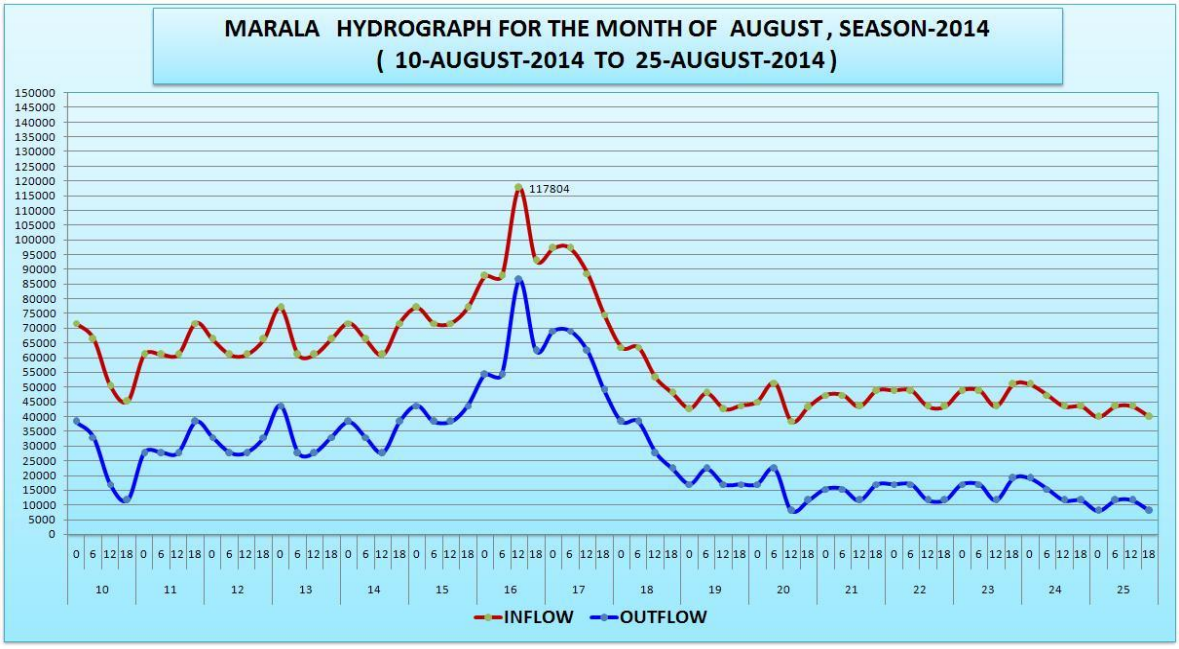


Figure 31: Marala Hydrograph

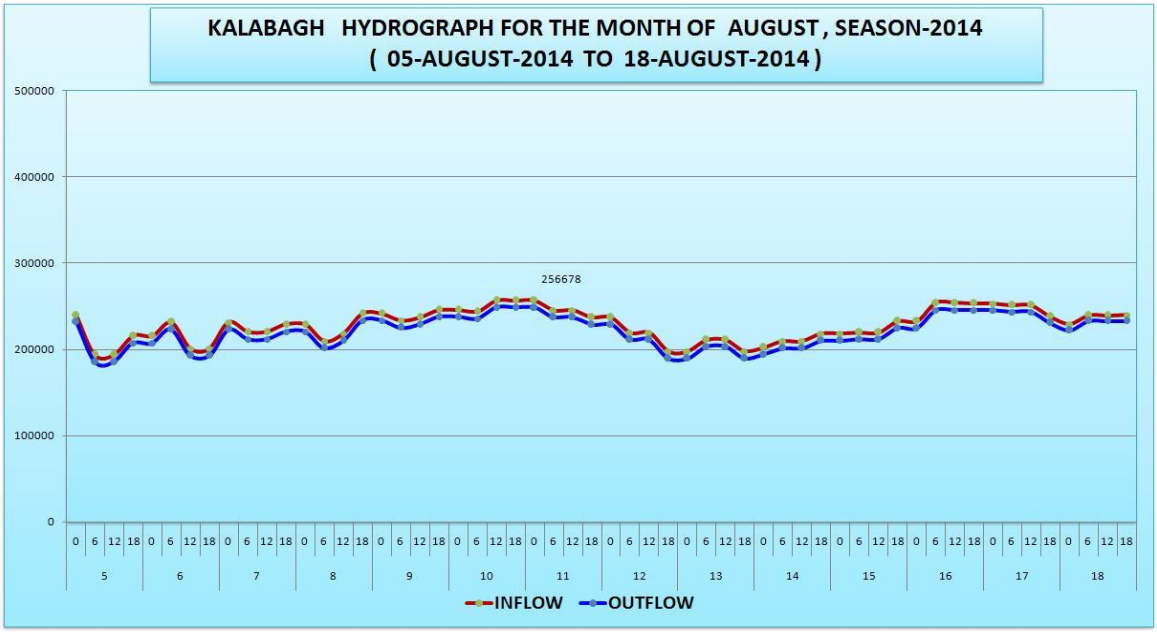


Figure 32: Kalabagh Hydrograph

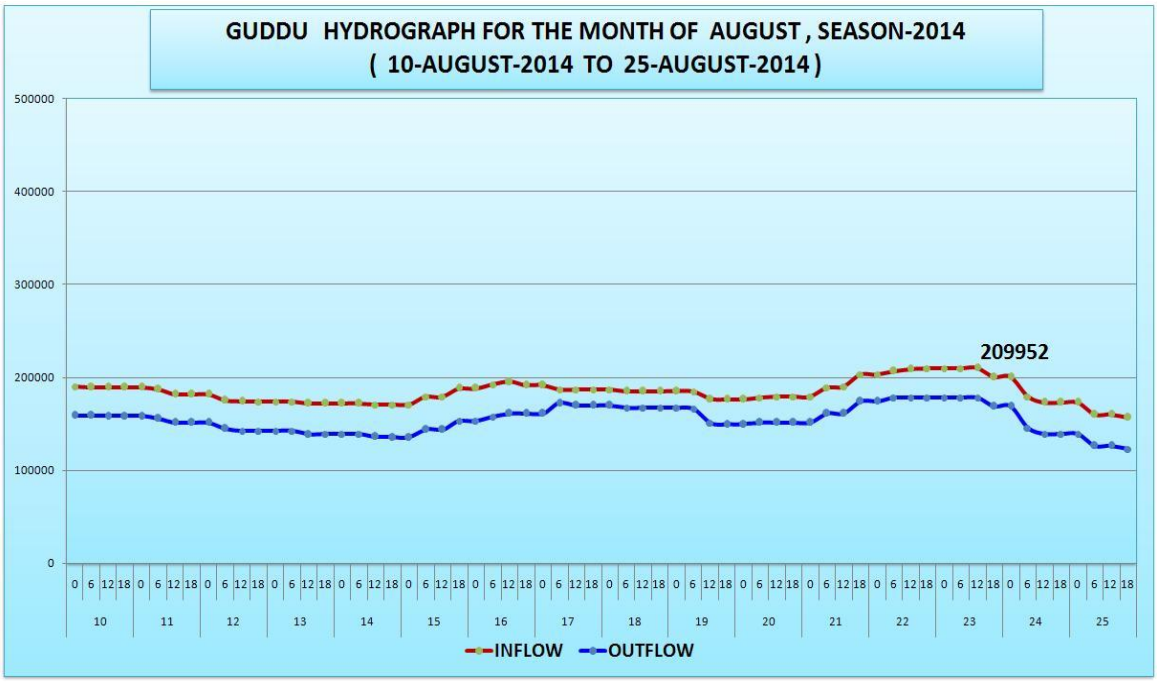


Figure 33: Guddu Hydrograph

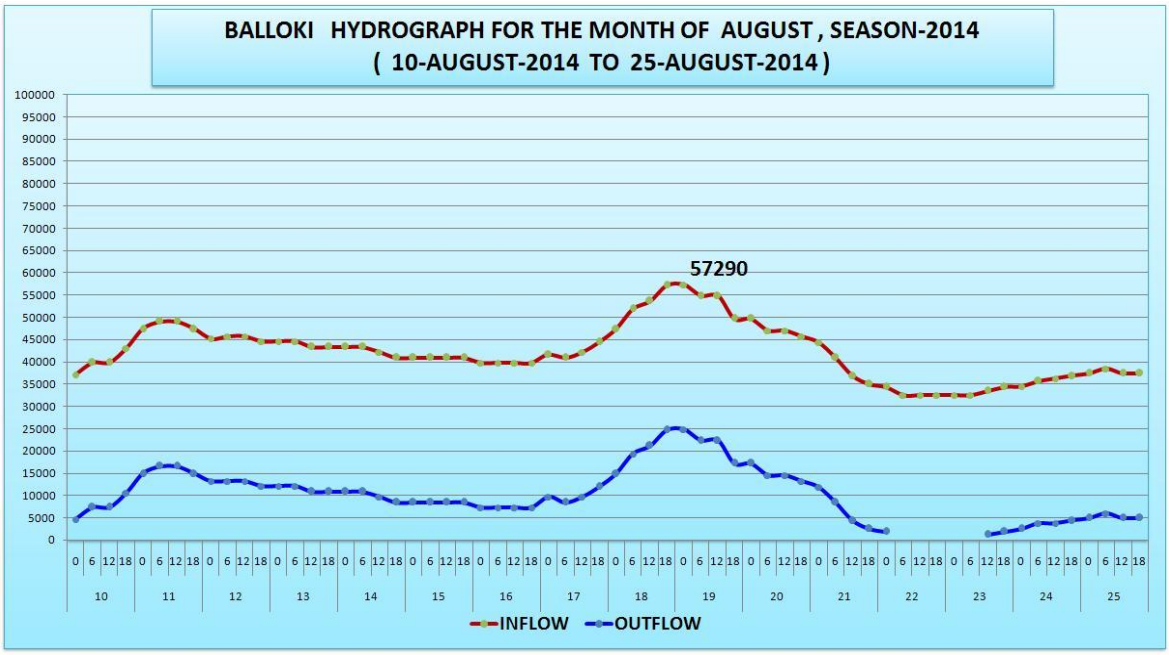


Figure 34: Balloki Hydrograph

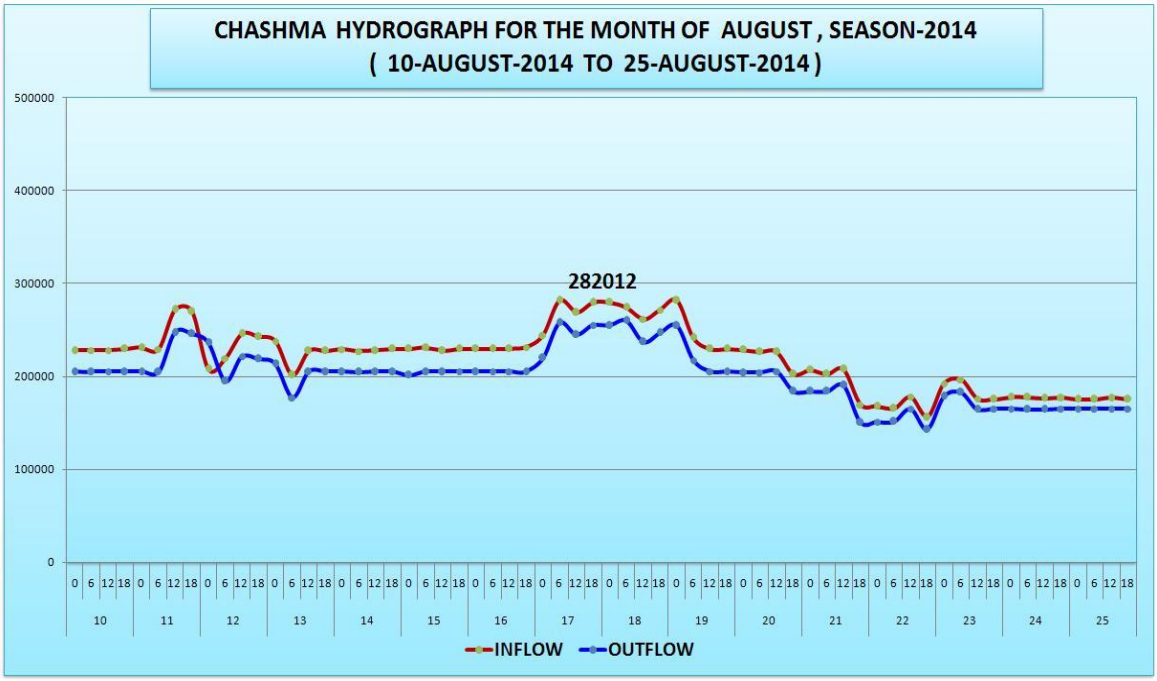


Figure 35: Chashma Hydrograph

5.1.7 Rainfall Pattern for the month of August, 2014:

The monthly Isohyetal pattern during the month of August indicates below normal monsoon activity over most parts of the country. Rainfall maxima exceeding 300 mm in the month of August 2014 encompassed Kashmir. Second rainfall maxima exceeding 250 (MM) was located over Islamabad.

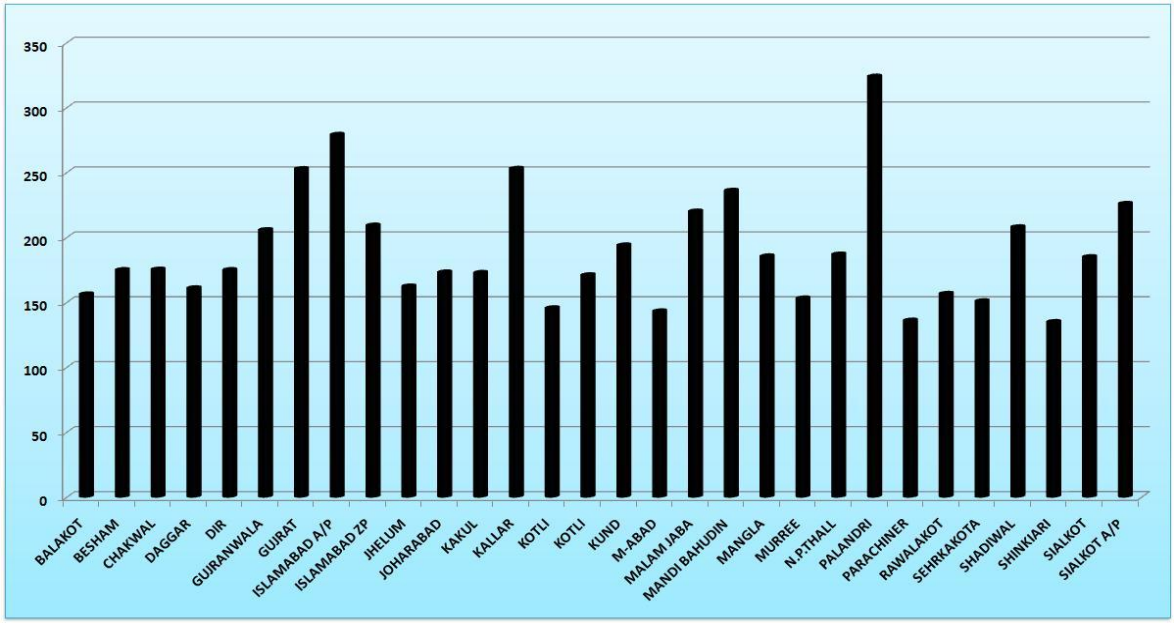


Figure 36: Significant Rainfall during 4th Wet spell (15 Aug-17 Aug 2014)

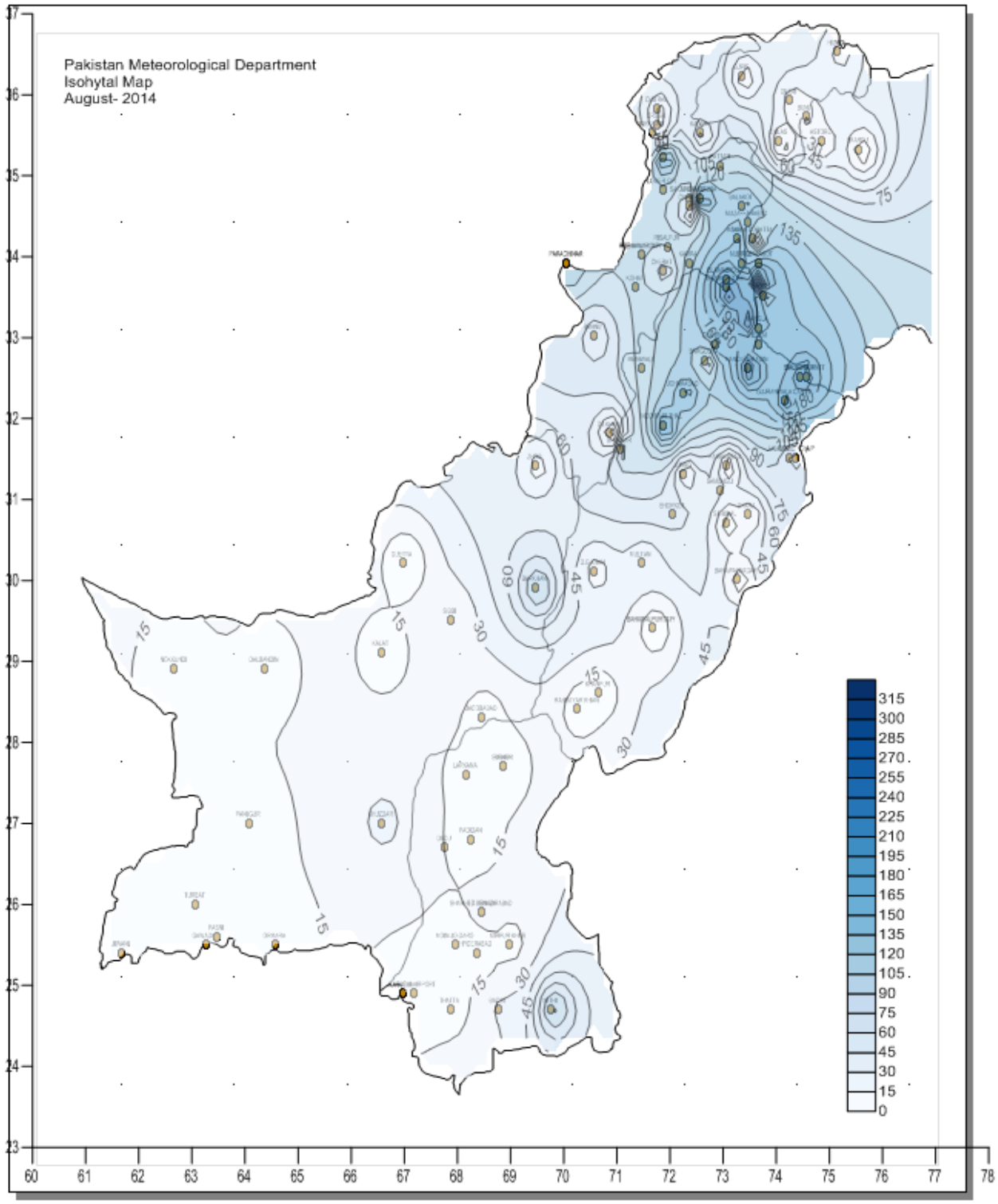


Figure 37: Isohyetal Map of August, 2014

5.2 Significant Hydrometeorological Events during the Month of Sep, 2014:

During the month of September two monsoon lows developed over Bay of Bengal. One of them which developed on 28th August and moving west northwesterly direction reached over Rajasthan on 3rd September. From here it moved in north-northwesterly direction affecting heavy Punjab and Kashmir on 5th of September 2014.The second monsoon low developed over Bay of Bengal and moved westerly direction upto East Madhya Pradesh, then it moved north- northwesterly direction and dissipated around Delhi without affecting the country.

5.3 First Wet Spell of September (03-09-2014 to 06-09-2014):

First rainy spell of September started from 3rd September, 2014 and continued upto 6th September, 2014. It was the most active spell of the season and provided torrential rainfall over Northeast Punjab, Kashmir & Catchments of Jhelum, Chenab and eastern Rivers which caused exceptionally high floods in river Chenab and Jhelum along with Nullahs of river Ravi and Chenab.

The Exceptionally high floods in river Chenab and Jhelum were caused by the interaction of well marked monsoon low with an active westerly wave. Monsoon low was first located over northwest Andhra Pradesh and adjoining Bay of Bengal and arrived over Rajasthan on 3rd . From here its journey continued under the influence of westerly wave in northwesterly direction rapidly and reached over Punjab and Kashmir on 5th.

The meteorological situation from surface to 500mb and associated significant rainfall shown in the Map and Graph

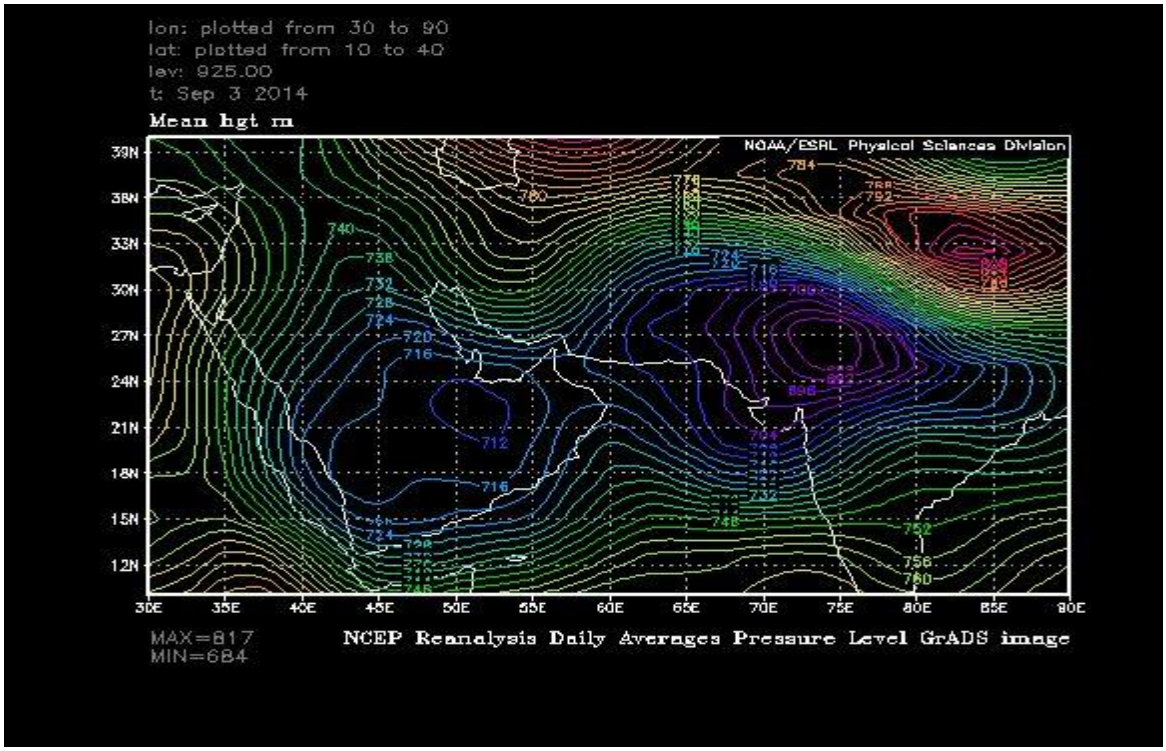


Fig.38a

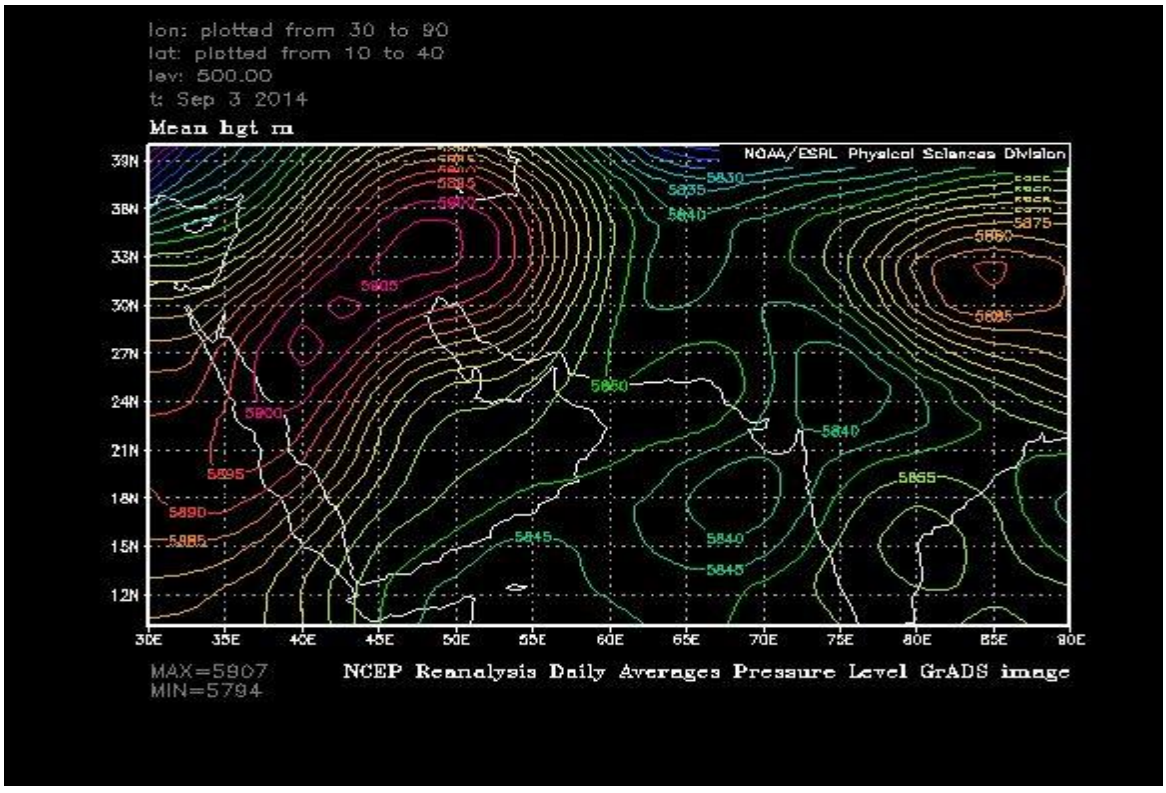


Fig.38b

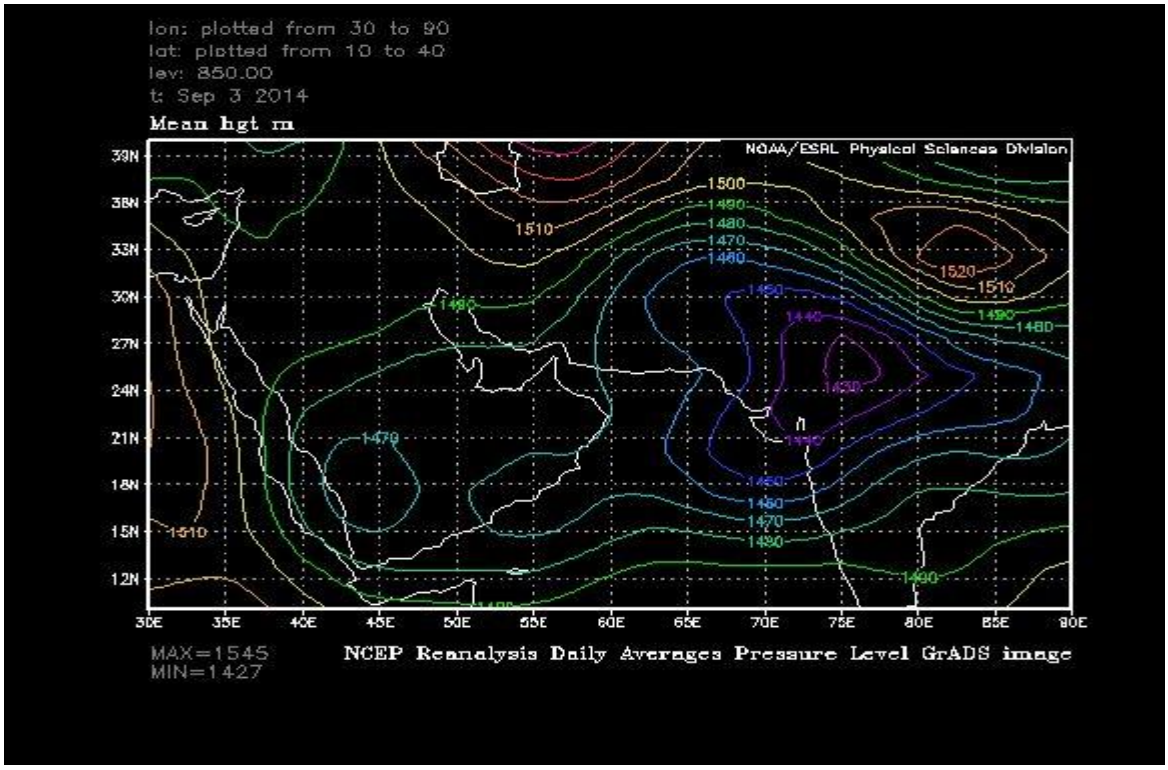


Fig.38c

Fig. 38 a to c: Meteorological situation of the flood generating system from surface to 5000mb

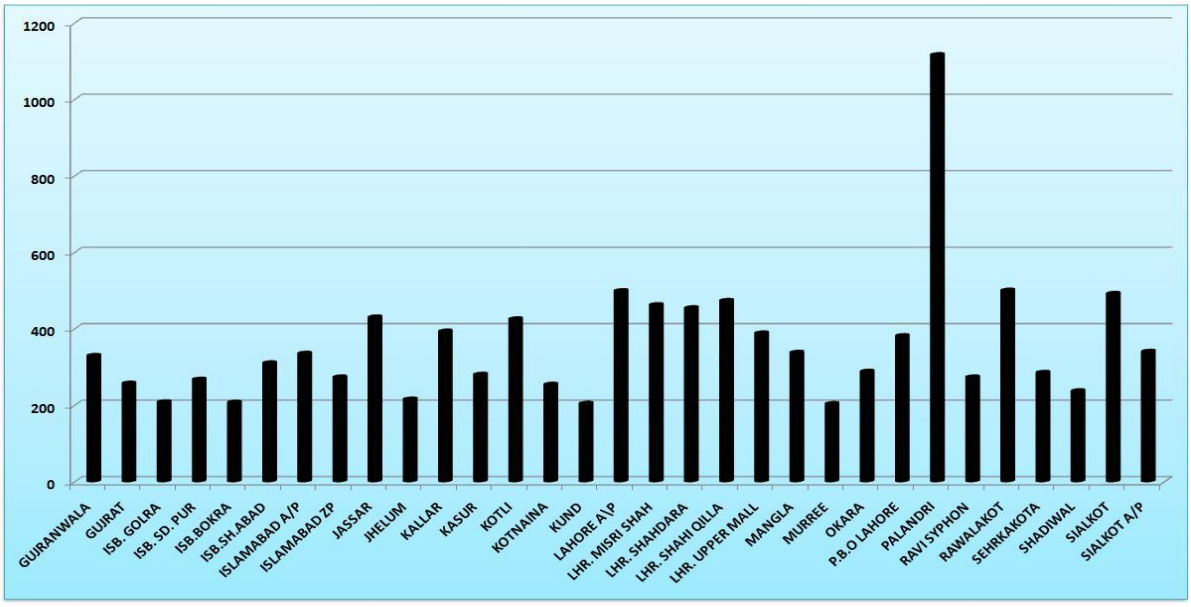


Figure 39: Significant Rainfall during Wet spell of September (03 Sep-6 Sep 2014)

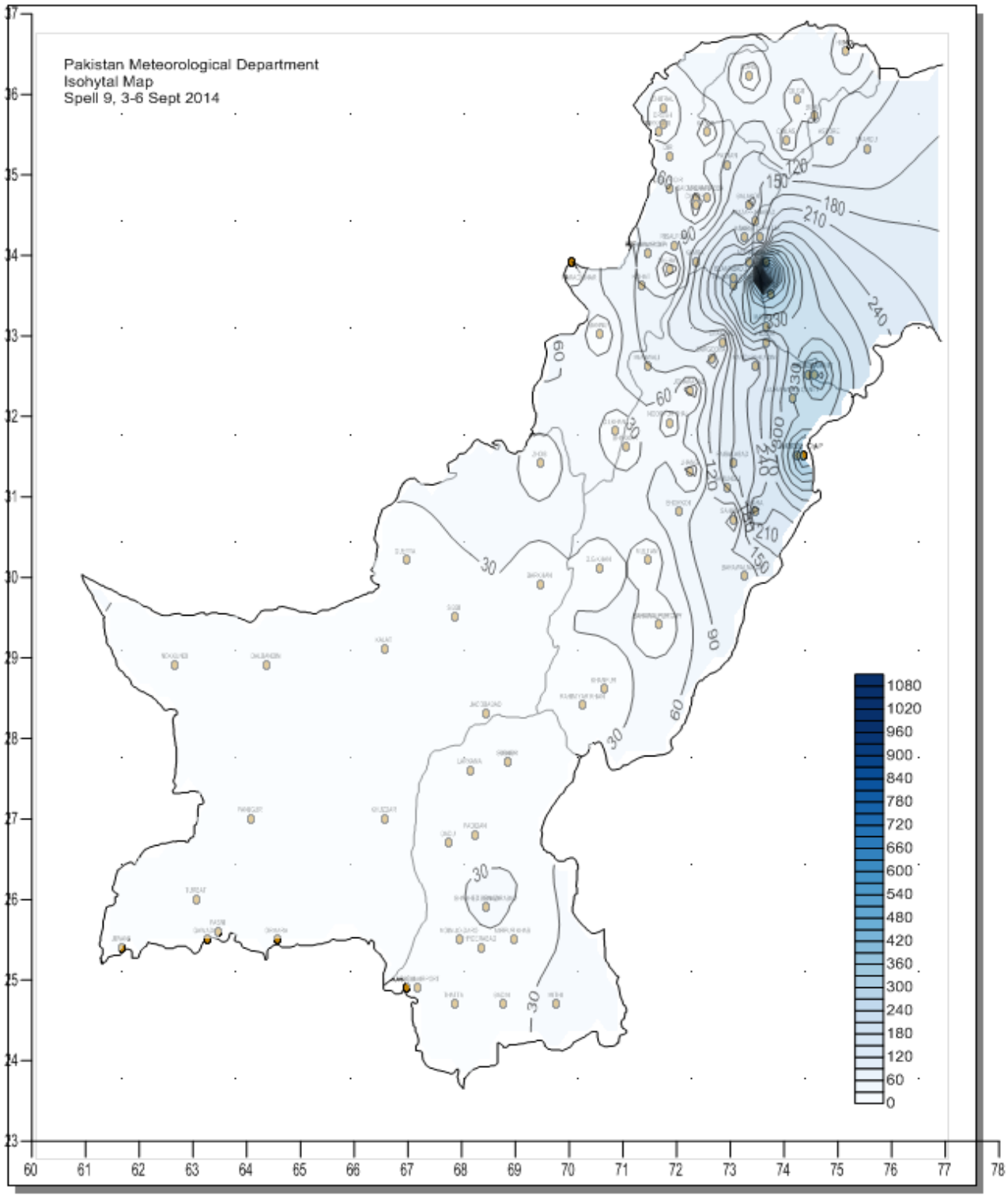


Figure 40: Isohyetal pattern of the Spell (03-Sep-06-Sep)

5.4 Rainfall distribution In the Catchment of River Chenab And Jhelum:

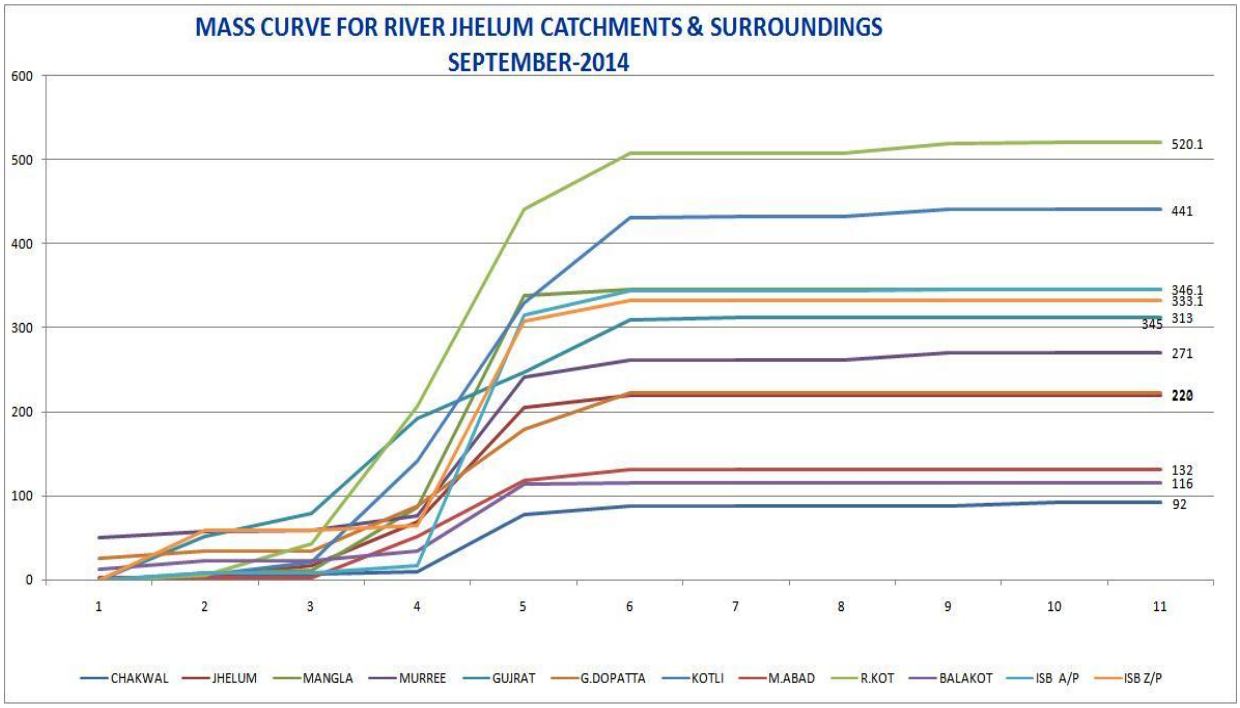


Figure 41: Mass Curves for River Jhelum Catchments

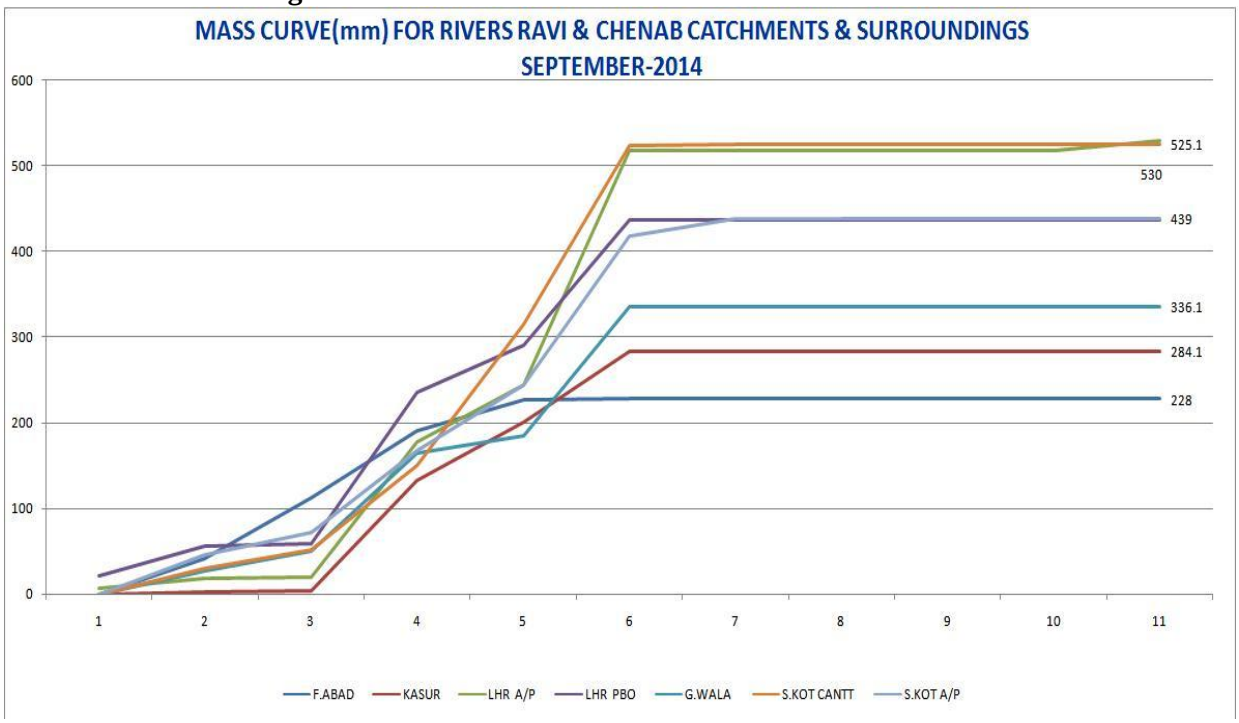


Figure 42: Mass Curves for Rivers Ravi & Chenab Catchments

5.5 Rivers Position during the Spell:

Exceptionally high flood level recorded in river Chenab and Jhelum. Medium to high flood level also recorded in river Ravi .Hydrographs recorded due to spell are shown below.

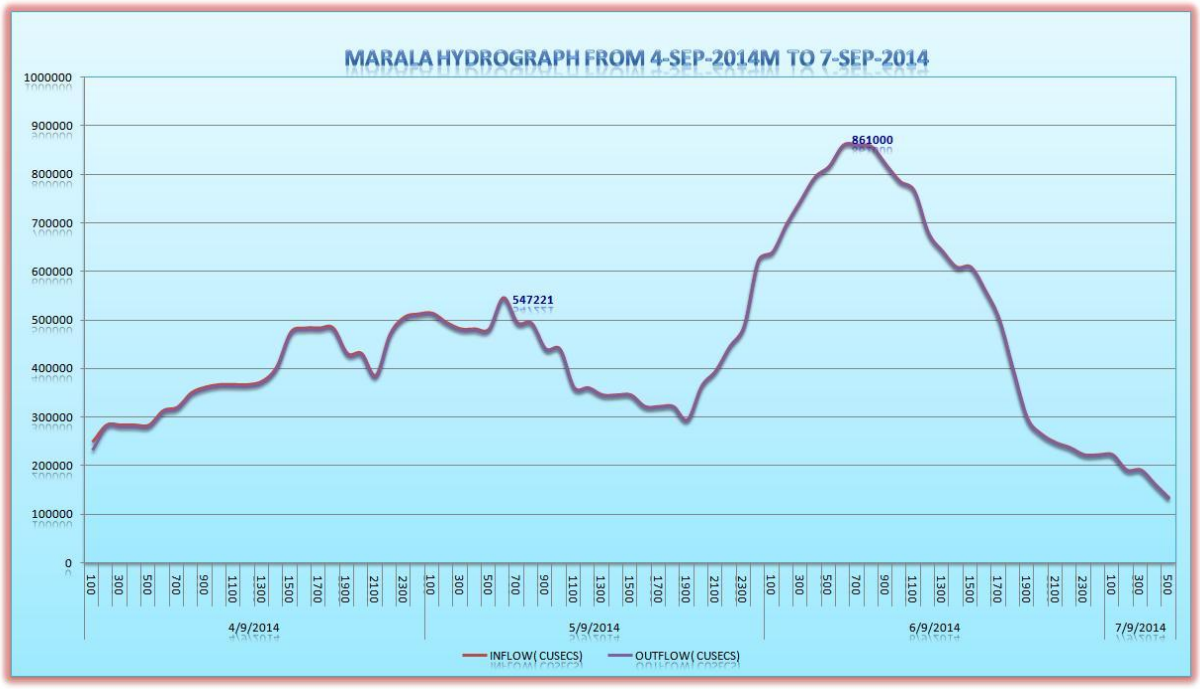


Figure 43: Marala Hydrograph

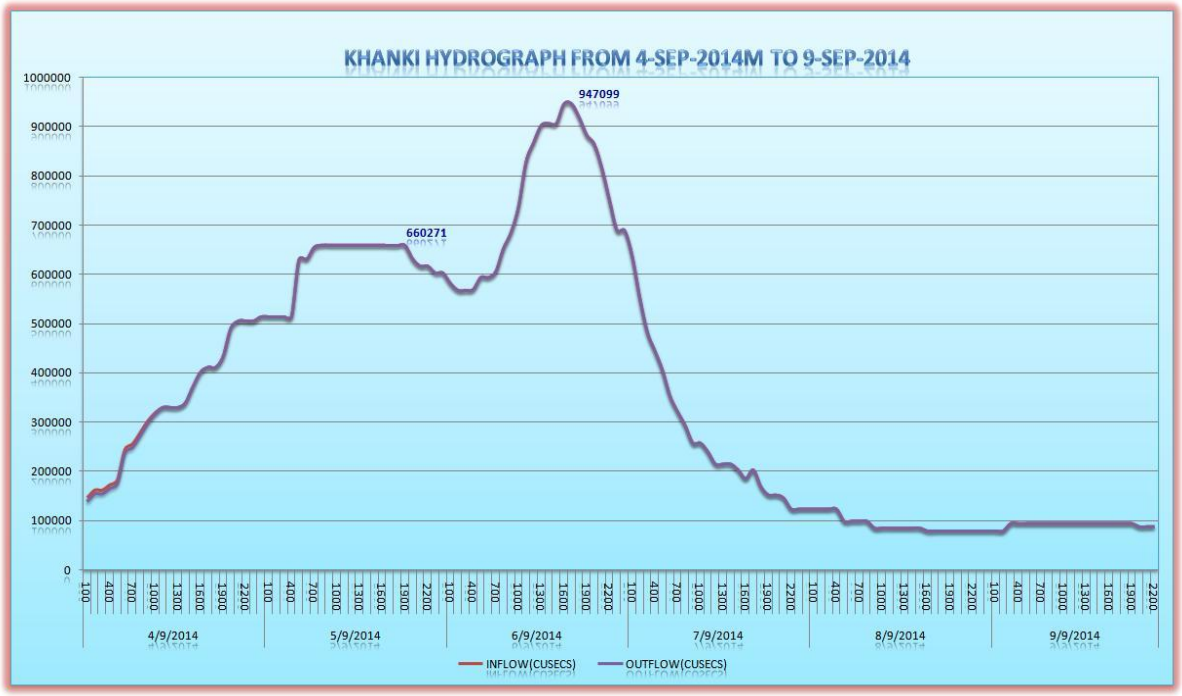


Figure 44: Khanki Hydrograph

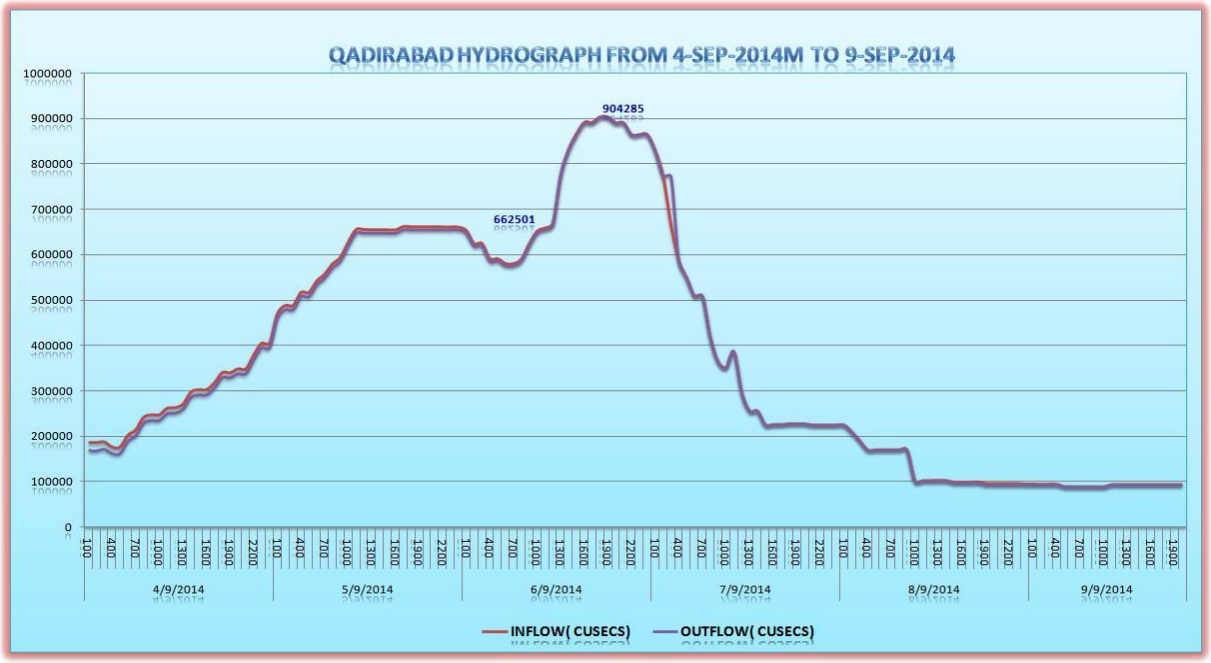


Figure 45: Qadirabad Hydrograph

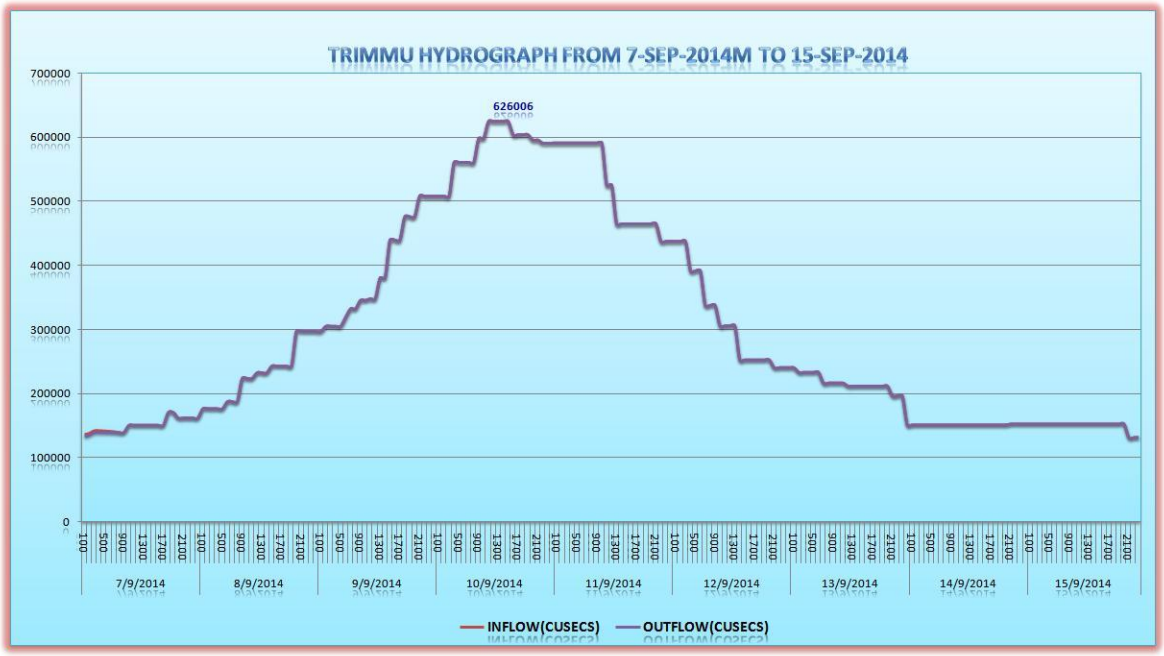


Figure 46: Trimmu Hydrograph

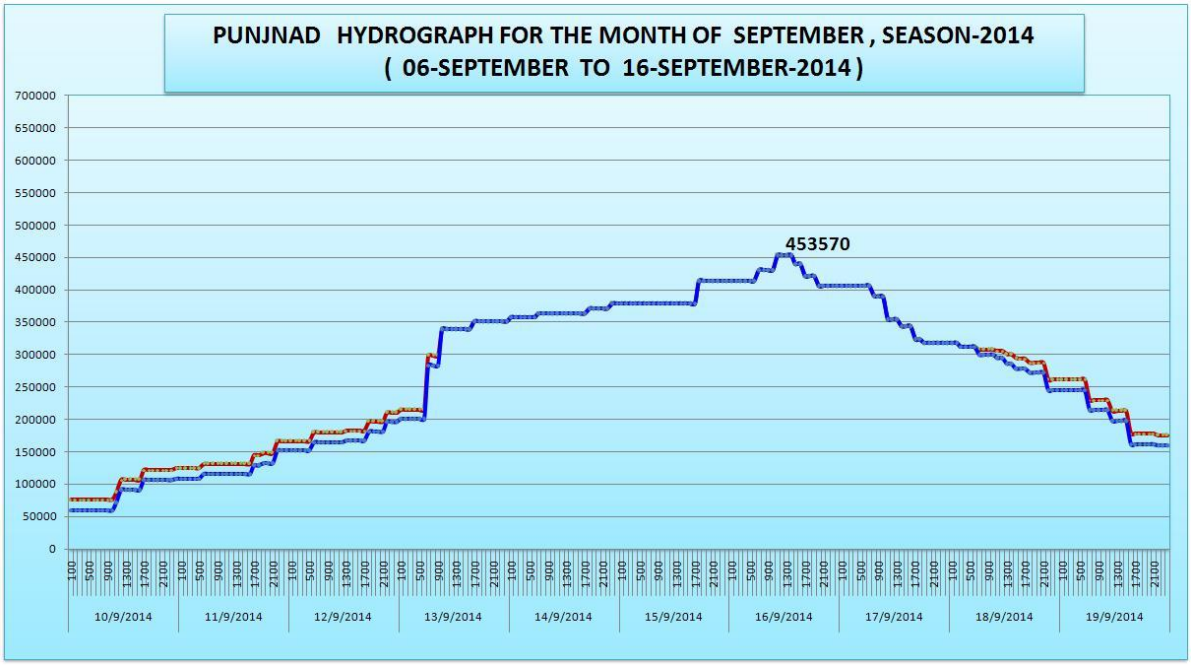


Figure 47: Punjnad Hydrograph

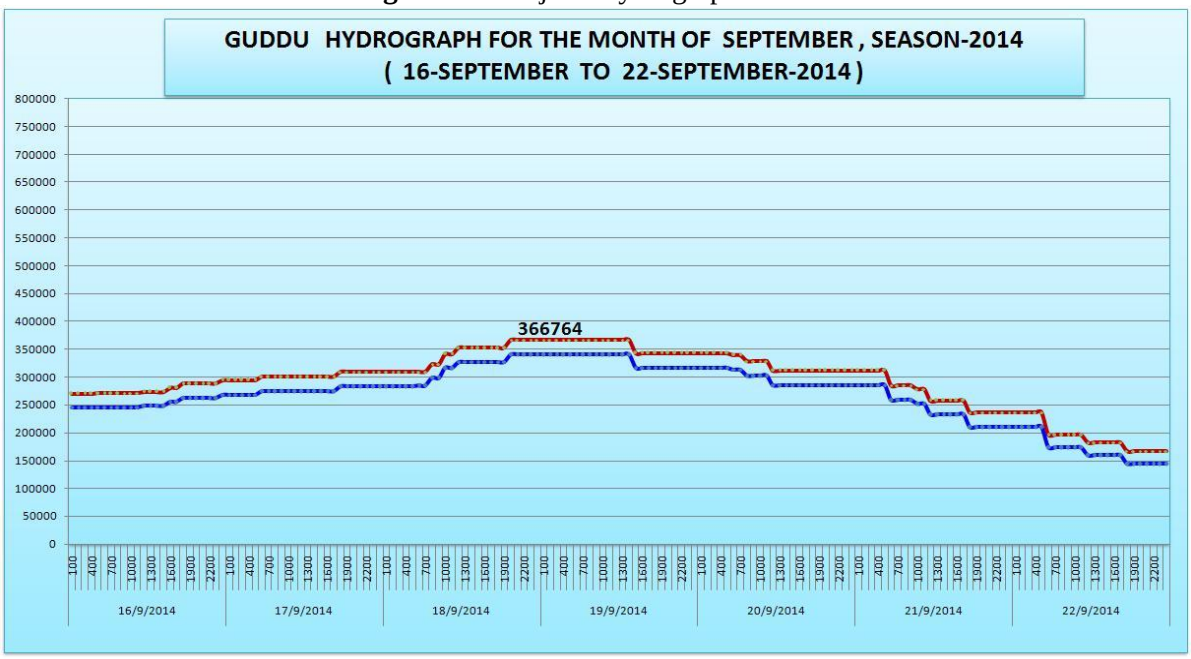


Figure 48: Guddu Hydrograph

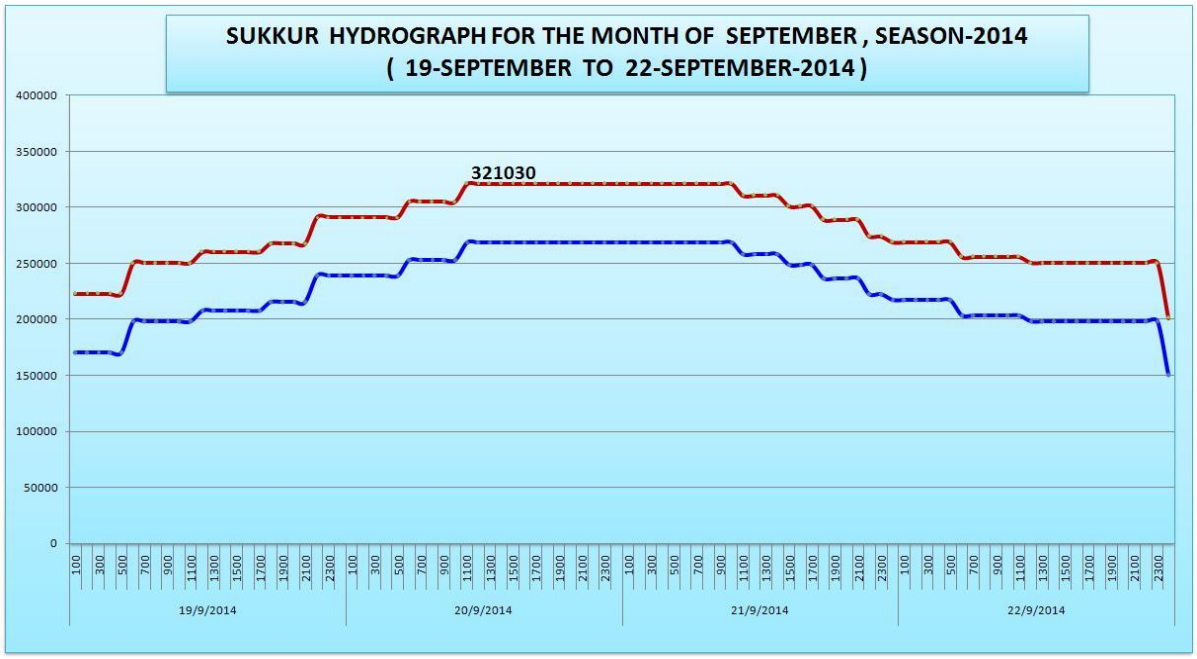


Figure 49: Sukkur Hydrograph

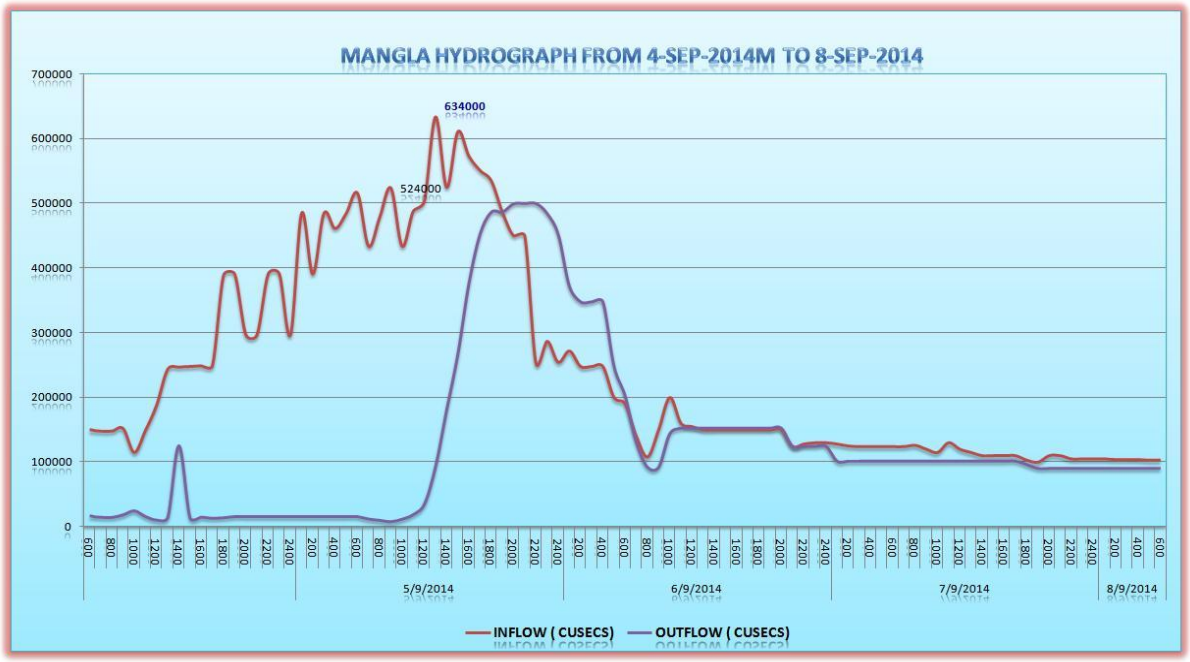


Figure 50: Mangla Hydrograph

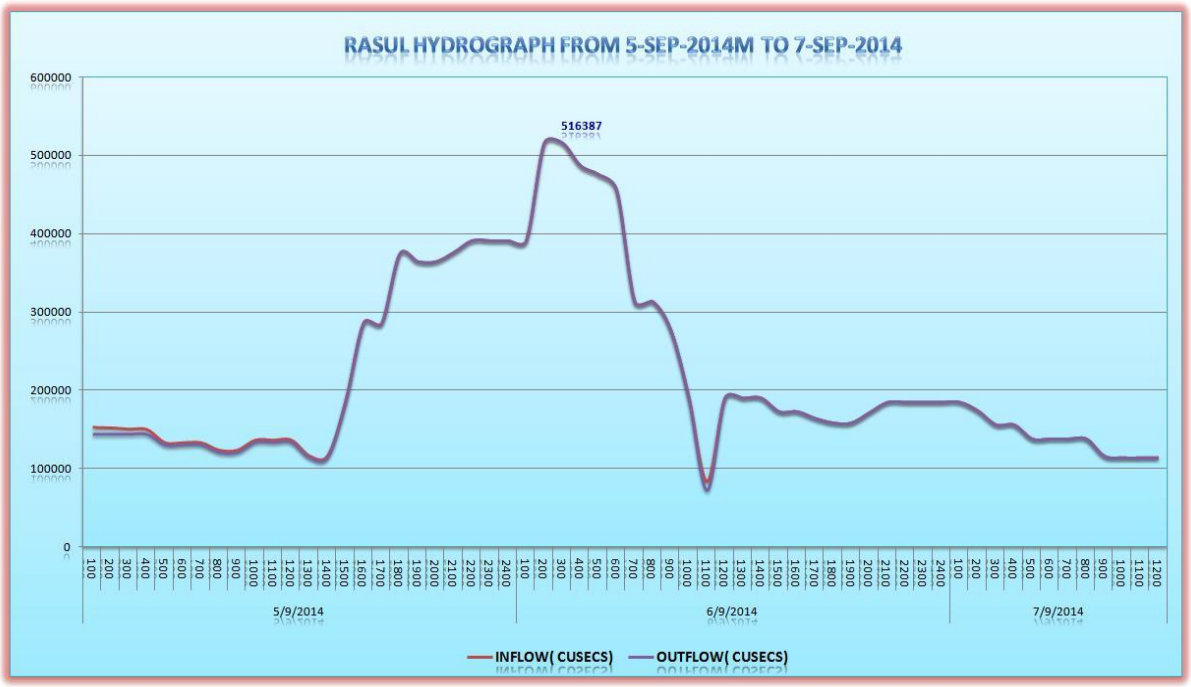


Figure 51: Rasul Hydrograph

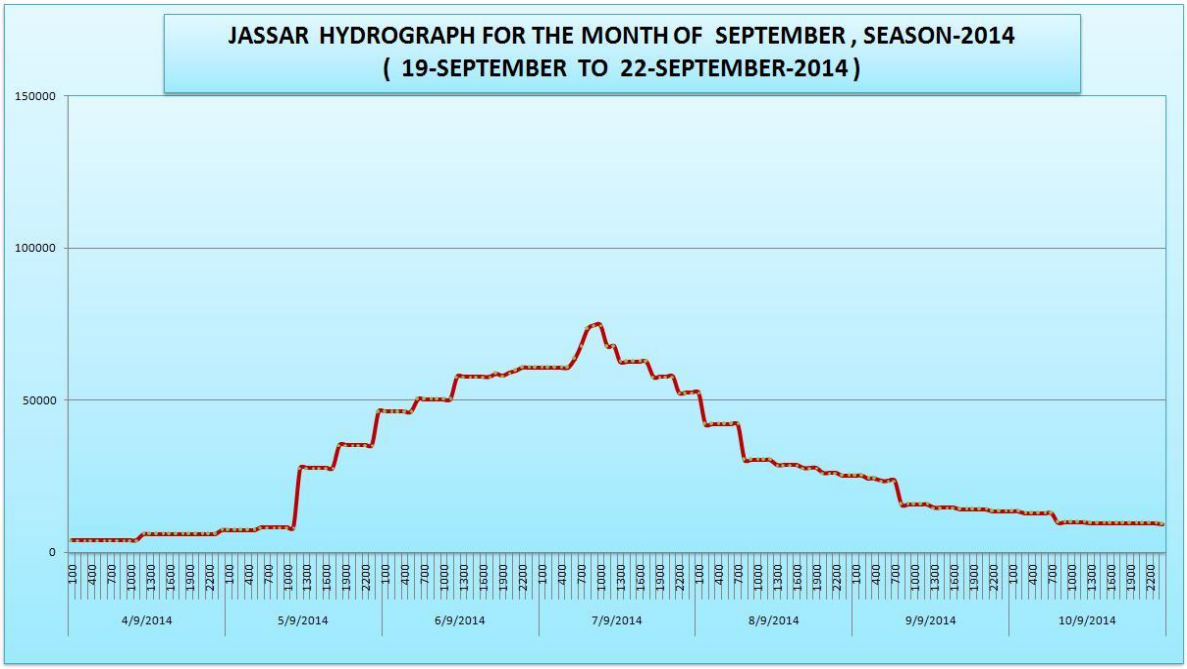


Figure 52: Jassar Hydrograph

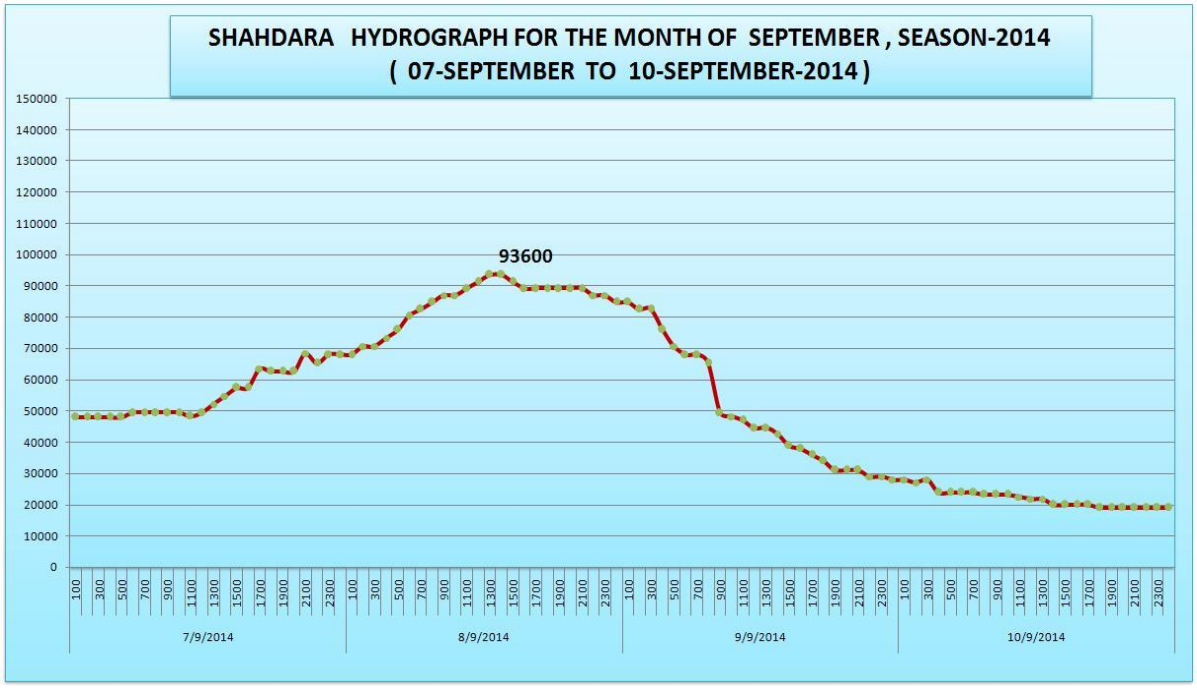


Figure 53: Shahdara Hydrograph

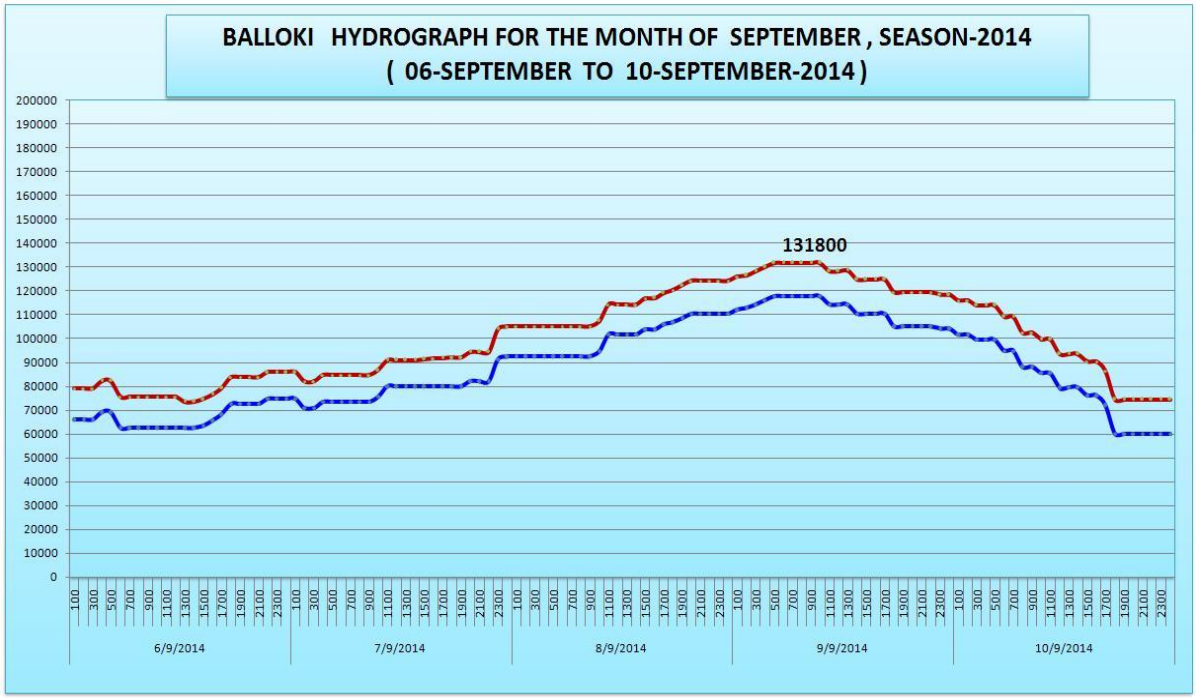


Figure 54: Balloki Hydrograph

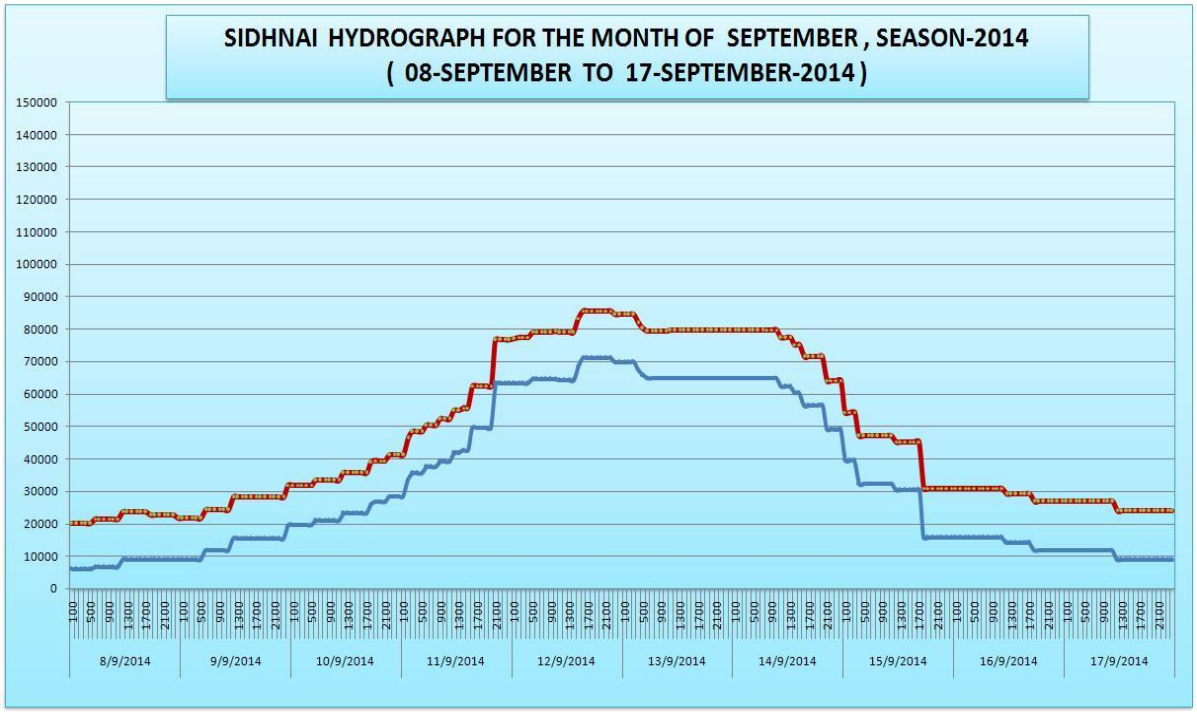


Figure 55: Sidhnai Hydrograph

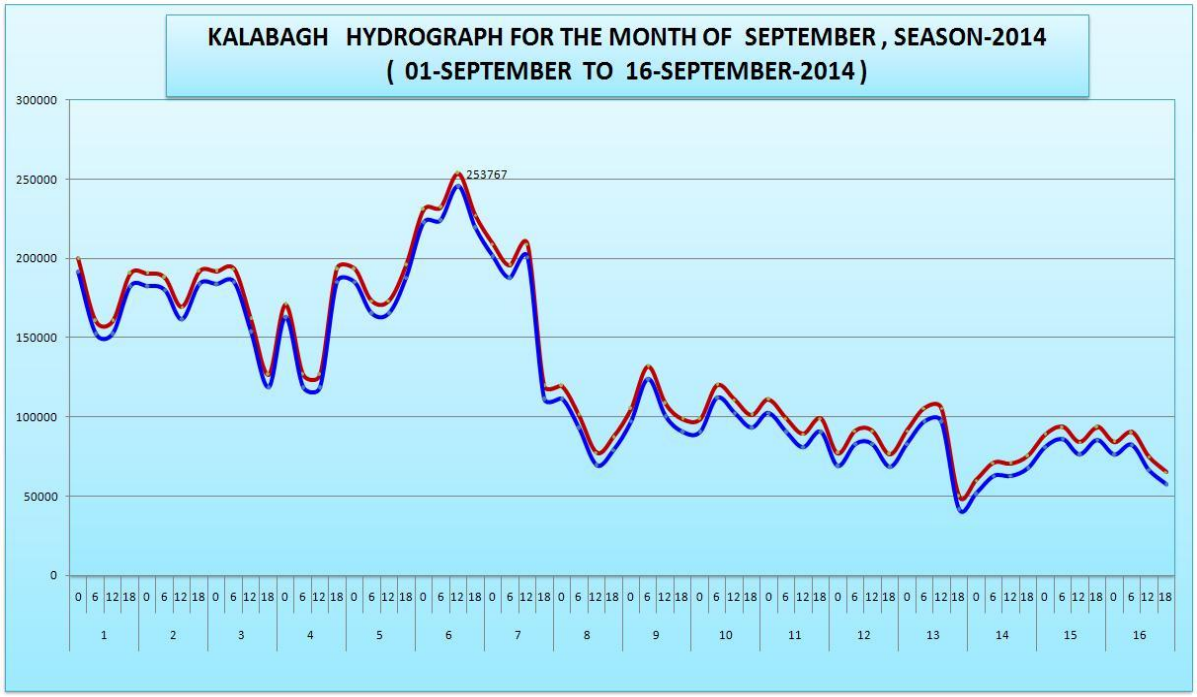


Figure 56: Kalabagh Hydrograph

5.6 Monitoring of flood wave during the spell by FFD (PMD) :

Flood generating system developed over Andhra Pradesh coast on 28th August and monitored immediately in the bulletin No.75 dated 28th August 2014. The track of the system continuously monitored in daily flood bulletins upto 2nd September 2014.As the well marked system located over Rajasthan , meteorological analysis suggested that it was likely to move towards the catchments of rivers Ravi, Chenab, Jhelum and their associated Nullahs, a flood alert for Very high to Exceptional high flood (Qualitative Forecast) during 5th to 7th issued in the bulletin No.81 on dated 3rd September 2014.After further analysis and confirmation, flood warning for exceptionally high flood issued in bulletin No.82 dated 4th September 2014 well before the flood peaks as shown below.

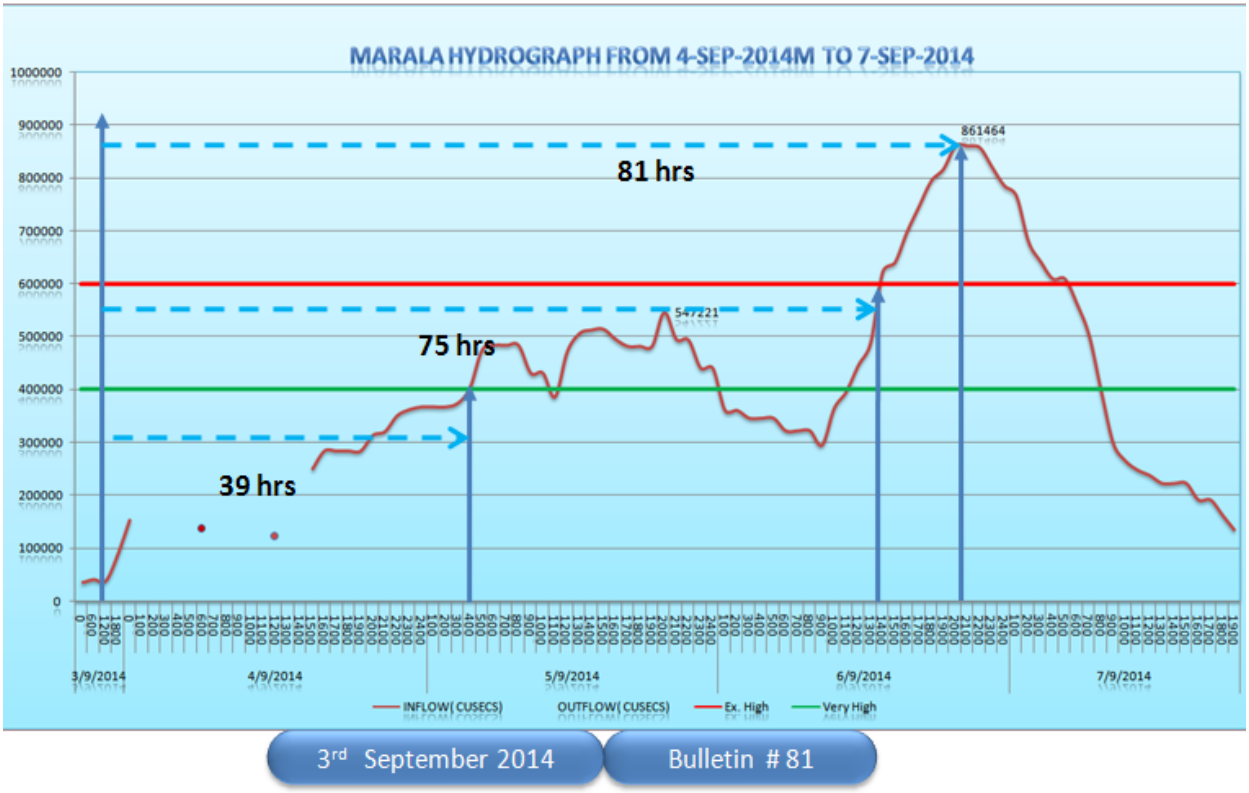


Figure 57: Time of early warning for Marala peak

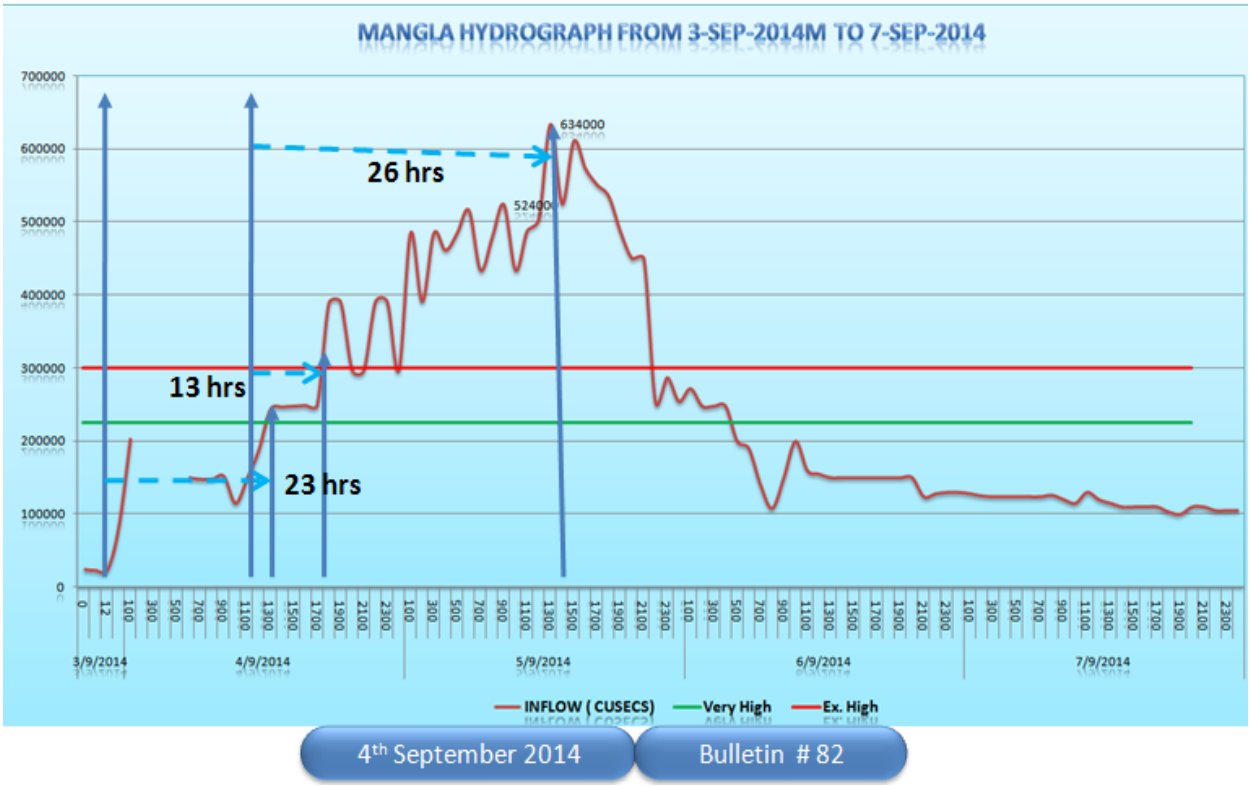


Figure 58: Time of early warning for Mangla peak

Quantitative forecasts for Mangla and Marala of 600000 and more than 900000 cusecs respectively were also issued after receiving the rainfall information accordingly. Information received from India through Pakistan commissioner for Indus water misguided to hydro meteorologists .Hydrograph of Marala upstream and Indian information at Akhnur and Jammu Tawi is shown as.

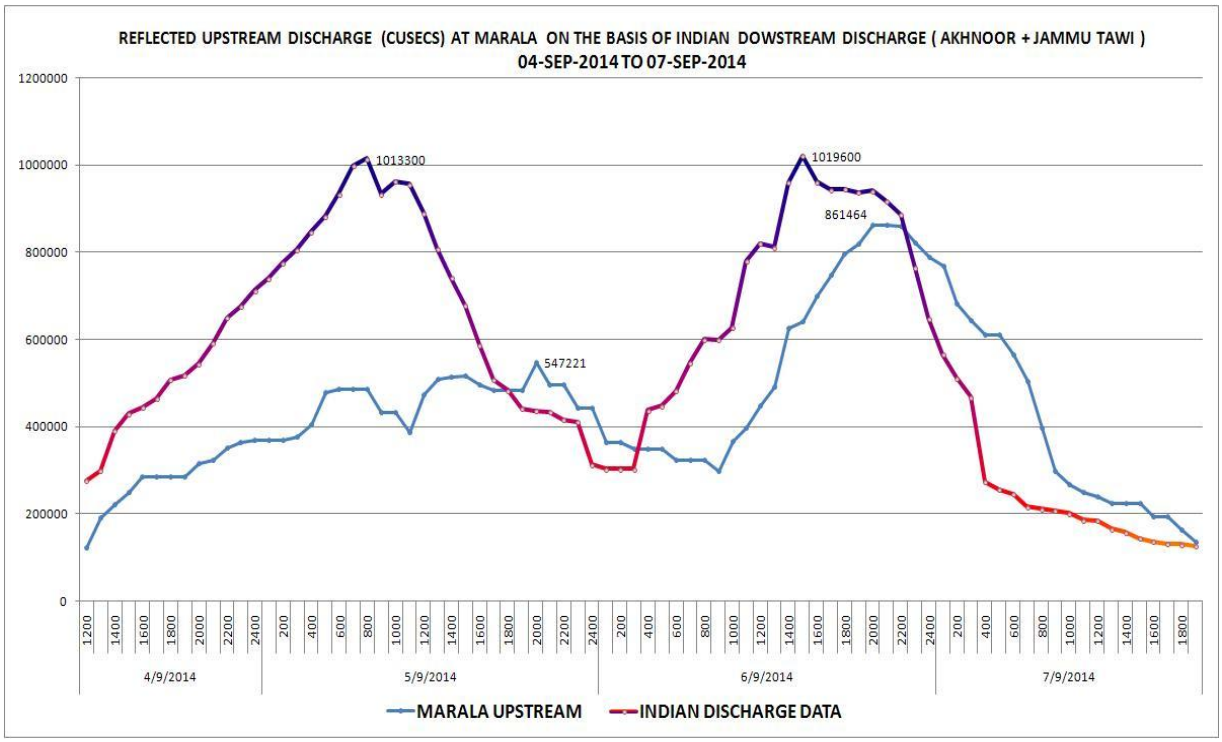


Figure 59: **Comparison Observed discharge at Marala (Upstream) & Downstream discharge (Akhnoor + Jammu Tawi)**

5.7 Rainfall Pattern for the Month of September 2014:

A rainfall maximum of more than 1000 mm was located around Kashmir in figure-60.

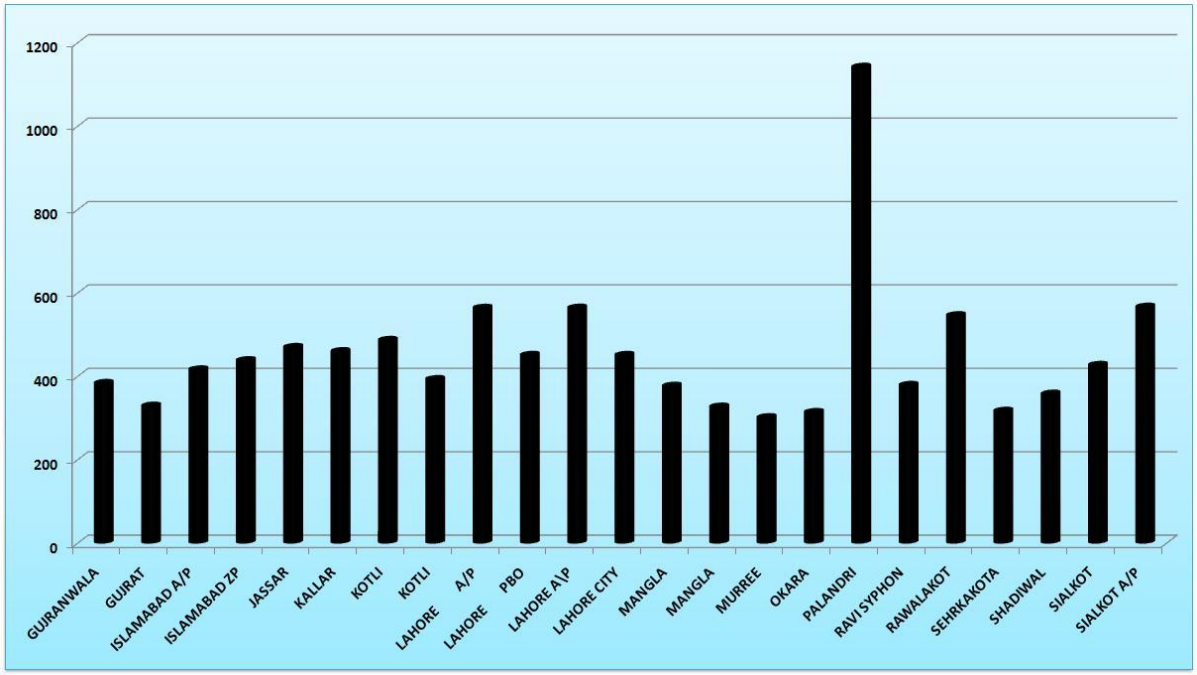


Figure 60: Wet spell of September (03 Sep-6 Sep)

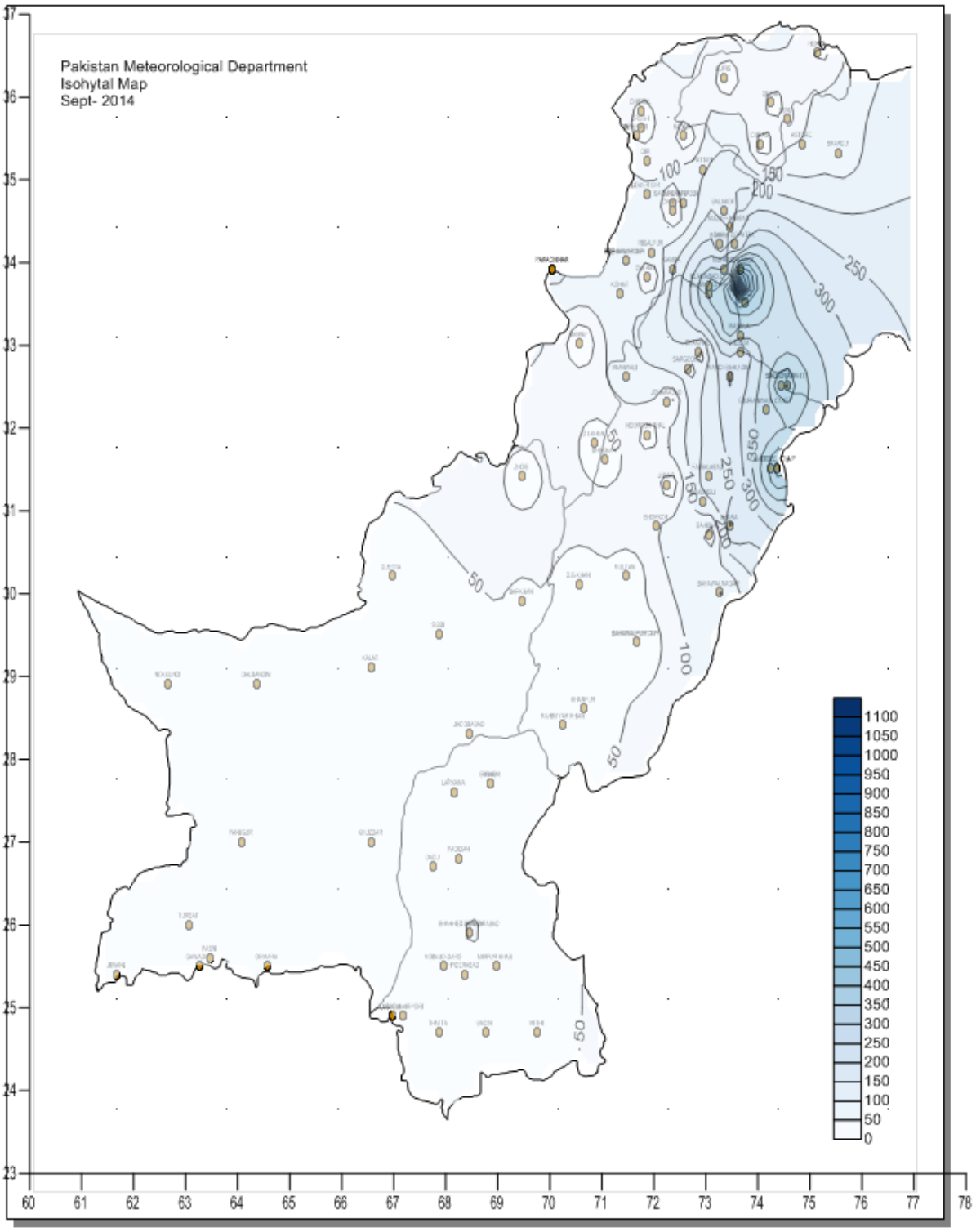


Figure 60: Isohyetal Map of September 2014

6 Seasonal Rainfall Pattern July to September 2014:

Seasonal rainfall pattern during the season is shown in figure below. Region of maximum precipitation (About 2000 mm) is located over Palandri in Kashmir another region of Maximum precipitation more than 1000 (MM) located over north and northeast Punjab. West Balochistan remained almost dry during the season as shown below.

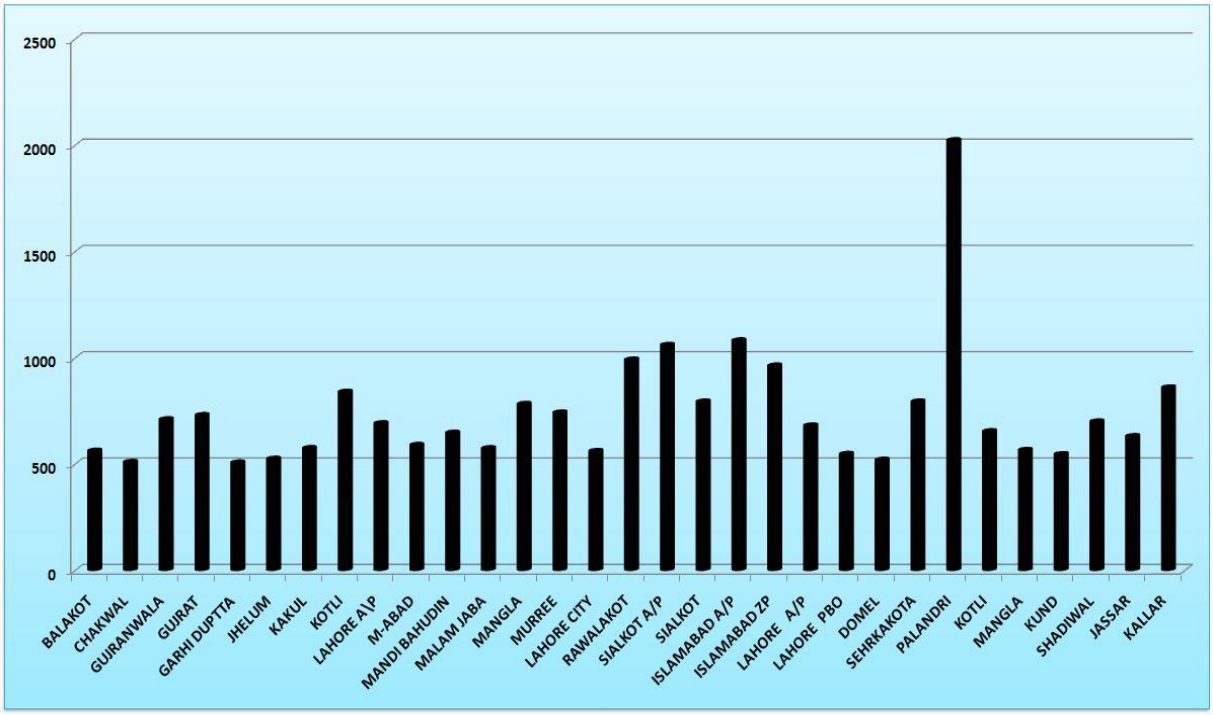


Figure 61: Significant Seasonal rainfall (July-Sep 2014)

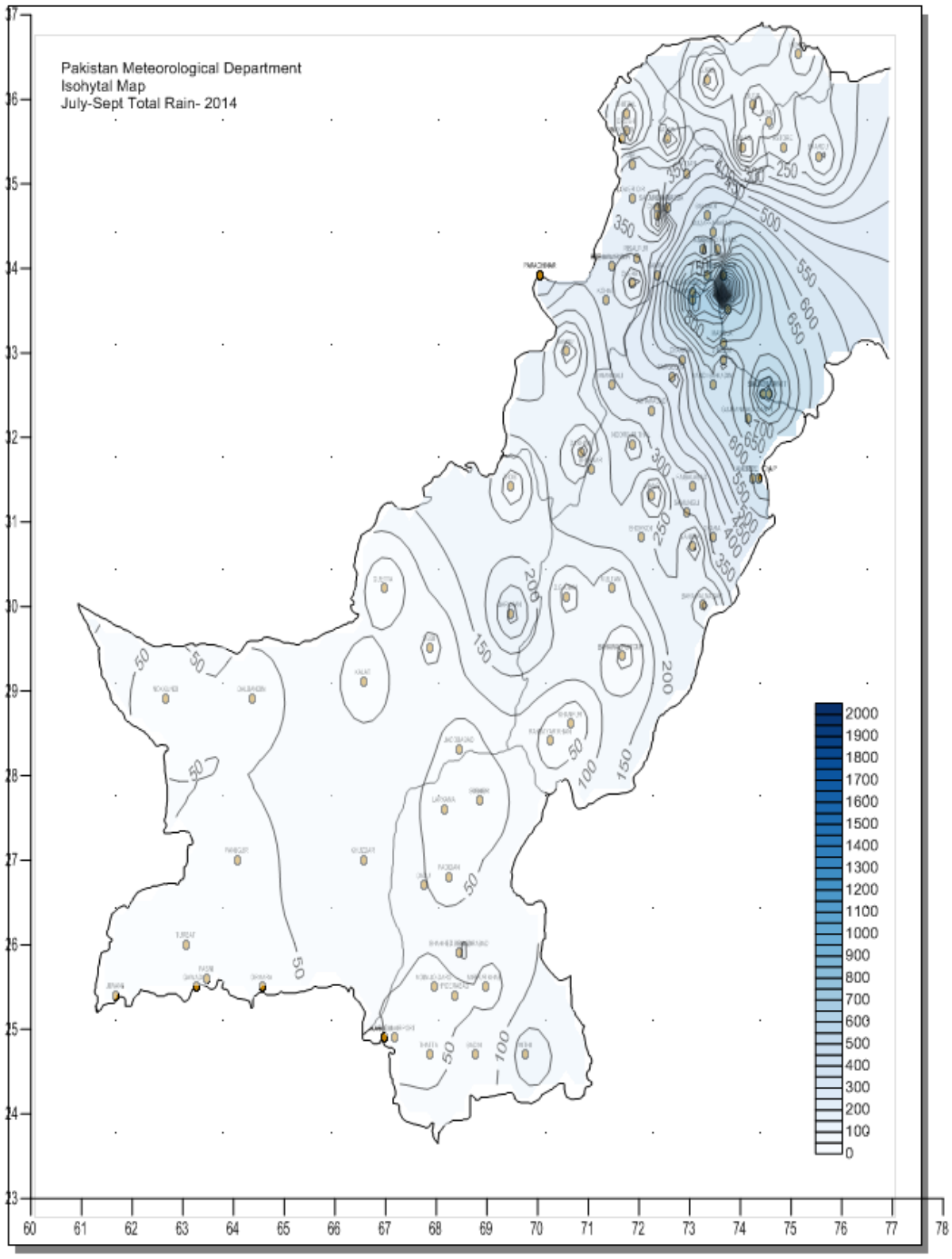


Figure 62: Seasonal Isohyetal Map(July-September-2014)

7 Seasonal Isopercental Map of Precipitation from July-September 2014:

The seasonal precipitation Isopercental map indicates that Below normal rainfall received over the most parts of the country. Northeast Punjab received slightly above normal rainfall. Gilgit Baltistan received slightly above normal rain. Catchments of all the major rivers except Indus remained almost in normal rainfall conditions. Western Balochistan remained almost dry during the monsoon season 2014.

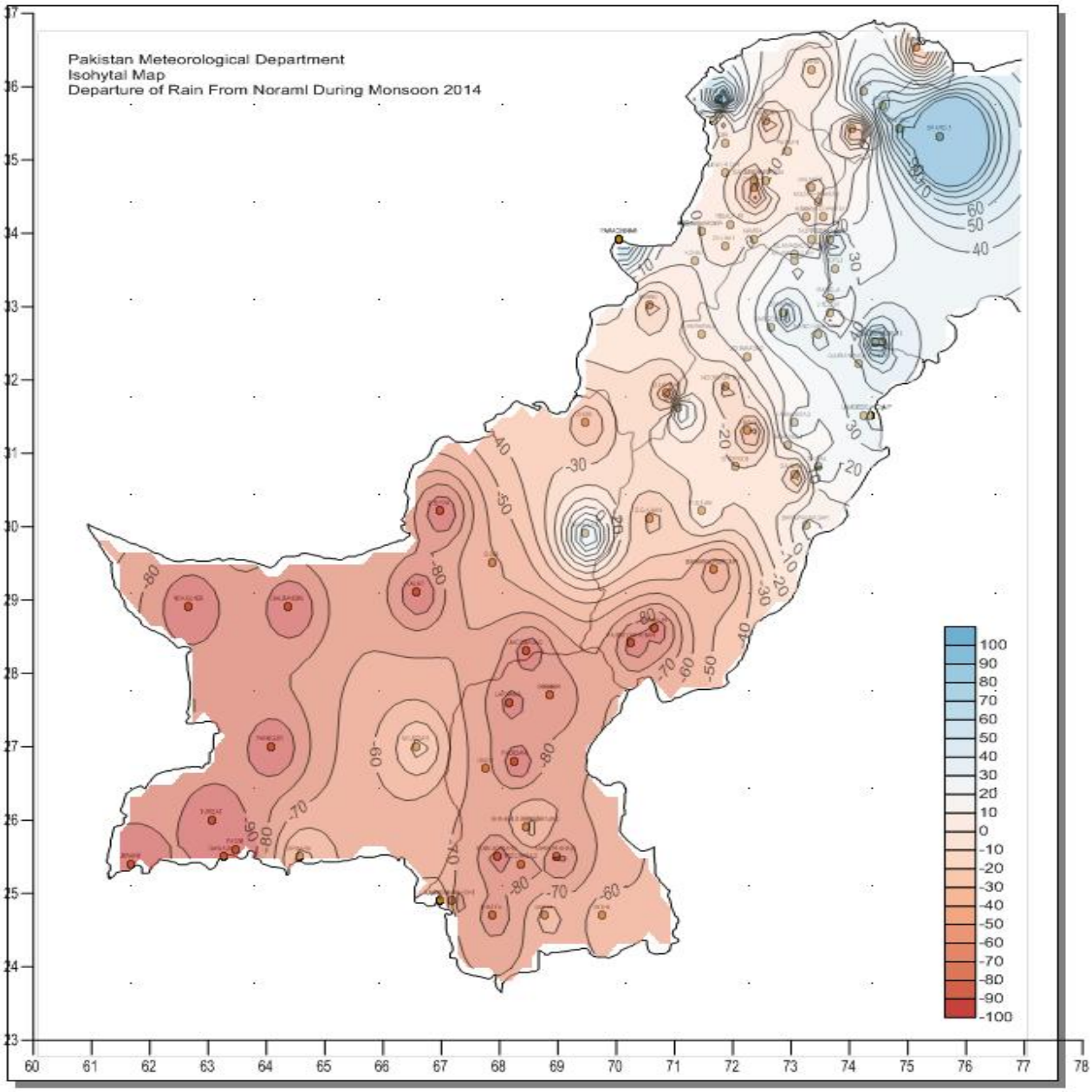


Figure 63: Seasonal Isopercental Map (July-September-2014)

8 Kharif Season Forecast-2014:

Remarkable achievement in seasonal water availability forecast for Kharif season from Indus and Jhelum for the period April -September. Issued in the 1st week of April

This year the accuracy remained 95.2%

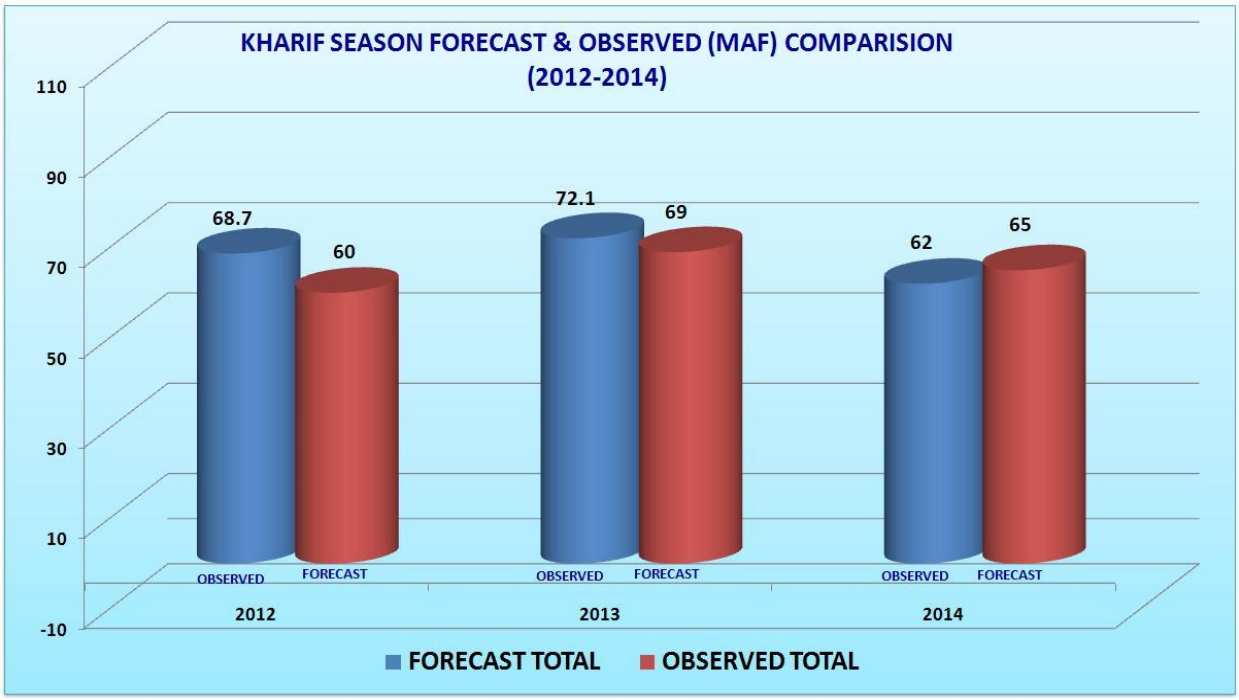


Figure 64: Kharif Season water availability forecast & Observed

9 Flood Forecast evaluation Report:

The Flood Forecast evaluation report for 2014 for each category of flood is given below;

Station	DATE	TIME	ACTUAL	FORECAST	PR.%
TARBELA	04/7/14	1800	266000	240-270	100
	18/7/14	1200	285000	280 F 250	98
	28/7/14	1800	299000	295-310	100
KALABAGH	28/6/14	1800	250126	240-265	100
	04/7/14	0000	252388	240-270	100
	05/7/14	0000	254717	230-250	98
	12/7/14	1200	256047	235-255	100
	17/7/14	1200	256093	245-265	100
	29/7/14	0600	255889	230-260	100
	10/8/14	1800	256678	240-275	100
CHASHMA	26/6/14	0600	259727	220-260	100
	29/7/14	0600	254948	240-260	100
	17/8/14	0600	282012	230-270	96
TAUNSA	18/7/14	1200	269412	240-260	97
	30/7/14	1200	261010	255-270	100
	20/8/14	1200	252466	240-250	99
GUDDU	18/9/14	2000	366764	330 R 410	100
SUKKUR	20/9/14	1200	321030	260-320	100
MANGLA	04/9/14	1900	391000	220 R 600	100
	05/9/14	1300	634000	300-500	79
RASUL	05/9/14	0800	152545	100-150	99
	06/9/14	0900	516387	<500*	100
MARALA	05/9/14	1500	515382	400-600	100
	06/9/14	2000	861000	<900	96
KHANKI	**05/9/14**	**2300**	**660271**	**400-600**	90
	07/9/14	0700	947099	<900	100
QADIRABAD	06/9/14	1200	662181	660 F 450	100
	07/9/14	1100	904285	<900	100
TRIMMU	10/9/14	1900	626006	520 R 750	100
PANJNAD	16/9/14	1100	453570	370 R450	100
JASSAR	06/9/14	1900	85000	50-100	100
	07/9/14	0900	74600	50-100	100
SHAHDARA	08/9/14	1300	93600	80 R 90	96
BALLOKI	09/9/14	0500	131800	105-120	92
SIDNAI	12/9/14	1600	85712	80-100	100

R: Rising F: falling

The overall accuracy of the forecast issued by FFD Lahore during the flood season 2014 has been calculated which shows a good 98.3% against all odds.

FLOOD LOSES (PUNJAB)
FLOOD SEASON-2014

Sr #	District	Total no. of death till date	Total no. of persons injured till	Total no. of houses damaged	Total no. of villages affected till	Crops Effected (Acres)	Cattles Head Perished	No. of relief camps	Persons in Relief Camps	Population Affected	Persons Evacuated	No. of livestock animals	No. of medical camps	No. of Today	No. of patients treated till	Date
1	BAHAWALPUR	0	75	2505	61	49196	0	16	93570	35808	36349	649108	0	0	13139	9/20/2014 0:00
2	MUZAFFAR GARH	2	17	845	399	202118	0	34	21193	42991	44414	1125150	0	0	33200	9/20/2014 0:00
3	KHANEWAL	2	8	804	80	60920	0	13	3909	39093	51970	390782	0	0	9969	9/20/2014 0:00
4	MULTAN	21	0	0	121	113859	1	23	29540	89194	156113	514922	0	0	40635	9/20/2014 0:00
5	JHELUM	13	11	4599	349	19183	50	13	0	121364	513	187540	0	0	15481	9/20/2014 0:00
6	RAHIM YAR KHAN	2	1	0	32	34669	0	20	2219	150782	0	952543	0	0	5717	9/18/2014 0:00
7	SHEIKHUPURA	13	47	55	160	35575	0	13	1950	237500	1304	758106	0	0	0	9/18/2014 0:00
8	CHINIOT	2	0	1769	145	130000	0	10	1045	35367	13710	284699	0	0	19190	9/18/2014 0:00
9	JHANG	6	0	20500	408	814047	0	24	9865	120000	120000	343150	0	0	15959	9/18/2014 0:00
10	SARGODHA	12	5	730	218	180194	6	24	0	81000	81000	389239	0	0	11084	9/18/2014 0:00
11	KHUSHAB	0	3	26	54	77235	0	7	250	0	466	272809	0	0	9504	9/18/2014 0:00
12	SIALKOT	34	23	260	190	53639	103	35	0	83000	2509	550233	0	0	14023	9/18/2014 0:00
13	NAROWAL	16	20	10	262	30450	1	13	0	156000	1749	525660	0	0	14645	9/18/2014 0:00
14	MANDI BAHUDDIN	6	0	568	103	206000	31	12	0	226645	7809	192520	0	0	11938	9/18/2014 0:00
15	HAFIZABAD	11	0	155	155	170202	25	6	0	16500	16500	211952	0	0	19879	9/18/2014 0:00
16	GUJRAT	6	11	718	72	18187	472	25	0	27000	180	279655	0	0	4583	9/18/2014 0:00
17	GUJRANWALA	7	0	1062	70	22650	27	14	0	243287	2179	397720	0	0	17324	9/18/2014 0:00
18	BAHAWALNAGAR	1	3	1	0	20883	0	14	0	0	0	613060	0	0	0	9/17/2014 19:00
19	RAJAN PUR	0	0	0	0	10000	0	11	2239	13457	136332	535520	0	11	2549	9/17/2014 19:00
20	LAYYAH	0	0	0	0	0	0	14	1900	0	0	770340	0	1	1967	9/17/2014 19:00
21	DERA GHAZI KHAN	0	0	0	0	0	0	0	0	0	0	982580	0	0	0	9/17/2014 19:00
22	VEHARI	2	0	0	0	58	0	14	0	0	0	289958	0	0	0	9/17/2014 19:00
23	LODHRAN	0	0	0	2	32	0	9	0	0	0	206820	0	0	0	9/17/2014 19:00
24	PAKPATTAN	1	2	8	0	0	0	18	0	0	0	229132	0	0	0	9/17/2014 19:00
25	OKARA	8	57	3059	36	11000	9	12	0	271	271	502986	0	0	1070	9/17/2014 19:00
26	SAHIWAL	0	0	36	56	11586	0	15	104	330	146	312540	0	1	1472	9/17/2014 19:00
27	NANKANA SAHIB	4	21	0	0	14456	0	6	1940	0	0	159330	0	0	0	9/17/2014 19:00
28	KASUR	17	34	36	0	0	0	23	0	0	0	413860	0	0	0	9/17/2014 19:00
29	LAHORE	28	68	45	0	11030	0	0	0	0	0	269470	0	0	0	9/17/2014 19:00
30	T.T.SINGH	3	0	179	59	23852	1	8	3500	14834	14834	422760	0	6	2653	9/17/2014 19:00
31	FAISALABAD	14	31	10	0	3495	11	0	0	0	0	804498	0	0	0	9/17/2014 19:00
32	BHAKKAR	0	0	0	0	0	0	25	0	0	0	265180	0	0	0	9/17/2014 19:00
33	MIANWALI	0	0	0	0	0	0	0	0	0	0	462869	0	0	0	9/17/2014 19:00
34	CHAKWAL	1	8	1	0	0	0	0	0	0	0	281310	0	0	0	9/17/2014 19:00
35	ATTOCK	3	0	0	0	0	0	0	0	0	0	337440	0	0	0	9/17/2014 19:00
36	RAWALPINDI	13	2	101	23	18739	118	21	0	96	0	264905	0	0	0	9/17/2014 19:00
	Total in all bulletins	248	447	0/38082	3055	2343255	855	492	173224	1734519	688348	16150346	0	19	265981	

FLOOD LOSES ((AZAD JAMU & KASHMIR))
FLOOD SEASON-2014

Sr. No	District	Persons Died	Persons Injured	Village Affected	Persons Affected	House Damaged		Cattle Head Perished	Shop	Water Mills	Area Affected (Acres)	Cropped Area Affected	Relief Camps Established	Persons in Releif Camps
						Fully	Partially							
1	Neelum	0	2	7	460	40	60	180	47	21				
2	Muzaffarabad	0	0	14	509	19	70	0	40	1				
3	Hattian	0	19	18	1885	65	260	60	13	5	38	28		
4	Bagh	2	9	15	2334	430	272	47	65	0	2300	1200	1	100
5	Haveli	29	60	30	14004	529	1925	550	22	0				
6	Rawalakot	6	0	10	4190	200	570	0	0	0				
7	Sudhnoti	14	17	20	8851	234	1231	0	56	0				
8	Kotli	8	15	6	8000	740	990	195	0	4		820	0	
9	Mirpur	2	6	5	2161	26	305	793	2	0				
10	Bhimber	3	1	5	4095	399	528	50	0	0			0	
	Total	64	129	130	46489	2682	6211	1875	245	31				

NOTE:- Deceased Persons of Disctrict Muzaffarabad and Hattian have been excluded from the list because these persons were not dead due to Flood 2014.

Issues:

1. The radars at Lahore, Sialkot and Mangla were installed quite a long period ago and with the passage of time the electronic parts have lost their efficiency. The reflectivity of echoes emitted by the radar beams has also become weak and the result of the radar observation does not remain same. Therefore the radar equipment requires continuous replacement which is not being done due to financial constraints.

2. The commercial electricity shut down during the flood season which is incidentally the summer season compels to the minimum use of radar observation which hampers the quality of flood forecast.

3. The poor financial support does not allow to keep the radar operation continuous even during the crisis hours which needs redressal.

4. The worn out radar equipment is very scarcely rather not available in the market due to being old versions and the production of the same has almost been stopped by the manufacturing companies.

Achievements:

1. Inspite of some odds and technical constraints the accuracy in the flood forecast and warnings issued by FFD during the flood season 2014 has been calculated as above 97%.

2. The vigilance shown by the FFD staff during the flood season is authenticated by the fact that the historic flood was quiet ably and early predicted by FFD and a qualitatively forecast was issued on 3rd September 2014 more than 70 hours in advance.

3. The availability of water for Kharif season from the Jhelum and Indus rivers at Mangla and Tarbela was predicted, which proved 95% accurate after calculating the actual inflows of the season.