MANAGING HISTORIC FLOOD

IN KRISHNA RIVER BASIN
OCTOBER 2009
ANDHRA PRADESH, INDIA

AN EXPERIENCE OF AVERTING CATASTROPHE

Flood Control Centre
Irrigation & Command area development Department
Chief Engineer Irrigation Office,
IInd Floor, Jalasoudha, Erramanzil,
Hyderabad - 500 082, A.P.
Dedicated to

The Visionaries & Architects
of
Srisailam Dam

Hon’ble Prime Minister Sri Jawaharlal Nehru laying Foundation Stone for Srisailam Dam on JULY 24TH 1963
Acknowledgements

Managing historic flood in Krishna basin is a unique experience for the present generation of Engineers and decision makers. The parts of the State were reeling under drought till then and administrators had to switch their role overnight from drought management to flood management in the State. The confidence with which the entire community of Engineers and Administrators handled the historic flood is exemplary.

Experts in various engineering fields, administrators, weather forecast experts, were present to given their valuable inputs for decision making at the flood control centre. The professional excellence, team coordination and responsible administration have played important role. The systems for decision support and communication played important role in bringing clarity for critical decision making.

The information shared and the discussions held during the the historic floods at flood control centre and the secondary literature collected from various line departments was useful for completing this document.

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The intention in bringing out this document to share the moments of the historic flood management experience. Climate change becoming real on the planet we may face such instances anywhere on the globe, I hope that this document with experiences could be useful in guiding for the management of the floods.

G. CHANDRASHEKAR REDDY. IFS
MD, APWRDC
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CHAPTER - 1
INTRODUCTION

Floods are the most frequent type of disaster worldwide. It can strike anywhere and anytime. Although floods can be predicted, they often cause massive damage and destruction of property as most urban communities are located near the water sources such as sea coasts and river banks.

Andhra Pradesh in the year 2009 had to tackle the dual challenges of a drought like situation in its peak monsoon period and a catastrophic flood situation in the River Krishna Basin. The flood occurred during October 2009 is a representative of the devastating impact of an erratic natural phenomenon and the strength of the human capabilities and capacities in trying to minimize the catastrophic impacts on human life. Entire quantum of water is safely routed to the sea without causing much impact on the civilization existing enroute. The October 2009 floods can be cited as an excellent example of perfectly coordinated efforts and consultative decision making on such complex technical matters. Sri. K. Rosaiah, the Hon’ble Chief Minister of Andhra Pradesh, led the flood management task from the front through constant review and monitoring. A team headed by Sri S.P. Tucker, the Principal Secretary I&CAD, senior most Irrigation Engineers and Irrigation Experts monitored the flood constantly round the clock, for almost a week period.
Cyclones occurring in Andhra Pradesh are one of the important causes of floods and inundation. The incidence of cyclones seems to have increased in the past decades, to the extent that severe cyclones have become a common phenomenon occurring once in every two to three years, repeatedly and severely affecting the State's economy while challenging its financial and institutional resources. Almost 29 million people are vulnerable to cyclones and their effects in Coastal Andhra Pradesh, 3.3 million belong to communities located within five km of the seashore. The deadliest cyclone in the last thirty years took place in November 1977 causing death of about 10,000 people.

The Godavari and the Krishna rivers have well-defined regime courses, and their natural and man-made banks have usually been capable of carrying flood discharges, with the exception of the delta areas. Traditionally, the flood problem in Andhra Pradesh had been confined to the spilling of smaller rivers and the submersion of marginal areas surrounding Kolleru Lake. However, the drainage problem in the delta zones of the coastal districts has worsened, thereby multiplying the destructive potential of cyclones and increasing flood hazards. Moreover, when a storm surge develops, as it was the case during the severe November 1977 cyclone, threats to people and property multiply as the sea water might inundate coastal areas which are already subjected to torrential rains.
Finally, a critical additional factor affecting the flood management is the irrigation systems maintenance and also dam safety aspects of large dams.
Krishna River is the second largest river, after Godavari that flows through Andhra Pradesh. Krishna Basin extends over an area of 258,948 km² which is nearly 8% of total geographical area of the country. The basin lies in the States of Andhra Pradesh (113,271 km²), Karnataka (76,252 km²) and Maharashtra (69,425 km²).

Krishna river rises in the Western Ghats at an elevation of about 1337 meters just north of Mahabaleshwar, about 64 km from the Arabian Sea and flows for about 1400 kms. 

Map 2: Krishna River Basin
and empties into the Bay of Bengal. It flows through Maharashtra and Karnataka before entering Andhra Pradesh at 782\textsuperscript{nd} km and flows for a common length of 42 kms between Karnataka and Andhra Pradesh and further a length of 576 kms before joining the Bay of Bengal in Krishna District. It is the second largest river in peninsular India. Most part of this basin comprises rolling and undulating country except the western border which is formed by an unbroken line of ranges of the Western Ghats.

The river bifurcates into two arms after about 64 kms from Prakasam barrage. The left stream after traversing a distance of 31 kms empties in to Bay of Bengal at Malakaya Lanka village in Krishna District. The right stream after traversing a length of 32 kms empties in to Bay of Bengal at Lankevanidibba village in Guntur district. The land situated between these two arms of the river is called “DIVISEEMA”

Most of the catchment area of Krishna River in Andhra Pradesh is a drought prone area. The mean annual rainfall in the catchment area ranges between 635mm and 1016mm and it is mainly from South-West monsoon. In the normal dependable year, the State has to receive about 550 TMC of water from upper States, out of its total allocation of 800 TMC of water in addition a return inflow of 11 TMC.

The State has constructed Nagarjuna Sagar, Srisailam, Jurala and Prakasam Barrage to harness the waters of Krishna river. The river also meets the drinking water demands of Hyderabad and Chennai cities, apart from municipalities, panchayats in its catchment and command.
The principal tributaries joining Krishna are the Ghataprabha, the Malaprabha, the Bhima, the Tungabhadra and the Musi. Tributaries like Dindi, Musi, Paleru and Muneru join it upstream of Vijayawada city. Cultivable area in the basin is about 203,000 km², i.e., 80 percent of the basin area, which is 10.4% of the total cultivable area of the country.
Both Krishna and Godavari basins were undergoing through severe shortage of water due to less rainfall till September 2009. As a result the Kharif irrigation water could not be supplied to the 22 lakh acres ayacut under Nagarjuna Sagar project. There were serious limitations on drinking water availability, as a result available limited quantity of water in reservoirs was being rationed and distributed. The contingency plans were operationalised to supply drinking water, power reserves and to save the area sown under command. Most of the Mandals in the State are declared drought affected, by 29th September, 2009.

In October 2009 floods at Srisailam, the Krishna basin received unprecedented flood flow of 25.4 lakh cusecs which is more than thousand year return flood. The previous highest recorded flood in the past hundred years for Krishna basin is 9.32 lakh cusecs on 17th October 1998 at Vijayawada.

The Srisailam Dam is primarily built for generating hydel power and is not designed for managing huge floods. Hence, the only way left is to moderate the floods by discharging flood water. However, free discharge of the entire flow is not possible because of limitations at the Srisailam Dam itself and also limitations at the Nagarjuna Sagar Project (NSP) below and the Prakasham Barrage (PB) near Vijayawada.
The Srisailam Dam is designed for a thousand year return flood of 20.20 lakh cusecs and for a discharge of 11.1 lakh cusecs at FRL +885 ft and 13.2 lakh cusecs at MWL 892 ft including the power draft, while the flood received peaked to 25.40 Lakh Cusecs, on 2nd October from 6.00 pm onwards and continued at this level of inflow for more than 10 hours. The previous maximum flood received was 9.11 lakh cusecs. The flood resulted in building up of water at the Srisailam dam to a level of +896.5 ft which is above maximum water level (MWL) of +892 ft.

Probable maximum flood is a theoretical concept likely to happen once in 10000 years. PMF is the flood that may be expected from the most severe combination of critical and hydrologic conditions that are reasonably possible in a particular drainage. The Probable Maximum Flood (PMF) for Srisailam reservoir is estimated as 26.08 lakh cusecs. Thus the flood inflows received on 2nd October night touched almost the PMF assessed.
Likewise the Nagarjuna Sagar Dam which is designed for 15.9 lakh cusecs discharge at MWL (Spillway capacity of 15.3 lakh cusecs at MWL and discharge of 35,000 cusecs through main power units and another 25,000 cusecs through canals) and 13.83 lakh cusec at FRL has received a flood inflow of 14.66 lakh cusecs at 6.00 pm on 3rd October 2009, against the previous highest record of 8.6 lakh cusecs. The maximum flood discharge released was 10.50 lakh cusecs on 3rd October 2009 against the previous highest discharge of 8 lakh cusecs on 16th October, 1998.

The Prakasam Barrage which is designed for 11.9 lakh cusecs has received 11.10 lakh cusecs at 7 pm on 5th October, 2009, and 10.94 lakh cusecs flood is discharged on midnight of 5th & 6th October, 2009. The Sunkesula Barrage and Jurala Dam also received maximum inflows.
Map 5: Historic flood in Krishna River

Thus, all irrigation systems in Krishna Basin were at the maximum capacity for the first time in history.
CHAPTER – 4
LIMITATIONS FOR FLOOD DISCHARGE

DAM SPECIFIC CONSTRAINTS

SRISAILAM

At Srisailam dam, the Maximum Water Level (MWL) is +892 feet. The maximum flood discharge at this level is 13.20 lakh cusecs, no guidelines on operating gates beyond this and more storage would submerge more areas upstream due to back waters. Beyond MWL there is a problem in emptying of the Tungabhadra River water into Krishna. In downstream when discharge is more, there is a issue of submergence of power utilities on left and right banks. The maximum discharge released from Srisailam was 7.36 lakh cusecs on 15th October 1998, whereas present flood inflow is at 25.4 lakh cusecs on 3rd October, 2009.

Photo 2: Srisailam at its Highest Flood Level October, 2009
FLOOD MANAGEMENT

NAGARJUNA SAGAR DAM
The dam is a combination of masonry and earth work construction. The FRL is +590 ft. The spillway of the dam is designed for discharge of 13.15 lank cusecs at FRL and 72,000 cusecs through power utilities. The dam is currently proposed for modernization. If more flood is discharged from Srisailam there is threat to NSP and if more discharge is let out at NSP large areas will submerge at Vijayawada. Hence, NSP is not a place to store more water in either case. The stretch of river between NSP and Vijayawada is significantly populated on the banks and submergence would cause lot of damage to property as well as lives.

Photo 3: Nagarjuna Sagar Dam

PRAKASHAM BARRAGE
The Barrage is built only to divert water in to the Eastern and Western canals and is not meant for storage. The maximum
water level at the barrage can be only about 12 feet above crest of barrage. The first warning is issued at flood level of 12ft over crest and discharge of 3.97 lakh cusecs. Second warning is issued at 15 ft over crest and discharge exceeding 5.69 lakh cusecs. Thus, any discharge beyond 5 lakh cusecs causes submergence of a large number of villages along the banks till its confluence in to the sea. The flood banks are designed for 10.6 lakh cusecs, but the flood contingency plan is made only up to 10 lakh cusecs discharge. The highest discharge from the barrage in last 100 years is only 9.32 lakh cusecs. The areas under Prakasam Barrage are thickly populated, and major towns including Vijayawada city are along the banks of river Krishna. Excess flood discharge will cause severe threat to population as well as property on downstream of barrage.

Photo 4: Prakasam Barrage during October, 2009 Flood
UNPRECEDENTED HEAVY RAINFALL

The drought situation looming large in the background and everyone was waiting for the rains. The Mahaboobnagar and Kurnool districts which are frequently drought prone areas, received unprecedented rains from 30\textsuperscript{th} of September and is continued up to 3rd of October. The normal annual rainfall for Mahaboobnagar and Kurnool District is 603mm and 670mm respectively.

The unprecedented heavy rainfall received in areas around Mantralayam on the border of Karnataka and Andhra Pradesh in the Krishna basin ranging between 300 mm to 560 mm in the Mandals of Mahaboobnagar and Kurnool district. This rainfall was almost 4 to 5 times of the normal rainfall of the month of October. The rainfall at Mantralayam was unheard in the 338 years of history in temple records. This heavy rainfall caused historic flood inflows in River Krishna and Tungabhadra.
SHORT LEAD TIME

Heavy rainfall in Western Ghats is generally prime cause of the flood in Krishna river. Usually long lead time is available before the flood water from Western Ghats reaches in to Andhra Pradesh State. On September 30th, 2009 an unusual weather system stationed in the middle reaches of the Krishna river close to the State border started causing unprecedented floods in its penultimate reaches and also for Tungabhadra River.

Bulk of the rainfall occurred below the major storage reservoirs of upper riparian states giving little scope for flood moderation. Cloud Burst remained stationary and emptied the large quantity of water load over a small area below Tungabhadra Dam, Narayanpur dam and Ujjain dam in Karnataka State and...
over Mahaboobnagar and Kurnool including Mantralayam in Andhra Pradesh. As such it was fag end of monsoon and all the reservoirs in Karnataka were at almost full capacity.

Very little lead time of about 6-8 hours to Sunkesula and Jurala projects from intense rainfall areas. There are no big reservoirs in between intense rainfall area and Srisailam to store the flood water.
Total distance between Almatti to Prakasam Barrage is 777 Kms.

Map 8: Distance from Almatti to Prakasam Barrage
Flood management is an important assignment with the CADA after the Engineering wing of Irrigation Department finishes building the dam structure and creating the reservoir. The water release comes under the purview of the CADA that has to allocate available water according to State approved set priority. As such flood management becomes a crucial responsibility of the department and the unit State Flood Control Centre which is assigned the task of monitoring and recording inflows and the water in reservoirs to take decisions on the amount of water to be released and stored.

The State Flood Control Centre in Irrigation Department under Engineer-in-Chief, irrigation operates round the clock from 16th June to 15th December every year, and one shift from 8 am to 2 pm during non-flood season. Sri. G. V. Krishna Reddy, DCE is the person incharge of flood control center during October 2009.

The forecast reports from Central Water Commission and Indian Meteorological Department are received at the State flood control centre on day to day basis. Based on the forecast received in the flood control centre the periodical actual flood inflow statement is prepared by collecting the data from river gauges and reservoir gauges then indicate the warning level first and second and danger level. This information is passed on to all concerned to safe guard the irrigation structures, lives of people and their assets and ensure safe passage of flood. The necessary action is taken by river conservators based on the flood contingency plan prepared.
FLOOD MANAGEMENT STRATEGY

The flood management exercise of 2009 was complex as until the end of September 2009, the monsoon was much below normal and the State was facing one of the worst droughts in recent years. Faced with low water flows in to the reservoirs the department focused on conserving the available water for meeting drinking water requirements for the rest of the period of rainfall year.

On 29th September the discussions in the State were on the drought mitigation and visit of drought study team from the Government of India and overnight the scenario changed drastically to the flood management.

During the floods the State Flood Control Centre in Irrigation Department was personally monitored by Principal Secretary Irrigation. An interdisciplinary team of Engineers, experts, and retired engineers with highly acclaimed credentials in various engineering disciplines like mechanical, dam safety, flood management, etc. has supported the flood control team round the clock.

At the field level, one Chief Engineer with experience on respective projects was deputed to Jurala Project, Sunkesula Barrage, Srisailam Dam, Nagarjuna Sagar Dam and Prakasham Barrage including right flood bank and left flood bank of Krishna river below Prakasam Barrage. The Secretaries of Irrigation Department, Sri. S.K. Joshi, Sri. Rajiv Ranjan Mishra and Sri. Adityanath Das were deputed by the Government to Vijayawada, Kurnool and Mahaboob Nagar respectively to coordinate the flood management with the district officials.
Sri I.S.N. Raju, Chief Engineer, Central Designs Organization, has visited Srisailam along with Sri Kannaiah Naidu, the gates expert for monitoring the operation of gates, later on he played an important role in flood management at Prakasam Barrage. Sri B.S.N. Reddy, Engineer-in-Chief, Irrigation was deputed to Nagarjuna Sagar Project to monitor discharge regulation and also to keep track on the seepage pattern through porous holes in galleries of the Nagarjuna Sagar dam. The Chief Engineers, Sri. Basheer, Sri Narayana Reddy and Sri. Masood Alam, were operating from Srisailam, Jurala and Sunkesula respectively.

Hon’ble Minister for Major Irrigation, Sri P. Lakshmaiah, in spite of his ill-health was constantly monitoring the flood situation and guiding from time to time. The Hon’ble ministerer for Minor Irrigation, Smt. Sunitha Laxma Reddy, reviewed the status of tanks and minor lift irrigation schemes. Hon’ble Revenue Minister, Sri Dharmana Prasada Rao kept regular track of flood management in the state and briefed press and electronic media from time to time. Sri M. Shashidhar Reddy, M.L.A., and Hon’ble Member of National
Disaster Management Authority, Govt. of India, actively associated with flood management at state level and mobilized resources from National Disaster Management Authority (NDMA). Hon’ble ministers of concerned districts were on the field guiding the officials throughout the flood management operation.

The Chief Minister and the Principal Secretary (Irrigation) were in constant touch with their counterparts in Karnataka for outflow management from dams in Karnataka to reduce the impact of the floods. The situation was reviewed every three hours by Hon’ble Chief Minister.

The Chief Minister reviewed flood situation at 11.30 pm on 2nd October, and at 6 am on 3rd October, as the situation warranted decision making on flood discharge. Hon’ble Chief Minister appeal on 1st October to the people to move out to safer places in Kurnool 24 hours before anticipated increase of flood rise, saved many lives.

The advance action taken for depletion of Srisailam and Nagarjuna Sagar facilitated moderation of flood during peak inflows on 2.10.2009 night.

The inundation areas were identified for Kurnool, Guntur, Vijayawada for various volumes of flood water discharge on digital maps with the support of APSRAC and circulated to the districts for advance evacuation.
All the irrigation Engineers in the affected districts were on high alert and took up extensive vigilance on the dams and along the courses of the river. Engineers also took up extensive vigil on the flood banks below Vijayawada to watch any slippage, seepage, distress on the bunds and taken preventive measures.

The hourly increase in reservoir levels in terms of height in feet and quantum of water in tmc is assessed to predict the inflows and expected rise in reservoir levels as the river gauges in most places are either washed out or water level crossed above gauges. Srisailam has double the extent of water spread area i.e., 616.42 sq. kms. compared to 295 sq.km of Nagarjuna Sagar Dam water spread area and is used for correlating to rise in water levels.

Srisailam inflow and Nagarjuna Sagar outflow is balanced for number of hours. Bringing to this status involved lot of modeling and real-time assessment of flood flow which ultimately resulted in the minimal damage.

CIOKRP meeting was held twice on 3rd October to decide the quantum of water to be discharged from the Nagarjuna Sagar Dam.

The time to time modelling studies for dam sites and hourly monitoring of the flood levels helped in taking decisions on flood discharge from the dams at flood control centre. The temporal movement of flood discharge from one dam to other is regularly kept under track and assessment is made with reference to rise in water level and its timing in next dam and is informed to the district administration.

In free flow condition the outflow or discharge from the dam depends on the water level in the reservoir. Though the inflows are reduced, at free flow conditions the dam discharge was very high as water level in the dams were at peak. The static discharge is due to the head up and time lag.
More than 200 km of earthen flood banks downstream of Prakasham Barrage, running to the capacity for more than 36 hours, required constant vigilance and watch. The water user associations, distributory committees and projects committees in Krishna Delta system have played significant role in preparing sand bags and breach closures during this period.

The district administration of the adjacent district has played important role in mobilizing Engineers to the affected areas and also supplying food and water in affected districts.

The Central Water Commission officials and Indian Meteorological Department officials have participated in decision making process at State flood control room and also attended the chief Minister’s review meetings, on invitation of the irrigation department.

The flood water management was crucial first at Srisailam initially and gradually the focus of flood management shifted to prakasam Barrage. Leadtime of 3-4 days was available for flood preparedness at prakasam barrage.

**CONTRIBUTING FACTORS IN FLOOD MANAGEMENT**

1. Holding of 90 TMC water between +885ft and +896 ft at Srisailam was crucial and critical decision, as anything like damtilt, dam overflow, dam breakge or dam upliftment was possible

2. Cushion of 146 tmc that was available at NSP helped in moderation of flood and restricting to the maximum discharge of 10.5 lakh cusecs
3. There were no catchment inflows below NSP from Munneru, Halia, Paleru and Musi which otherwise would have been in the range of even 5 lakh cusecs.

4. Interbasin transfer of about 40 TMC flood water from Krishna to Pennar has taken place as the breach at Pothireedypadu has allowed to pass one lakh cusecs to Kundu River and subsequently to Somasila reservoir partially flooding Nandyala town and some villages.

5. There was no rain in Krishna basin after 4th October morning.

6. The seepage through porous holes is noticed in the galleries of Nagarjuna Sagar dam. Therefore, the Turbidity test is carried out to know the sand content in the seepage water and then matching with the outflow or discharge water turbidity. The permissible seepage through the porous hole is 17 GPM. However, the turbidity was within the limits.

7. A concern was expressed regarding the full moon tidal movement of sea water in to the coast which may cause obstruction to the entry of flood water in to sea and thereby causing more flooding. However, the low and high tide difference in height is 2 meters where as river discharges at 4mt height. Therefore it has not become an issue.

8. The upstream topography of the Srisailam dam is safe as the velocity of water coming does not touch dam directly. The flood water first hits hillocks and velocity is dissipated. The dam tilt study indicated that the tilt is within the safe limits.

9. The modernization of the 1700 railway affecting tanks with an investment of Rs 200 crore has resulted in less damage to the railway lines.
10. Free board cushion of Flood banks could accommodate flood water more than the designed capacity of 10.6 lakh cusecs for almost 24 hours on 5th and 6th of October, 2009.

**DECISION SUPPORT SYSTEM**

**APSRAC**

The APSRAC has prepared the digital images to know the flood impact areas for various quantities of flood discharges within few minutes of request and these maps are sent to the district administration for evacuating the people to safer places. The result is that with such a deluge also the flood could be managed with minimum loss of property and lives.

Keeping in view of the opening of the gates at Prakasam Barrage and high inflows at Srisailam reservoir APSRAC was asked to prepare the areas likely under inundation at different levels of storage at Srisailam reservoir and different discharge flows below Prakasam Barrage. The inundation maps for +885 ft, +892 ft, and +904 ft storage levels at Srisailam were communicated to Mahaboobnagar and Kurnool districts in advance for evacuation. Similarly for discharge of 10 lakh cusecs and 12 lakh cusecs water from Prakasam Barrage, the likely inundation maps were sent to Guntur and Krishna districts in advance for taking up evacuation measures. The inundation maps for breach at Oleru on Krishna river banks in Guntur district is also prepared and circulated to district administration for evacuation of the people. This advance warning facilitated the districts administration to evacuate one million people and prevented the loss of human life.
Map 9: Flood affected areas of Kurnool with contours

Map 10: Possible Inundation Areas due to Dam Break
As the flood water in Srailam Dam touched about +896.2 ft against MWL +892 ft, everybody's apprehension was that the dam may break at any time if the water level further increases. In this context, the Principal Secretary, I&CAD solicited APSRAC to map possible extension of inundated areas in the downstream of Jurala, Srisailam, Nagarjunasagar dams and Prakasam barrage in case of
such eventuality. Though specific softwares were not available for carrying out dam break analysis, APSRAC has carried out the mapping immediately with available resources, reservoirs/barrage data and topographic information in GIS format i.e. DEM, slope, drainage, geology, soils and landforms, etc.

The number of habitations with demographic details in the possible inundation areas in the downstream of each dam is analyzed and disseminated to the concerned departments for preparedness in advance.

**IMD RAINFALL FORECAST**

Indian Meteorological Department, Hyderabad issues daily weather bulletins for Andhra Pradesh State, covering synoptic situation, realized rainfall, rain forecast. Daily weather report given on 29th September, 2009, by Meteorological Centre, Hyderabad, indicated rain or thunderstorms are likely to occur at many places over Telangana, and a few places in interior Karnataka and Rayalaseema during the next 48 hours. The warning given is, isolated heavy to very heavy rain is likely to occur over Telangana and isolated heavy rain is likely to occur over Rayalaseema during next 48 hours. The daily weather report issued by Meteorological Centre, Hyderabad, on 30th September, indicated isolated heavy to very heavy rain like to occur in coastel area, Telangana and isolated heavy rain is likely over Rayalaseema during next 48 hours. However the quantum of rainfall received was beyond forecast and imagination.
CWC FORECAST

The Central Water Commission maintains river gauges at all important locations on all major rivers like Krishna, Godavari and Pennar and its tributaries. The Central Water commission based on the rainfall pattern and rainfall received issues a forecast of inflows to various river basin reservoirs on daily basis. The CWC forecasts the inflows at various points for effective coordination and management of available waters.

The CWC forecast of the inflow at the Srisailam Dam and the actual realised inflows are tabulated and given below.

The CWC forecast for levels at Mantralayam until 29th of September, 2009 were not alarming and well below the warning level. The warning level of Mantralayam is +310mt. The first advisory indicating the level to touch +310 at Mantralayam was issued on 30th September at 10.40 am. The discharge at Mantralayam was 26,486 cusecs on 30th September which is the nominal flow in Tungabhadra River.

A specific forecast bulletin about flood at Matralayam is received around 4.30PM on 1.10.2009 from CWC unit office at Kurnool mentioning that the historical flood level of +315.8M is likely to touch by midnight. The forecast bulletin was communicated to the District collector by 5.15PM on the same day requesting him to take all precautionary measures for safeguarding people and property.
Table 1: SRISAILAM RESERVOIR INFLOW & OUTFLOW DETAILS

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<tr>
<th>DATE</th>
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<th>Reservoir Level Ft</th>
<th>Capacity in TMC</th>
<th>Inflows in c/s</th>
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Though High inflow indications are given, the realized inflows are much higher than expected by CWC. On 2nd October midnight almost 25.4 lakh cusecs inflows are realized at Srisailam reservoir for almost 10 hours which is far above forecast of CWC. Inspite of this the situation is well managed and brought under control.

CIOKRIP MEETING

The Committee on Integrated Operation of Krishna river Irrigation projects (CIOKRIP) meetings are held under Chairmanship of Sri M. K. Rahaman, Engineer-in-Chief, Administration twice on 3rd
of October, to take decisions on flood discharge in Krishna basin. In the CIOKRIP meeting held on 3rd October at 4pm a decision is taken to limit the outflows at Nagarjuna Sagar to 9.50 lakh cusec keeping in view of the flood banks. At the CIOKRIP meeting held on the same day at 9pm after reviewing the inflow position at Srisailam, Nagarjunasagar and Prakasam barrage a decision is taken to increase the outflows from Nagarjuna Sagar to 10 lakh cusec immediately and then outflow is to be increased to 10.50 lakh cusec from 6Am on 4th October, 2009 onwards.

**EXPERTS ADVICE**

Senior most Irrigation Engineers, Advisors to the Government in Irrigation department and Experts on irrigation monitored the whole flood management constantly round the clock and played an important part in decision support. Continuous consultation with battery of experts led to the best possible solutions, and there were no knee jerk reactions. The experts were allowed to give all options and finally the administrators made the decisions.

The Principal Secretary Sri. S. P. Tucker, Engineer-in-Chief (Administration) Sri. M. K. Rahaman, Engineer in Chief, (Irrigation) Sri B.S.N. Reddy, Chief Engineer CDO, Sri. I. S. N. Raju, Chief Engineer ISWR, Sri P.Rama Raju, Advisors to the Government in Irrigation Department, Engineer-in-Chief (Retd.) Sri. K. Prakash, Director General APSRAC Dr. Mruthyunjaya Reddy and Sri. M.S. Reddy - Former Chairman, CWC and Secretary, Ministry of Water Resources, Government of India, Sri. S.K Das- Former Chairman, CWC also the Gates expert- Sri Kannaiah Naidu were among the key participants who played a lead role in managing the unprecedented floods and the flood situation. Sri S.B. Thyagi, Director, IMD, Sri Vijaya Bhaskar, Meteorologist,
Sri M.Y.N. Wakpanjar, Chief Engineer, CWC, Sri A. Paramesam, SE, CWC, have given their valuable inputs on forecast and assessment of inflows for decision making.

Sri. K. Tirupathaiah, Director General, WALAMTARI, has supervised the real time video recording of the flood situation as well as production of animated video film on floods, Sri. Sanjay Gupta, Spl. Commissioner, CADA has co-ordinated the preparation of the presentation made before Hon’ble Prime Minister of India. Sri. G. Chandra Shekar Reddy, MD, APWRDC is involved in documenting all the events of flood management. All the three above officers were facilitating decision making and implementation of the flood management decisions taken at flood control centre.

APGENCO requested to examine the reduction of outflow from Srisailam and increase out flow from Nagajuna Sagar Project to protect the power houses which is rejected keeping in view of the rising trend of water level on 3rd October night.

The professional learners have sat with the experts while making the decision. As such, it was the unique experience for the Engineers of present time as imaginary situation of probable maximum flood is dealt in their life time.
SUGGESTIONS FOR FLOOD MANAGEMENT

The following suggestions have come out during the discussion at the Flood Control Center for managing the flood situation arising in future.

1. Software for flood estimation for hourly rainfall, dam break analysis and inundation assessment is to be procured.

2. One meter contour interval digital contour maps for 5 kms distance on either side of the river course is to be procured.

3. Relocation of people from low lying areas along Krishna river specially at Alampur, Rajoli, Vijayawada town

4. Dam gates, gantry crane, stop log gates must be ensured in working condition before every rainy season

5. State dam safety committee must inspect the dams every year and ensure guidelines for operational plans for the flood management.

6. Special compensatory allowance of 30% for project staff staying at the project site

7. Prakasm Barrage flood banks works with modified TBL considering 1.8 meters free board to be completed at the earliest

8. More numbers of floating bulk head gates to be procured against existing two gates for safety of Pakasam barrage.

9. Permanent restoration of breeched earth dam and flood banks of Sunkesula barrage and additional spillway to be taken up for flood discharge over and above designed flood of 5.25 lakh cusecs

10. Flood banks to Hundri and Tungabhadra to protect Kurnool city to be taken up.
11. Protection of Alampur town by raising retaining wall and permanent restoration of the pumping scheme with new motors of higher capacity

12. Satellite phone placed in coastal districts is now required in other places too.

13. Modernization of the existing flood control centre with the historical record and decision support systems in place.

14. Request could be made to retain water in Karnataka dams where there is forest or remote uninhabited areas inundation is likely

15. Engineers should see safe flood management and other officers to look after the relief arrangement

16. Flood embankment where the routes are made to facilitate the sand lifting are to be plugged with sand bags and are to be monitored.

17. The option of flood discharge tunnel for Dams could be explored to increase the flood water disposal capacity

18. 1st and 12th gate are the flanking gates and they should be opened only in extreme condition as the erosion of the flanks are expected.

19. During the flood rise seepage along the rear side of the banks has to be observed while doing patrolling. During the receding of flood there is a possibility of slippage of flood banks on the river side as they have been wetted and needs vigilant patrolling.

20. Installation of automatic recording rain and river gauges having capability of measuring at frequent intervals and to transmit the data to the places of decision making without loss of any time specially for the catchment area of Srisailam dam.
COMMUNICATION SYSTEMS

SMS BASED RESERVOIR LEVEL INFORMATION SYSTEM

SMS text messaging is the most widely used data application in the world. With penetration of mobile phones even in rural areas, SMS serves as an instant disaster warning system to the communities. The inflow, outflow, level and capacity information SMS from affected reservoirs were obtained at each hour round the clock and were also disseminated to the flood control room and connected authorities every hour round the clock thus a real time scenario could be created for hour to hour decision making.

The loss to life and property could be avoided using these instant communication systems. The thousands of people stranded in the flood waters could get connected to people, authorities and media and could save their lives in time through rescue operations.

ROLE OF PRESS AND ELECTRONIC MEDIA

Electronic media seems to be teaching many things even to the unlettered. During the floods, many people reeled out their problems the moment they saw news channels. Live discussions have taken place on managerial issues and decisions taken on flood discharge. This has helped in making better decisions for flood management. The statement given by Sri Arun Kumar Bajaj the CWC Chairman has led to lot of debate on the flood management across the country.
The CM appeal through press and electronic media at 5 pm on 1st October to vacate the Kurnool and asking people to move to safer places as flood is likely increase and water level in kurnool will rise by 4 ft by mid night and another 4 ft by morning has really saved human lives. Almost 200 press and media personnel were there in press conference. The lack of power supply and rising water level in Kurnool would have been a real problem.

The television has played a vital role in flashing flood levels and inundated and likely submergence areas. Eleven Telugu news channels and many national and international channels reached millions of people with coverage of floods for full five days. Some TV Channels collected relief materials to be sent to the flood victims.

Press has brought out detailed aspects of the flood management in a simple manner so that every one could understand. It has provided enough information for the people to safe guard themselves and their property in advance as good lead time was available for flood management below Nagarjuna sagar Dam.
Sri. M. K. Rahaman, Engineer-in-Chief, was in constant touch with the Press and Electronic Media and briefed about the flood situation and its management from time to time.

**INTERNET SERVICE**

There are many international scientific agencies working on weather system realtime monitoring in the world. The satellite imageries of weather systems are available on the internet. Likewise the IMD site on weather forecasting is highly informative. Access to all these through the web sites has reinforced the confidence of decision-making with reference to flood management.

*Map 12: Weather Maps seen in on the Website*
REAL TIME MONITORING OF FLOOD AND MODELLING

The hourly increase in water levels is obtained from the dam sites to arrive at inflows as most of the river gauges are damaged or were overflowing. The spatial and temporal movement of water is almost accurately assessed and this has helped in decision making for flood moderation and evacuation of people.
As on 30th September 2009 at 6 AM Srisailam Water Storage was at + 884.40 ft. The flood forecast for Srisailam Reservoir as forecast by Central Water Commission from 6 PM on 30th September 2009 to 6 AM on 1st October 2009 is 1,16,533 cusecs. Keeping in view the flood forecast and the flows observed at Jurala (Krishna River) and Roja (Tungabhadra), the spillway gates were operated gradually from 7 PM on 30th September 2009 to free flow condition by 11 AM on 1st October 2009 by operating gates stage by stage.

Thus inflow did not have any obstruction and even more than inflow was released which was maximum possible.

The lifting of gates of Srisailam was started at 7.20 pm on 30th September starting with two central gates and operating the further gates by wee hours of 1st October, 2009 with a discharging capacity of 5.4 lakh cusecs (which is maximum possible discharge with the then reservoir level of 884.4 feet by keeping the 10 gates totally
open) against the forecast inflow of 1,16,533 cusecs by CWC on 30th September, 2009 through its bulletin no 108.

This advance action has facilitated heading up of water in Nagarjuna Sagar Dam to facilitate discharge by opening all gates by 1st October, 2009 evening.

Further 11th gate was also operated at 9 PM on 1st October, 2009 and a allowed total discharge of 9,66,052 cusecs (including power houses draft). The Reservoir level then was depleted to +880.6 ft by 11 PM on 1st October, 2009 from +884.90 ft at 7 PM on 30th September, 2009 due to release of higher discharge than inflows in advance.
The FRL of Srisailam Dam is +885.00 feet which was crossed at 5.00 pm on 2nd October. The MWL of +892.00 feet was crossed 3.00 am on 3rd morning. The peak level touched was 896.50 feet at 11.00 am on 3rd October, which continued till 6.00 am on 4th October.

The inflows in Srisailam Reservoir on 2nd evening onwards are about 25.50 lakh cusecs. On 3.10.2009 morning, 12th gate (Gate No: 1) was also operated and a maximum discharge of 14.80 lakh cusecs was passed through the Srisailam spillway.

The Srisailam Dam design is checked for a thousand year return flood of 20.20 lakh cusecs. In such scenario, it is designed to accommodate the difference between the inflow and outflow to be impounded between FRL of +885.00 ft and MWL of +892.00 ft for a short period of 3 to 5 days. However, the huge inflow caused water level reaching +896.5 ft.
<table>
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<th>Time</th>
<th>Storage in TMC</th>
<th>Reservoir level in feet</th>
<th>Inflow forecast in Cusecs</th>
<th>Received inflow in Cusecs</th>
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<tr>
<td>Date</td>
<td>Time</td>
<td>Prakasam Barrage Gross Capacity in TMC</td>
<td>FRL in feet</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>-------</td>
<td>----------------------------------------</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.98</td>
<td>57.05</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

At Nagarjuna Sagar project on 30th September, 2009 the water storage level was at +536.20 ft. The water level reached the crest level of NSP +546 at 11.30 am of 1st October 2009, due to inflow...
from Srisailam Dam. All the 26 gates of NSP were lifted by 6.30 pm on 1\textsuperscript{st} October 2009 for free flow of water to create enough cushion to regulate the flood. The maximum regulated out flow from NSP is to be in the order of 10.5 lakh cusecs which is in accordance with the capacity of the Prakasam barrage and flood banks downstream. The water storage at NSP reached peak on 5\textsuperscript{th} October to +589.4 ft. The maximum inflow received is on 3\textsuperscript{rd} October, to the tune of 14.66 lakh cusecs. The inflow was above 10 lakh cusecs from 1\textsuperscript{st} October to 5\textsuperscript{th} October.
Prakasam Barrage started receiving water beyond the danger level from 3rd October and reached below normal only on 11th October, 2009. The Krishna River flood banks below Prakasam barrage was designed for a maximum flood discharge of 10.6 lakh cusecs while the actual flood discharge was 10.94 lakh cusecs which continued for about 10 hours. The outflow was maximum on 5th October at the same time inflow was 11.10 lakh cusecs.

The time to time modeling studies for dam sites and hourly monitoring of the flood levels and taking decisions on flood discharge from the dams at flood control room and excellent regulation of the inflows and out flows at Srisailam, Nagarjuna Sagar and Prakasam barrage to enable the projects work in tandem as a flood control measure, saved the state from major catastrophe.
CHAPTER - 6
PARTICIPATION OF FARMERS ORGANISATIONS

The Water Users’ Associations, Distributory Committees and Project Committees have played significant role in flood management during this period. The farmers’ organizations have taken responsibility in flood water management and protection of the flood banks in this unprecedented and historically high flood discharge from Prakasam Barrage.

Farmers organizations of Krishna delta system plays important role in efficient irrigation water management in 13.46 lakh acres command area. There are Project committees for Krishna Eastern Delta (KED) and Krishna Western Delta (KWD) system.
There are 32 Distributory committees and 223 Water user associations under KED and 22 Distributory Committees and 160 Water user associations in KWD.

All the water user associations were asked to take up patrolling of flood banks and canal banks in their respective command areas and keep a watch on the slips on the river side and seepage on the rear side and inform district flood control room and participate in control measures. The elected representatives of the water user associations have voluntarily extended support at local level in flood management.

Presidents of WUA and Presidents of Distributory committee along with the members have participated in patrolling of the flood banks for continuous monitoring of stress and vulnerable areas on flood banks and canal banks from 4th October 2009 to 6th October 2009 in their respective jurisdiction. CADA and
irrigation department at district level established continuous contact with these farmer organizations in flood situation monitoring and control.

The following are some of the major incidents in which the farmer organizations have played important role:

The project committee chairman KWD along with members took active part in association with District administration in restoration of right bank outfall sluice at Vallabhapuram and prevented damage to the vast crop area.

The Distributory committee president of Duggirala along with members has actively worked to close the *bungas* (water seepage) along the right bank in Guntur district.

At Hamsaladeevi, water user association along with local people participated in dumping sandbags in the slips of flood banks and prevented breaching.

Farmer’s organizations also have taken active role in alerting the villagers to evacuate to safer places when the breach of flood bank occurred at Oleru in Guntur District.

There is a length of 230 kms flood bank in Krishna district and 116 kms length of flood bank in Guntur district. The continuous patrolling and timely rectification of weak points on the flood banks by the Water User Associations helped in the safely depleting flood water into the sea.
CHAPTER - 7
POST FLOOD MANAGEMENT : RESTORATION OF IRRIGATION SYSTEMS

Government has taken measures to restore the irrigation systems on war footing basis in order to ensure irrigation water and drinking water supplies.

Dam safety review panel visited the Srisailam dam on 2\textsuperscript{nd} November, 2009 and concluded that there are no significant structural damages.

AP GENCO has taken up the power plant restoration work on Srisailam Left & Right banks.

A Committee is constituted for fast technical clearances. All the works costing less than Rs. 5 lakhs is given to WUA on nomination basis.

The Sunkesula breach has threatened the farmers under KC canal and augumentation of drinking water supply to Kurnool. The desilting of KC canal and construction of the bund in the river to divert the water in to canal is taken up on war footing basis involving thousands of farmers and ensured water by 24\textsuperscript{th} October, 2009.
Photo 12: ring bund to divert water in to KC canal

Map 13: KC Canal Schematic Diagram
### TABLE 4 : FLOOD DAMAGES TO THE IRRIGATION SOURCES

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the Unit</th>
<th>Temporary Restoration Rs in Crores</th>
<th>Permanent Restoration Rs. In Crores</th>
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<tbody>
<tr>
<td>1</td>
<td>Major</td>
<td>56</td>
<td>2800</td>
</tr>
<tr>
<td>2</td>
<td>Medium</td>
<td>1.9</td>
<td>100</td>
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<td>3</td>
<td>Minor</td>
<td>65</td>
<td>500</td>
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<td>4</td>
<td>APSIDC</td>
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<tr>
<td></td>
<td>Total</td>
<td>134</td>
<td>3500</td>
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### DETAILS OF FLOOD DAMAGES TO IRRIGATION SYSTEM

#### MAJOR

<table>
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<tr>
<th>Temporary Restoration</th>
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<tbody>
<tr>
<td>2</td>
<td>Repairs to Structures</td>
</tr>
<tr>
<td>2</td>
<td>Repairs to Structures</td>
</tr>
<tr>
<td>7.5</td>
<td>Earthen bund, flood bank and repairs to structures</td>
</tr>
<tr>
<td>3</td>
<td>Repairs to canal Systems</td>
</tr>
<tr>
<td>4</td>
<td>Repairs to canal Systems</td>
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<tr>
<td>5</td>
<td>Canal/Dam works</td>
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<tr>
<td>2.5</td>
<td>Canal Systems</td>
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<tr>
<td>5</td>
<td>Repairs approach canal and canal systems.</td>
</tr>
<tr>
<td>10</td>
<td>Repairs canal system</td>
</tr>
<tr>
<td>10</td>
<td>Repairs flood banks and structures</td>
</tr>
<tr>
<td>5</td>
<td>Repairs to Dam.</td>
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<td>56</td>
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#### MEDIUM IRRIGATION

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<tr>
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<tr>
<td>0.15</td>
<td>- 30 breaches on canal</td>
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<tr>
<td>0.05</td>
<td>Minor damages</td>
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<td>1.9</td>
<td></td>
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#### MINOR

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<tr>
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<td>1341 nos of M.I.Tanks</td>
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#### APSIDC

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<td>28 Schemes</td>
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<td>0.1</td>
<td>- flood bank breached to let out flood water</td>
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<tr>
<td></td>
<td>- 20 pumps stationed to pump out flood water</td>
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| Grand Total           | 134                                           |
CHAPTER 8
FLOOD IMPACT : RESCUE & RELIEF

RESCUE

The State Government launched immediate rescue operations with the help of National Disaster Responsive Forces provided by NDMA, Army, Navy, State Police and Civil Administration. NDRF on the request of NDMA has deployed 713 personnel with 302 boats in three affected districts and this assistance was prompt and useful. Round-the-clock monitoring was going on both at State Head Quarters and Districts Head Quarters through control rooms.

Nineteen Helicopters were pressed into service in Kurnool, Mahabubnagar, Krishna and Guntur districts to rescue and provide food to the people marooned in flood water.

Army columns with 805 personnel were deployed for undertaking rescue and relief operations in the affected districts. In addition to local vehicles such as tractors, trucks, Lorries etc., 439 boats including Naval boats and 1,576 swimmers were also engaged to rescue and evacuate the people to the relief camps or safer places.

The State Government appointed Special Officers to monitor the flood situation and the rescue and relief operations in the flood affected districts. Massive Relief Measures were taken up in the flood affected areas. Necessary arrangements were made for the provision of food, water etc., at relief camps and to the marooned people; Medical teams were constituted to take necessary measures to prevent the out-break of epidemics;
Health camps have been opened in the affected areas; Damaged infrastructure – Roads, drinking water, power, etc., are being restored on priority basis.

**RELIEF**

Relief Measures had been taken on massive scale in the flood affected areas. These measures include:

i) Ex-gratia of Rs.2.00 lakh to the kin of the deceased;

ii) Organization of Relief Camps in the affected areas as per requirements;

iii) Distribution of 20 Kgs. of rice and 5 ltrs. Of kerosene to the families whose houses have been washed away / damaged and who were brought to the relief camps; since the affected families lost everything including provisions and were living in pathetic conditions essential commodities namely rice (20 Kgs.), dal (2 Kgs.), palm oil (2 kgs.), sugar (2Kgs.), kerosene (5 ltrs.) and tea powder (50 Grms.) were provided additionally per family.

iv) Assistance for repair / restoration of damaged houses;

v) Assistance for clothing and utensils / house hold goods to the families whose houses have been washed away;

vi) Distribution of food and water packets in the affected areas; and

vii) Organization Medical Camps / Veterinary camps in the affected areas.
Smt Sonia Gandhi, Chair Person, UPA accompanied by Minister for Home Affairs, Government of India visited on 4th Oct’2009 the flood affected areas in Andhra Pradesh.

The Hon’ble Prime Minister along with the Chief Minister of Andhra Pradesh visited the flood affected areas in Krishna and Guntur districts on 9th October and those in Kurnool and Mahabunagar districts on 10th Oct’2009.

The Chief Minister of Andhra Pradesh visited the flood affected areas in Kurnool and Mahabunagar districts on 11th October, 2009 and those in Krishna and Guntur districts on 12th October, 2009.
About 387 relief camps were organized on 87 mandals in Kurnool, Mahabubnagar, Krishna, Guntur and Nalgonda districts. Of the 5.89 lakh people evacuated from the flood affected areas 3.66 lakh people were provided shelter in relief camps. About 47.32 lakh food packets and 63.98 lakh water sachets have been provided to the people in relief camps.

In order to provide health care to the people evacuated and sheltered in the camps as well as those affected by the floods, 307 medical camps have been organized wherein emergency drugs / medicines are being distributed for protection of health of the people and prevention of outbreak of epidemics.

**FLOOD IMPACT**

Never in the history have all three projects in Krishna basin discharged the recorded maximum out flow. The impact of the flood affected 18.16 lakh population and 2.14 lakh houses damaged. About 2.82 lakh hectares of crop area is damaged. In the entire flood, 90 people lost their lives and 45,000 animals reported dead. The power utilities and road networks and housing infrastructure has suffered maximum losses. The total estimated damage is in Rs.12,824.68 crores.

The breach at Sunkesula caused lot of damage and 10 Engineers including the Chief Engineer escaped the washout. Dundubi River flow beyond the dangerous levels and 14 students rescued after 24 hours

Kurnool city once the capital of Andhra State was under 20 ft water.
The inundation of Mantralayam was due to unprecedented local rain and swelling of Tungabhadra river in a very short time. In Mantralayam the water was flowing above the houses and Tungabhadra spread two km wide making 13 ft water in temple town.

The rising level in Srisailam reservoir was the cause for entry of almost 1 lakh cusecs of water through the Pothireddy padu regulator in to Kundu river which inundated Nandyal town.

The Alampur town was inundated due to flood water overtopping of the flood banks and protection wall.

The impact on Repalle was due to the breech of the left flood bank near Oleru village in Guntur district below Prakasam barrage in early hours of 6th October 2009.
Temple kitchens were used to cook food and supply and traffic jams hampered services. No access by road to Kurnool for almost two days. 1 km stretch of national highway was under 4ft Krishna water near Bachupally.

Photo 15: Flood Situation in Kurnool

Photo 16: Train Transport during October Flood
People are shifted by train route from Mantralayam as the road transport is affected. Police help is sought in forceful evacuation of the people to safer places. RTC coordination helped in shifting people to safer places with the help of villagers and village assistant in known and safer routes.

Crocodiles are sighted in water scaring rescuers and people. The road bridge at 900 feet height down stream of Srisailam dam was vibrating due to the velocity of the gushing flood discharge from dam.

The flood impact is minimised as the flood control team regulated the inflows and outflows over a period of one week at Srisailam, Nagarjunasagar and Prakasam Barrage to enable the three projects to work in tandem as a strategy for flood management with minimum damage. In the process 700 TMC flood water received in one week in Srisailam Reservoir was routed through 400 km distance to the sea with minimum damage. This minimized loses in food bowl of Andhra Pradesh under Nagarjuna Sagar and Krishna Delta system, the power utilities at Srisailam and Nagarjuna sagar Projects and saved the civilization inhabited over two crore people in five districts. However, the stretch between the Srisailam and Nagarjuna Sagar is practically clear of habitations. The Srisailam dam acted as most suitable flood moderating system. The result is that with such a deluge also the flood water could be managed with minimum loss of life and property.
Q: Government of Andhra Pradesh Did not Act on CWC reports and there was no coordination

The CWC forecast is issued at Mantralayam Gauge for level and at Srisailam for inflow. The Mantralayam forecast issued until 29\textsuperscript{th} September 2009 were not alarming and well below the warning level. The warning level of Mantralayam is +310mt and the first advisory indicating that the level will touch that point was issued on 30\textsuperscript{th} September at 10.40 am. The Discharge at Mantralayam was 26,486 cusecs as reported by the CWC on 30\textsuperscript{th} September which is a nominal flow for Tungabhadra river. Based on the rainfall, its forecast, warning issued by the CWC and the flows released at Jurala and Sunkesula, the gates of Srisailam were opened at 6:20 pm onwards to deplete the water level at Srisiluam reservoir. The Srisailam dam was in free flow condition on 1\textsuperscript{st} October morning after 10 of its 12 gates were opened, there by discharging an outflow of 9 lakh cusecs.

The forecast on October 1st 2009 at 4.30 pm indicated that highest flood level of +315 mt is likely to be reached. But by that time, gates of Srisailam were already opened. The district administration has issued immediate warnings and undertook evacuation measures at Mantralayam.
Moreover the CWC officials were part of the decision making. They took part in numerous meetings at various levels of the Government, including at the Hon’ble Chief minister level. Their views have been taken in to consideration and actions are expedited. The 18.36 lakh cusecs forecast of peak flood of CWC fell short of actual inflow of more than 25 lakhs cusecsecs which is huge by any means. However the State government was agile and an effective evacuation plan was executed to minimize the impact below Srisailam.

Q: The water levels at Srisailam were allowed to increase to save coastal areas

Gates of Srisailam were opened from 6.20 pm onwards on September 30th. The 10 gates were kept in freeflow condition from morning of October 1st and maximum possible discharges took place depending on the level of the reservoir. The discharge capacity of srisailam at FRL(+885 ft) is 11.10 lakh cusecs and at MWL(+892 ft) 13.2 lakh cusecs. The discharge reached a peak of more than 14.66 lakh cusecs and the reservoir attained a maximum level of 896.5 ft. While the release from the spillway was at its maximum an inflow of the order of 25 lakh cusecs was received. This resulted in building of the water levels beyond MWL even as the gates were kept open.
Q. More water is stored at Srisailam to facilitate drawl of more and more water to Rayalaseema through Pothireddy padu regulator. Therefore no balance storage facility when flash flood came.

From Srisailam Dam the quantum of water released in July is 22.49 tmc, in August 51.83 tmc, in September 153.63 tmc and thus a total of 227.95 tmc is released. The water released through the Pothireddy Padu regulator in August is 0.3 tmc and in September 13.24 tmc only. Except barring few years the Srisailam reservoir level was maintained above 880 ft. level as on 1st October, every year.

Reservoir water levels at N.S.R.S. Srisailam Project as on 1st October, 1984 to 2009

<table>
<thead>
<tr>
<th>Year</th>
<th>Level in feet (in ft)</th>
<th>Storage in TMC (in ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984-85</td>
<td>883.60</td>
<td>298.900</td>
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<td>1985-86</td>
<td>876.10</td>
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<td>1988-89</td>
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<td>1989-90</td>
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<td>194.067</td>
</tr>
<tr>
<td>1996-97</td>
<td>885.00</td>
<td>308.062</td>
</tr>
</tbody>
</table>

Contd...
Q. Even the full Power generation is not taken up at NSP to facilitate water to Rayalaseema?

Srisailam reservoir is primarily built for hydro power generation. Therefore the FRL +885 is being maintained to provide enough water for this purpose until next monsoon. In its history of 25 years barring 6 years where the water inflow was poor due to inadequate rainfall the water level was always maintained between +880 ft to +885 ft. In a drought year like the current one, the water in the dam could not have been depleted without generating power. 1 TMC of water generates 7 million units of power. The total power plant capacity is 1670 MW.

The power production is in full scale since with a discharge of 60,000 cusecs. The power draft is sufficient for irrigating 13 lakh acres in Krishna Delta system and 11 lakh acres under Nagarjuna Sagar. This apart the Chennai 15 TMC and

<table>
<thead>
<tr>
<th>Year</th>
<th>Level in feet (in ft)</th>
<th>Storage in TMC (in ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997-98</td>
<td>884.30</td>
<td>303.457</td>
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<td>1998-99</td>
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<td>2004-05</td>
<td>880.60</td>
<td>238.790</td>
</tr>
<tr>
<td>2005-06</td>
<td>884.80</td>
<td>262.210</td>
</tr>
<tr>
<td>2006-07</td>
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<td>263.634</td>
</tr>
<tr>
<td>2007-08</td>
<td>884.50</td>
<td>260.078</td>
</tr>
<tr>
<td>2008-09</td>
<td>883.90</td>
<td>257.49</td>
</tr>
<tr>
<td>2009-10</td>
<td>884.50</td>
<td>260.780</td>
</tr>
</tbody>
</table>

Note: FRL: 885.00 Ft Capacity: 308.06 TMC / 263.63 TMC (from 2004 – 05 as per APERL Capacity tables)
Hyderabad 11 TMC water supply is to be met. Had water been released from Srisailam power could have been produced at NSP is only after thought which is not practical while State is reeling under drought.

Q. What are the causes of Kurnool Flooding?

The Kurnool town has a population of 3.5 lakhs and having a geographical area of 25 sq km. The Kurnool town is frequently affected by the floods of Hundri river passing through the Kurnool town. Vakkera vagu and Sudda vagu are tributaries of Hundri join in Kurnool town KC canal also passes through city and as such the city is on the banks of Tungabhadra. The 2007 flood in the city was due to a flood of 2 lakh cusecs passing through Hundri inundating the city but receded in 24 hours due to normal flows in Tungabhadra river and Srisailam reservoir much below FRL facilitating fast depletion.

The October 2009 flood was due to very heavy precipitation of order of 400mm in 3 days in the catchment area down below the Tungabhadra dam. A flood of 2 lakh cusecs passing through river Hundri raised the flood level to 283 mt inundating Kurnool city, but this time it inundated Kurnool for 3 days. This was because there was simultaneous flood in Tungabhadra and the Srisailam reservoir was full. Further the breach at Sunkesula aggravated the situation, the Tungabhadra flood water through breach first entered Sunkesula village and traversed to Kurnool when Hundri was in spate. The unprecedented flood to Srisailam was on 3rd October but the Kurnool suffered worst on 1st and 2nd October. The inundation of Kurnool was due to swelling of Hudri and Tungabhadra rivers much before the water level in the Srisailam reservoir reached its FRL of +885 ft at 5 pm on 2nd October.
The Kurnool city can be made flood proof with protection works by construction of flood banks, retaining walls to Hundri and flood banks and escape sluices for Tungabhadra river can mitigate the flood to minimal losses.

Q. Is the Climate Change a Reality?

The climate change is making weather less predictable. The rainfall uncertainty and heavy stormy rainfall more likely. The current rains in Andhra Pradesh preceeded with very high temperatures. With heavy intense spells no percolation is possible. The ground water dependent drinking water scenario in the country is a task to face in the coming years. Intensification of hydrological cycle will impact on the regional water resources. Unprecedented rainfall 1/3 of annual rainfall in oneday leading to flash flood and innundation of larger areas.
Annexure – A

SRISAILAM PROJECT

Neelam Sanjeeva Reddy Sagar Dam

1. PREAMBLE

a) Neelam Sanjeeva Reddy Sagar Dam (NSRSP)

This is Hydro Electric Project constructed in deep gorge across River Krishna at about 3 km from the famous Srisailam temple. It is the First Major Hydro Electric Project taken up for power generation in the state. Although originally envisaged as a purely Power Project, Irrigation and Water supply are also included subsequently. The construction of Dam including crest gates was completed in 1984.

b) Srisailam Right Bank Canal (SRBC)

The Krishna Water Disputes Tribunal (in 1973) has allocated 800 TMC of Krishna water to Andhra Pradesh and also entitled 11 TMC as its share in the regenerated Water. In consonance with this, for utilizing 19 TMC of Krishna Waters, the SRBC Scheme was formulated and was cleared by the Planning Commission in 1981. This Scheme was formulated to irrigate 1.90 lakh acres in Chronically famine striken area of Kurnool (3 Taluk) and Kadapa (1 Taluks) districts of Rayalaseema Region.
c) Srisailam Left Bank Canal (SLBC)

It is contemplated to provide Irrigation facilities in Drought prone areas of Nalgonda District in addition to drinking water to fluoride affected villages enroute. The Project is later renamed as Alimineti Madhava Reddy Project. This is a Lift Scheme taking off from foreshore of Nagarjuna Sagar Reservoir and consists of two canals.

2. SALIENT FEATURES

a) Dam

<table>
<thead>
<tr>
<th>Location</th>
<th>Srisailam</th>
</tr>
</thead>
<tbody>
<tr>
<td>River</td>
<td>Krishna</td>
</tr>
<tr>
<td>Catchment Area</td>
<td>2.06 lakh Sq Km</td>
</tr>
<tr>
<td>Design Flood</td>
<td>19.00 lakh Cusec</td>
</tr>
<tr>
<td>Type of Dam</td>
<td>Gravity Dam</td>
</tr>
<tr>
<td>Height above the Deepest</td>
<td>143 m</td>
</tr>
<tr>
<td>Gross storage @ FRL + 885'</td>
<td>308 TMC (1976 Survey)/263.63 TMC (1997 Survey, APERL)</td>
</tr>
<tr>
<td>Total Discharging capacity at MWL</td>
<td>13.65 lakh Cusec</td>
</tr>
<tr>
<td>Spillway Gates</td>
<td>12 Nos</td>
</tr>
</tbody>
</table>

b) Power House

<table>
<thead>
<tr>
<th>Units</th>
<th>7 Nos.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size of Units</td>
<td>1.1 lakh KW</td>
</tr>
<tr>
<td>Generators</td>
<td>7 Nos</td>
</tr>
<tr>
<td>Capacity of each Unit</td>
<td>1.1 lakh KW</td>
</tr>
<tr>
<td>Turbines</td>
<td>7 Nos. (Francis)</td>
</tr>
</tbody>
</table>
c) Srisailam Right Bank Canal (SRBC)

<table>
<thead>
<tr>
<th>Length (Km)</th>
<th>Discharge (Cusec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banakacherla Regulator to Gorakallu Balancing Reservoir</td>
<td>50 4,960</td>
</tr>
<tr>
<td>Gorakallu Balancing Reservoir to Owk Balancing Reservoir</td>
<td>59 2,400 Cusec Head discharge reducing to 1470 Cusec in last reach.</td>
</tr>
</tbody>
</table>

d) Srisailam Left Bank Canal (SLBC)

| Water Requirement | : | 30 TMC |
| Pumps (High Level Canal) | : | 4 X 18 MW (600 Cusec each) |
| Pumps (Low Level Canal) | : | 4 X 2.15 MW (212 Cusec each) |

3. IRRIGATION POTENTIAL

(a) SRBC

The total Irrigation Potential contemplated is 1.9 lakh acres covering 3 Taluks in Kurnool District (1.67 lakh acres) and 1 Taluk in Kadapa District (0.23 lakh acres).

(b) SLBC

Irrigation Potential contemplated is 2.70 lakh acres. So far, no Irrigation Potential is created.
Annexure - B
NAGARJUNA SAGAR PROJECT

1. PREAMBLE
The multipurpose Nagarjunasagar Project (NSP) on the river Krishna, near the then Nandikonda Village, Peddavoora Mandal, Nalgonda District, is the pride of Andhra Pradesh. It is one of the Modern Temples of Independent India. This is the largest and highest masonry dam in the world. The Project was inaugurated by the (Late) Pundit Jawaharlal Nehru, the then Prime Minister of India on the 10th December 1955. The water was let into both the two main canals i.e. Right Main Canal (Jawahar Canal), Left Main Canal (Lalbahadur Canal) by the late Prime Ministre Smt. Indira Gandhi on the 4th August 1967.

2. SALIENT FEATURES

(a) Location: Nandikonda (Village)
               Peddavoora (Mandal)
               Nalgonda (District)

(b) Hydrology

<table>
<thead>
<tr>
<th>Catchment Area</th>
<th>2.15 lakh Sq Km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Observed Flood(on 7th October 1903) at Vijayawada</td>
<td>10.61 lakh Cusec</td>
</tr>
</tbody>
</table>

(c) Reservoir

| Water spread area at FRL | 285 Sq Km |

(d) Masonry Dam

<table>
<thead>
<tr>
<th>Spill way of Dam</th>
<th>471 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-over flow Dam</td>
<td>979 m</td>
</tr>
<tr>
<td>Masonry Dam</td>
<td>1450 m</td>
</tr>
<tr>
<td>Maximum height of Dam above deepest foundation</td>
<td>125 m</td>
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</table>
(e) Earth Dam

<table>
<thead>
<tr>
<th>Total Length of Earth Dam</th>
<th>3414 m</th>
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</thead>
<tbody>
<tr>
<td>Maximum height</td>
<td>26 m</td>
</tr>
</tbody>
</table>

(f) Power Generation

<table>
<thead>
<tr>
<th>Power Units</th>
<th>1 No. conventional (110 MW capacity)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7 nos Reversible (100 MW capacity)</td>
</tr>
</tbody>
</table>

(g) Canal Power House

<table>
<thead>
<tr>
<th>Right side</th>
<th>3 units 30 MW (each)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left side</td>
<td>2 units 30 MW (each)</td>
</tr>
</tbody>
</table>

3. IRRIGATION POTENTIAL

Under Nagarjuna Sagar Right Main Canal and Left Main Canal, an ayacut of 10 to 11 lakh acres and 8.5 to 9.5 lakh acres respectively are irrigated during normal years.

<table>
<thead>
<tr>
<th>Ayacut Canal-wise</th>
<th>Contemplate (lakh acres)</th>
<th>Localized (lakh acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right Main Canal</td>
<td>11.75</td>
<td>11.13</td>
</tr>
<tr>
<td>Left Main Canal</td>
<td>10.38</td>
<td>10.30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ayacut District-wise</th>
<th>Contemplate (acres)</th>
<th>Localized (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nalgonda</td>
<td>3,97,000</td>
<td>3,81,022</td>
</tr>
<tr>
<td>Khammam</td>
<td>2,75,000</td>
<td>2,76,633</td>
</tr>
<tr>
<td>Krishna</td>
<td>3,68,305</td>
<td>3,70,681</td>
</tr>
<tr>
<td>West Godavary</td>
<td>6,734</td>
<td>2,244</td>
</tr>
<tr>
<td>Guntur</td>
<td>7,01,999</td>
<td>6,68,541</td>
</tr>
<tr>
<td>Prakasam</td>
<td>4,71,999</td>
<td>4,44,729</td>
</tr>
</tbody>
</table>
Annexure - C

PRAKASAM BARRAGE
KRISHNA DELTA SYSTEM

1. PREAMBLE

The Prakasam Barrage (i.e. Krishna Delta System) was constructed during 1952-58 across river Krishna. It serves an ayacut of 13.09 lakh acres khariff wet (Paddy) in Krishna, West Godavary, Guntur and Prakasam Districts. The total registered ayacut is 13.09 lakh acres.

2. SALIENT FEATURES

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Vijayawada (Town)</td>
</tr>
<tr>
<td>River</td>
<td>Krishna</td>
</tr>
<tr>
<td>Catment area</td>
<td>2.51 lakh sq km</td>
</tr>
<tr>
<td>Maximum flood discharge</td>
<td>10.61 lakh cusec (1903)</td>
</tr>
<tr>
<td>Designed discharge</td>
<td>11.90 lakh cusec</td>
</tr>
<tr>
<td>Gross capacity at FRL</td>
<td>3.071 TMC</td>
</tr>
<tr>
<td>Dead Storage</td>
<td>0.771 TMC</td>
</tr>
<tr>
<td>Live storage between MDDL and FRL</td>
<td>2.300 TMC</td>
</tr>
</tbody>
</table>

3. IRRIGATION POTENTIAL

Total ayacut under the project (lakh acres)

<table>
<thead>
<tr>
<th>Season</th>
<th>Ayacut (lakh acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kharif</td>
<td>7.37</td>
</tr>
<tr>
<td>Rabi</td>
<td>3.06</td>
</tr>
</tbody>
</table>

Ayacut Canal wise (lakh acres)

<table>
<thead>
<tr>
<th>Canal</th>
<th>Ayacut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Main Canal</td>
<td>7.37</td>
</tr>
<tr>
<td>Western Main Canal</td>
<td>5.71</td>
</tr>
</tbody>
</table>
### 4. COMPONENTS

**a) Barrage**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Length</td>
<td>973 m</td>
</tr>
<tr>
<td>Vents</td>
<td>70 nos</td>
</tr>
</tbody>
</table>

**b) Head Sluices**

<table>
<thead>
<tr>
<th></th>
<th>Eastren Head Sluice</th>
<th>Westren Head Sluice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vents (Nos)</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>Discharge (Cusec)</td>
<td>10,600</td>
<td>6,640</td>
</tr>
</tbody>
</table>

**c) Canals**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Eastern Main Canal</td>
<td>370 Km</td>
</tr>
<tr>
<td>Western Main Canal</td>
<td>322 Km</td>
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### Annexure - 3

**FLOOD BANKS IN KRISHNA AND GUNTUR DISTRICTS**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Krishna District</th>
<th>Length in K. M</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Krishna Left Flood Bank (above Prakasham Barrage)</td>
<td>13.00</td>
</tr>
<tr>
<td>2</td>
<td>Krishna Flood Bank (below Prakasham Barrage)</td>
<td>6.40</td>
</tr>
<tr>
<td>3</td>
<td>Krishna Left Flood Bank (below Prakasham Barrage)</td>
<td>89.60</td>
</tr>
<tr>
<td>4</td>
<td>Divi Left Flood Bank</td>
<td>36.00</td>
</tr>
<tr>
<td>5</td>
<td>Divi Right Flood Bank</td>
<td>32.00</td>
</tr>
<tr>
<td>6</td>
<td>K. E. Tridal Bank Divi Island</td>
<td>22.00</td>
</tr>
<tr>
<td>7</td>
<td>Kona Tidal Bank (Machilipatnam Side)</td>
<td>18.50</td>
</tr>
<tr>
<td>8</td>
<td>Seadyke Flood Bank (Machilipatnam Side)</td>
<td>2.50</td>
</tr>
<tr>
<td>9</td>
<td>West Side Flood Bank (Machilipatnam Side)</td>
<td>6.00</td>
</tr>
<tr>
<td>10</td>
<td>Rudravaram Flood Bank (Machilipatnam Side)</td>
<td>4.00</td>
</tr>
<tr>
<td></td>
<td><strong>Total:</strong></td>
<td><strong>230.00</strong></td>
</tr>
<tr>
<td></td>
<td><strong>GUNTUR DISTRICT</strong></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Krishna Right Flood Bank (Above Barrage)</td>
<td>22.00</td>
</tr>
<tr>
<td>12</td>
<td>Krishna Right Flood Bank (Below Barrage)</td>
<td>85.40</td>
</tr>
<tr>
<td>13</td>
<td>Rajukalva Flood Bank</td>
<td>9.00</td>
</tr>
<tr>
<td></td>
<td><strong>Total:</strong></td>
<td><strong>116.40</strong></td>
</tr>
</tbody>
</table>

**TOTAL LENGTH OF FLOOD BANKS IN BOTH DISTRICTS : 346.40 Kms.**
Sri I.S.N. Raju, M.Tech. MBA. M.Phil. BL. AE. Chief Engineer, I& CAD Department, Central Design Organization, Hyderabad.
### PARTICULARS OF MAJOR RESERVOIRS AS ON 29-09-2009 @ 6.00 AM.

<table>
<thead>
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<td>1704.72</td>
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<td>17500</td>
<td>0</td>
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<td>NARAYANAPUR</td>
<td>1615.00</td>
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<td>37.20</td>
<td>19830</td>
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<td>0</td>
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<td>UJJANI DAM</td>
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<td>1624.91</td>
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<td>1632.95</td>
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<td>JURALA</td>
<td>1045.00</td>
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<td>49234</td>
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<td>1500</td>
<td>1632.95</td>
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<tr>
<td>5</td>
<td>TUNGABHADRA</td>
<td>1633.00</td>
<td>104.34</td>
<td>1633.00</td>
<td>104.34</td>
<td>17250</td>
<td>4611</td>
<td>4236</td>
<td>8246</td>
<td>1632.95</td>
<td>104.14</td>
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<tr>
<td>6</td>
<td>NAGAUNDA SAGAR</td>
<td>850.00</td>
<td>263.63</td>
<td>884.20</td>
<td>258.88</td>
<td>80243</td>
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<td>64609</td>
<td>6500</td>
<td>884.50</td>
<td>260.78</td>
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<tr>
<td>7</td>
<td>SINGUR</td>
<td>1717.93</td>
<td>29.91</td>
<td>1703.71</td>
<td>12.73</td>
<td>0</td>
<td>282</td>
<td>0</td>
<td>0</td>
<td>1717.68</td>
<td>29.47</td>
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<tr>
<td>8</td>
<td>NIZAM SAGAR</td>
<td>1405.00</td>
<td>17.80</td>
<td>1381.06</td>
<td>1.51</td>
<td>961</td>
<td>0</td>
<td>357</td>
<td>357</td>
<td>1405.00</td>
<td>17.80</td>
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<td>1503.32</td>
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<td>102.73</td>
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<td>10</td>
<td>SRI RAM SAGAR</td>
<td>1091.00</td>
<td>90.31</td>
<td>1068.80</td>
<td>26.64</td>
<td>2064</td>
<td>2064</td>
<td>1725</td>
<td>339</td>
<td>1091.00</td>
<td>90.31</td>
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<td>11</td>
<td>VELIGODU BALANCING</td>
<td>868.50</td>
<td>16.95</td>
<td>848.46</td>
<td>8.13</td>
<td>5000</td>
<td>2310</td>
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<td>SOMASILA</td>
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<td>3885</td>
<td>204</td>
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<td>KANDALERU</td>
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<td>205</td>
<td>1632</td>
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<td>YELERU</td>
<td>283.00</td>
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<td>1174</td>
<td>536</td>
<td>0</td>
<td>0</td>
<td>275.49</td>
<td>19.11</td>
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**KRISHNA BASIN**

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<td>129.72</td>
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NOTE: Please visit the above particulars on the WEBSITE; [http://irrigation.cgg.gov.in](http://irrigation.cgg.gov.in) user ID: guest, password guest
### PARTICULARS OF BARRAGES ON 29-09-2009 @ 6.00 AM.

#### 1. S.A.C. BARRAGE, DOWLAI SWARAM

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<th>Arms</th>
<th>Depth of water in feet (above Crest)</th>
<th>Discharge in cusecs</th>
<th>DISCHARGE INTO CANALS IN GODAVRI DELTA</th>
<th>As on Today in Cusecs</th>
<th>CUMULATIVE UTILISATION IN T.M.C. FROM 1-06-09</th>
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<td>(Surplus) Total out flow over crest</td>
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<td>TOTAL 14000 105.60</td>
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| Depth of water in feet (above Crest) | 10.80 | Surplus Total outflow over crest | 6725 | CUMULATIVE SURPLUS IN TO SEA FROM 1-06-2009 in T.M.C. | 653.05 |

#### 2. PRAKASAM BARRAGE, VIJAYAWADA

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<th>DISCHARGE INTO CANALS IN KRISHNA DELTA</th>
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<td><strong>TOTAL</strong></td>
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OFFICER IN CHARGE OF FLOOD DUTY
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<th>F.R.L. in feet</th>
<th>Gross Capacity in T.M.C.</th>
<th>Level in Feet</th>
<th>Storage in T.M.C.</th>
<th>Inflow in Cusecs</th>
<th>Outflow in Cusecs</th>
<th>Outflow details</th>
<th>Flood Cushion in T.M.C.</th>
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NOTE: Please visit the above particulars on the WEBSITE; http://irrigation.cgg.gov.in user ID: guest, password: guest

*Reading as on 06-10-2009 @ 6.00 am.*
## PARTICULARS OF BARRAGES ON 07-10-2009 @ 6.00 AM.

### S.A.C. BARRAGE, DOWLAISWARAM

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<th>Arms</th>
<th>Depth of water in feet (above Crest)</th>
<th>Discharge in cusecs</th>
<th>DISCHARGE INTO CANALS IN GODAVRI DELTA</th>
<th>As on Today in Cusecs</th>
<th>CUMULATIVE UTILISATION IN T.M.C. FROM 01-06-09</th>
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### PRAKASAM BARRAGE, VIJAYAWADA

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<th>DISCHARGE INTO CANALS IN KRISHNA DELTA</th>
<th>As on Today in Cusecs</th>
<th>CUMULATIVE UTILISATION IN T.M.C. FROM 1-06-09</th>
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<tr>
<td><strong>(Surplus)</strong> Out Flow over crest**</td>
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<td><strong>TOTAL</strong></td>
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<table>
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<th>Inflow in cusecs</th>
<th>CUMULATIVE SURPLUS IN TO SEA FROM 1-06-2009 in T.M.C.</th>
<th><strong>SURPLUS IN TO SEA FROM 1-6-09 To 31-5-2009 (1865.175 T.M.C.)</strong></th>
<th>CUMULATIVE UTILISATION FROM 1-6-08 to 31-05-2009 (224.03 TMC)</th>
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**OFFICER INCHARGE OF FLOOD DUTY**
### Annexure - A

**Srisailam Project**

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### Nagarjuna Sagar Project

#### Annexure – B

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## Annexure – C

### PRAKASAM BARRAGE

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Government of India, India Meteorological Department

Meteorological Centre, Hyderabad

Daily Weather Report for Andhra Pradesh

Tuesday, the 29 September 2009 / 7 Asvin 1931 (SAKA)

Summary of observations recorded at 0830 hours IST

Yesterdays low pressure area over west central Bay of Bengal and neighbourhood has become well marked over the same area, today 29/0830 hours IST. Southwest monsoon has been active over Telangana, Coastal Andhra Pradesh & Rayalaseema.

The stations recorded heavy rainfall in cm are Cuddapah (6), Nandyal, Alampur (Mahabubnagar dist), Ichapuram (Srikakulam dist), 6 each, Wanaparthi (Mahabubnagar dist) 7.

The other chief amounts of rainfall recorded in cm are Kamalapuram (Cuddapah dist), Mandasa (Srikakulam dist) 6 each, Bapatla, Kurnool, Nalgonda, Vizianagaram AP, Allagadda (Kurnool dist), Palasa & Sompetla (both Srikakulam dist) 5 each, Nandyal, Adilabad & Cumbum (both Prakasam dist), Kelvakurthy (Mahabubnagar dist), Nizamnagar (Nizamabad dist), Parkal (Warangal dist), Proddatur (Cuddapah dist), Tiruvuru (Krishna dist) 4 each, Hakimpet AP, Kalingapatnam, Mahabubnagar, Visakhapatnam AP, Almakur & Srisailam (both Kurnool dist), Avanigadda & Paleru Bridge (both Krishna dist), Bhojapalle (Nalgonda dist), Darsi (Prakasam dist), Jammalamadugu & Lakshmedupalli (both Cuddapah dist), Jurala Project (Mahabubnagar dist), Kamareddy (Nizamabad dist), Karimnagar & Sirillla (both Karimnagar dist), Khanaapur, Luxettipet, Mudhol & Nirmal (all Adilabad dist), Macherla (Guntur dist), Madhira (Khammam dist), Narayanakshed (Medak dist), Tekkai (Srikakulam dist), Vindhya (Nellore dist) 3 each.

Forecast & Farmers’ weather bulletin valid until the morning 01 Oct 2009

Moderate to rather heavy rain or thundershowers are likely to occur at most places over Telangana and in the districts of Srikakulam, Vizianagaram, Visakhapatnam and East & West Godavari of Coastal Andhra Pradesh and at many places over Rayalaseema and in the remaining districts of Coastal Andhra Pradesh.

Heavy Rainfall Warning

Isolated heavy to very heavy rain is likely to occur over Telangana and in the districts of Srikakulam, Vizianagaram, Visakhapatnam and East & West Godavari of Coastal Andhra Pradesh and Isolated heavy rain is likely to occur over Rayalaseema and in the remaining districts of Coastal Andhra Pradesh during next 48 hours.

Outlook for subsequent two days

Increase in rainfall.

Forecast for Hyderabad City & N’hood valid until the morning 01 Oct 2009

Cloudy sky. Spells of rain or thundershowers likely at times heavy. Maximum and minimum temperatures are likely to be around 29 & 20 degrees Celsius respectively.
Government of India, India Meteorological Department

Meteorological Centre, Hyderabad

Daily Weather Report for Andhra Pradesh

Wednesday, the 30 September 2009 / 8 Asvina 1931 (SAKA)

Summary of observations recorded at 0830 hours IST

Yesterdays well marked low pressure area over West central Bay of Bengal and neighbourhood persists.
Southwest monsoon has been vigorous over Coastal Andhra Pradesh & Telangana and active over Rayalaseema.

The following stations recorded very heavy to heavy rainfall in cm: Achampet (Mahabubnagar dist) 18, Kalwakurthy (Mahabubnagar dist) 14, Nuzvid (Krishna dist) 13, Eluru (West Godavari dist) 11, Kodangal (Mahabubnagar dist) & Madhira (Khammam dist) 10 each, Shadnagar (Mahabubnagar dist) 9, Mahabubnagar, Visakhapatnam AP, Jurala Project & Nagarkurnool (both Mahabubnagar dist) & Miryalguda (Nalgonda dist) 8 each, Visakhapatnam, Devarakonda (Nalgonda dist), Makhil & Wangapathy (both Mahabubnagar dist), Paleru Bridge (Krishna dist) & Rangareddy dist) 7 each.
The other chief amounts of rainfall recorded in cm are Nalgonda, Anakapalle (Visakhapatnam dist), Atmakur (Kurnool dist), Kollapur (Mahabubnagar dist), Machadu (Guntur dist), Mahabubabad (Warangal dist), Nagajunasinagaram Dam (Nalgonda dist) 6 each, Hyderabad AP, Kalingapatnam, Kurnool, Nandigama, Rentachintala, Alampur (Mahabubnagar dist), Anmool (Nizamabad dist), Mantralayam (Kurnool dist), Ramannapar (Nalgonda dist), Sangareddy (Medak dist) 5 each, Guntur, Kakinada, Khammam, Tuni, Vijayawada AP, Allagadda, Alur & Srisailam (all Kurnool dist), Chevella, Daswakal, Medchal, Pargi & Vikarabad (all Rangareddy dist), Dowlaiahwar, Prathipadu & Rajamundry (all East Godavari dist), Golkonda (Hyderabad dist), Kaikaluru (Khammam dist) & Tenali (Guntur dist) 4 each.

Forecast

Grippers’ weather bulletin valid until the morning of 02 Oct 2009
Moderate to heavy heavy rain or thundershowers are likely to occur at most places over Coastal Andhra Pradesh & Telangana and at many places over Rayalaseema.

Heavy Rainfall Warning
Isolated heavy to very heavy rain is likely to occur over Coastal Andhra Pradesh, Telangana and isolated heavy rain is likely to occur over Rayalaseema during next 48 hours.

Outlook

Increase in rainfall. Two days

Forecast

Hyderabad City & NH10 valid until the morning of 02 Oct 2009
Cloudy. Intermittent spells of rain or thundershowers are likely, at times heavy.
Maximum & minimum temperatures are likely to be around 30 & 20 degrees Celsius respectively.
Government of India, India Meteorological Department

Meteorological Centre, Hyderabad

Daily Weather Report for Andhra Pradesh

Thursday, the 01 October 2009 / 9 Asvina 1930 (Saka)

Summary of observations recorded at 830 hours IST

Yesterdays well marked low pressure area over West Central Bay and adjoining North Andhra and South Orissa Coast persists South west monsoon has been vigorous over Rayalaseema & Telangana and active over Coastal Andhra Pradesh. Achampet (Mahabubnagar dist) recorded exceptionally heavy rainfall of 27 cm. The following stations recorded very heavy to heavy rainfall in cm: Kollapur (Mahabubnagar dist) 24, Wanaparthi (Mahabubnagar dist) 22, Kurnool 19, Alur (Kurnool dist) 18, Alampur (Mahabubnagar dist), Almuk, Mantralayam & Yemmiganur (all Kurnool dist.), 17 each, Nagarkurnool (Mahabubnagar dist) 15, Tiruvuru (Krishna dist), 13, Jurala Project & Kalwarkurthi (both Mahabubnagar dist) 12 each, Nuzvid (Krishna dist), Srisailam (Kurnool dist) 11 each, Dummagudem (Khammam dist) 10, Holagunda & Pathikonda (both Kurnool dist), 9 each, Atchampet (Guntur dist), Devarakonda (Nalgonda dist) 8 each, Dhone (Kurnool dist), Miryalguda & Nagarjunasagar Dam (both Nalgonda dist), Palasa (Srikakulam dist) 7 each, Khammam, Mahabubnagar, Chintalapudi (West Godavari dist), Ichapuram (Srikakulam dist), Macherla & Piduguralla (both Guntur dist) 6 each.

Forecast & Farmers’ weather bulletin valid until the morning 03 Oct 2009

Moderate to rather heavy rain or thundershowers are likely to occur at most places over Telangana and in the districts of Srikakulam, Vizianagaram, Visakhapatnam, East and West Godavari of Coastal Andhra Pradesh. Moderate to rather heavy rain or thundershowers are likely to occur at many places over Rayalaseema and in the remaining districts of Coastal Andhra Pradesh.

Heavy Rainfall Warning

Heavy to very heavy rain is likely to occur at a few places over Telangana and in the districts of Srikakulam, Vizianagaram, Visakhapatnam, East and West Godavari of Coastal Andhra Pradesh and isolated heavy to very heavy rain is likely to occur over Rayalaseema and in the remaining districts of Coastal Andhra Pradesh during next 48 hours.

Outlook for subsequent two days: Increase in rainfall.

Forecast for Hyderabad City & N’Hood valid until the morning 03 Oct 2009

Cloudy sky. Spells of rain or thunders are likely, at times heavy. Maximum and minimum temperatures are likely to be around 30 & 22 degrees Celsius respectively.
Government of India, India Meteorological Department

Meteorological Centre, Hyderabad

Daily Weather Report for Andhra Pradesh

Friday, the 02 October 2009 / 10 Asvina 1931 (SAKA)

Summary of observations recorded at 830 hours IST

Yesterdays well marked low pressure over West Central Bay and adjoining Coastal Andhra Pradesh and neighbourhood now lies over Telangana and neighbourhood. Southwest monsoon has been vigorous over Rayalaseema and active over Coastal Andhra Pradesh & Telangana.

The following stations recorded very heavy to heavy rainfall in cm: Yemmiganur (Kurnool dist) 26, Holagunda (Kurnool dist) 19, Sompeta (Srikakulam dist) 17, Alur (Kurnool dist) 13, Bobbili (Vizianagaram dist) 12, Makthal (Mahabubnagar dist) 11, Cheepurupalli (Vizianagaram dist), Kanekal (Anantapur dist), 9 each, Anakapalle (Visakhapatnam dist), Kalyandurg (Anantapur dist), Parvathipuram & Tirlam (both Vizianagaram dist), 8 each, Jurala Project (Mahabubnagar dist), Palasa (Srikakulam dist), Pidugurallu (Guntur dist), Rayadurg (Anantapur dist) 7 each. The other chief amounts of rainfall recorded in cm are Kollapur (Mahabubnagar dist), Mancherial (Adilabad dist), Mandasa (Srikakulam dist), Manthani (Karimnagar dist), Parkal (Warangal dist), Pathikonda (Kurnool dist), Venkatapuram (Khammam dist) 6 each, Achampet (Mahabubnagar dist), Gooty & Pamidi (both Anantapur dist), Mantralayam (Kurnool dist) 5 each, Anantapur, Hanamakonda, Mahabubnagar, Nandigama, Rentachintala, Alampur (Mahabubnagar dist), Atmakur (Kurnool dist), Chintapalli & Narsipatnam (both Visakhapatnam dist), Ichapuram (Srikakulam dist), Jangaon, Mulugu & Narsampet (all Warangal dist), Salur (Vizianagaram dist), Sultanabad (Karimnagar dist) 4 each.

Forecast & Farmers’ weather bulletin valid until the morning

Moderate to rather heavy rain or thundershowers are likely to occur at many places over Telangana, Coastal Andhra Pradesh and Rayalaseema.

Heavy Rainfall Warning

Isolated heavy to very heavy rain is likely to occur over Telangana, Coastal Andhra Pradesh and Rayalaseema during next 24 hours.

Outlook for subsequent two days

Decrease in rainfall

Forecast for Hyderabad City & N’Hood valid until the morning

Cloudy sky. Few spells of rain or thundershowers are likely. Maximum and minimum temperatures are likely to be around 31 & 21 degrees Celsius respectively.
FLOOD MANAGEMENT

India Meteorological Department

Meteorelogical Centre, Hyderabad

Daily Weather Report for Andhra Pradesh

Saturday, the 03 October 2009 / 11 Asvina 1931 (Saka)

Summary of observations recorded at 0800 hours IST

Yesterday's well marked low pressure area over Telangana and its neighbourhood persists.

Southwest monsoon has been vigorous over Telangana and active over Coastal Andhra Pradesh. Rain occurred at a few places over Rayalaseema.

The stations recorded heavy rainfall in cm: Makthal (Mahabubnagar dist) 12, Jurala Project (Mahabubnagar dist), Tandur (Rangareddy dist) 10 each, Wanaparthy (Mahabubnagar dist) 8 and Luxettipet (Adilabad dist) 7

The other chief amounts of rainfall recorded in cm are, Elamanchili (Visakhapatnam dist), Kodangal (Mahabubnagar dist), Navipet (Nizamabad dist), Sangareddy (Medak dist), Siricilla (Karimnagar dist), Terlam (Visianagaram dist), Yemmiganur (Kurnool dist) 6 each, Tuni, Alampur (Mahabubnagar dist), Cumbum (Prakasam dist), Huzurabad (Karimnagar dist), Ibrahimpatnam & Pargi (both Rangareddy dist), Parvathipuram & Salur (both Visianagaram dist) 5 each, Mahabubnagar, Asifabad (Adilabad dist), Bobbili (Visianagaram dist), Medchal & Vikarabad (both Rangareddy dist), Narsipatnam (Visakhapatnam dist), Palakonda & Veeraghattam (both Srikakulam dist) 4 each.

On Friday, the maximum temperatures below over the State. The highest maximum temperature of 35 degrees Celsius was recorded at Adilabad. The minimum temperatures were normal over the State. The lowest minimum temperature of 19 degrees Celsius was recorded at Arogyavaram.

Forecast & Farmers' weather bulletin valid until the morning of:

Moderate to rather heavy rain or thundershowers are likely to occur at many places over Coastal Andhra Pradesh & Telangana. Light to moderate rain or thundershowers are likely to occur at a few places over Rayalaseema

Heavy Rainfall Warning

Isolated heavy rain is likely to occur over Telangana during the next 48 hours.

Outlook for subsequent two days

No large change.

Forecast for Hyderabad City & N’hood valid until the morning of:

Generally cloudy Sky. A few spells of rain or thundershowers at times heavy in parts of city. Maximum and minimum temperatures are likely to be around 30 & 21 degrees Celsius respectively.
Annexure – B
CWC, Lower Krishna Division, Hyderabad (from 29th September to 7th October 2009)
### Flood Forecasting Bulletin for Krishna Basin

#### Table: Forecasted Inflows

<table>
<thead>
<tr>
<th>No.</th>
<th>Forecast Station</th>
<th>Maximum Level</th>
<th>Level</th>
<th>Trend</th>
<th>Inflow</th>
<th>Discharge</th>
<th>Current Storage</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Anasini Dam</td>
<td>170.80</td>
<td>170.74</td>
<td>S</td>
<td>27,690</td>
<td>28,000</td>
<td>100.0</td>
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<td>Narayanguda Dam</td>
<td>151.50</td>
<td>149.73</td>
<td>S</td>
<td>937</td>
<td>963</td>
<td>38.6</td>
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<tr>
<td></td>
<td>(Karimnagar)</td>
<td>150.25</td>
<td>48.11</td>
<td>S</td>
<td>323</td>
<td>327</td>
<td>75.1</td>
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<td>3</td>
<td>P.D.Jalna</td>
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<td>104.50</td>
<td>S</td>
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<td>23760</td>
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<td></td>
<td>(S.)</td>
<td>147.76</td>
<td>S</td>
<td></td>
<td>1993</td>
<td>2040</td>
<td>109.3</td>
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<tr>
<td>5</td>
<td>Yeddanna</td>
<td>303.30</td>
<td>303.30</td>
<td>F</td>
<td>2543</td>
<td>2480</td>
<td>111.3</td>
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<tr>
<td></td>
<td>(Karimnagar)</td>
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<td>S</td>
<td>580</td>
<td>574</td>
<td>79.4</td>
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<td>6</td>
<td>Sitaramanna Dam</td>
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<td>65.35</td>
<td>S</td>
<td>3959</td>
<td>4010</td>
<td>78.6</td>
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<tr>
<td></td>
<td>(A.P.)</td>
<td>205.75</td>
<td>206.60</td>
<td>S</td>
<td>1877</td>
<td>1845</td>
<td>28.0</td>
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<tr>
<td>7</td>
<td>M.D.Boo</td>
<td>90.50</td>
<td>88.50</td>
<td>R</td>
<td>66912</td>
<td>2423</td>
<td>49.3</td>
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<tr>
<td>8</td>
<td>Forecast Warning</td>
<td>Range Level</td>
<td>Trend</td>
<td>Current Storage</td>
<td></td>
<td></td>
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<tr>
<td>9</td>
<td>Mallow Anant</td>
<td>17.30</td>
<td>17.30</td>
<td>S</td>
<td>485</td>
<td>485</td>
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<tr>
<td></td>
<td>(A.P.)</td>
<td>15.51</td>
<td>17.28</td>
<td>S</td>
<td>87.1</td>
<td>87.1</td>
<td></td>
</tr>
</tbody>
</table>

#### Level Forecast:

- **1035**

#### Stage Warning:

- **R**

#### Coral Level:

- **S**

#### Note:

- **Data**
- **Time level**
- **Trend**
- **R** = Raw
- **P** = Full
- **S** = Steady
- **M** = Slow

---

**By Fax:**

1. The Chief Engineer, Krishna GODWIN, 1305, Hyderabad.
2. The Executive Engineer, LGG, CWC, Hyderabad.
3. The Executive Engineer, LGD, CWC, Hyderabad.
4. The Executive Engineer, LGD, CWC, Hyderabad.
5. The Executive Engineer, LGG, CWC, Hyderabad.
6. The Executive Engineer, LGD, CWC, Hyderabad.
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10. The Executive Engineer, LGD, CWC, Hyderabad.
11. The Executive Engineer, LGG, CWC, Hyderabad.
12. The Executive Engineer, LGD, CWC, Hyderabad.
13. The Executive Engineer, LGG, CWC, Hyderabad.
14. The Chief Engineer, HYDERABAD, 1305, Hyderabad.
15. The Chief Engineer, CGO, 1305, Hyderabad.
16. The Chief Engineer, CGO, 1305, Hyderabad.
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99. The Chief Engineer, CGO, 1305, Hyderabad.
100. The Chief Engineer, CGO, 1305, Hyderabad.
## Flood Forecasting Bulletin for Krishna Basin

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Forecast Station</th>
<th>Water Level</th>
<th>Trend</th>
<th>Per</th>
<th>Inflow Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Unit in</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feet</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Inflow Forecast

- **Ammuluri Dam**: 1790.00 ft, 176.71 ft
- **Kandulur**: 576.30 ft, 487.00 ft
- **Chintapalle**: 556.00 ft, 465.00 ft
- **Gooty**: 526.30 ft, 404.39 ft
- **Y.S. Dam**: 1030.00 ft, 1102.05 ft
- **Srikakulam Dam**: 479.74 ft, 497.63 ft
- **N.S. Dam**: 595.00 ft, 579.00 ft

### Forecast Warning

- **Level at 0900 Hrs**: 178.63 ft, 176.17 ft

### Water Level at 0800 AM on 02/10/2009

<table>
<thead>
<tr>
<th>Level</th>
<th>Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.30</td>
<td>17.30</td>
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</table>

### Water Level at 0900 Hrs

<table>
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<tr>
<th>Level</th>
<th>Trend</th>
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</thead>
<tbody>
<tr>
<td>13.50</td>
<td>13.50</td>
</tr>
</tbody>
</table>

### Flood Management

- **Central Water Commission, Lower Krishna Division, Hyderabad**
- **Daily Bulletin No. 111**

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**Note:**
- **Water Level at 02:00 AM on 02/10/2009**
- **Trend:** Rising
- **F = Fatal, I = Important**

---

**Contact Information:**
- **For Executive Engineer, Lower Krishna Division, CWC, Hyderabad**
  - Phone: 8943225089
  - Email: executive.engr@cwcb.gov.in

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**System:**
- **KDFPD/FB/F019/91-92**
- **Date:** 02-Oct-09
### Flood Forecasting Bulletin for Krishna Basin

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Forecast Station</th>
<th>Maximum Level</th>
<th>Present Level</th>
<th>Inflow</th>
<th>Current Forecast</th>
<th>Lowest Storage</th>
<th>Live Storage in TMC</th>
<th>Live Storage In MCM</th>
<th>Forecast Valid from to Hrs</th>
<th>Inflow Forecast for next 1/2/3 hrs</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>1</td>
<td>Alwal</td>
<td>172.00</td>
<td>171.20</td>
<td>S</td>
<td>2,202.24</td>
<td>2,611.22</td>
<td>83.0</td>
<td>103.9</td>
<td>07/06/2009 09</td>
<td>07/06/2009 09</td>
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<tr>
<td>2</td>
<td>Jammaleswer</td>
<td>213.85</td>
<td>213.95</td>
<td>S</td>
<td>3,095.96</td>
<td>3,547.96</td>
<td>97.9</td>
<td>114.2</td>
<td>07/06/2009 09</td>
<td>07/06/2009 09</td>
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<td>170.60</td>
<td>S</td>
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<td>2,611.69</td>
<td>83.0</td>
<td>103.9</td>
<td>07/06/2009 09</td>
<td>07/06/2009 09</td>
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<tr>
<td>4</td>
<td>T.B.Dam</td>
<td>155.00</td>
<td>155.15</td>
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<td>860.73</td>
<td>1,079.53</td>
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<td>07/06/2009 09</td>
<td>07/06/2009 09</td>
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<td>5</td>
<td>Sandhuputri</td>
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<td>259.23</td>
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<td>150.0</td>
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<td>07/06/2009 09</td>
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<td>6</td>
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<td>17.35</td>
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<td>07/06/2009 09</td>
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<td>17.15</td>
<td>R</td>
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<td>9991.92</td>
<td>69.5</td>
<td>114.6</td>
<td>07/06/2009 09</td>
<td>07/06/2009 09</td>
<td></td>
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</tbody>
</table>

**NOT APPLICABLE**

---

**Key:****
- R: River
- S: Storage
- F: Far

**Forecast Levels:**
- Below Warning Level - Palar, Vellayani
- Below Warning Level - Palampur, BR
- Normal Level - Perumal

**Water Level at 2:00 AM on 07.06.2009:**
- Chinnur: 0.0
- N.S. Dam: 0.0
- Welasampalai: 0.0
- Madhavi: 0.0
- Pongal Bridge: 0.0

**For Executive Engineer Lower Krishna Division, CWC Hyderabad.**

---

**Note:** Reservoir Information received from project authorities.
<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Forecast Station</th>
<th>Mean</th>
<th>Level</th>
<th>Trend</th>
<th>Inflow Forecast</th>
<th>% of Share</th>
<th>Live Storage in MTC</th>
<th>Storage in MTC</th>
<th>MTC</th>
<th>MTC</th>
<th>MTC</th>
<th>MTC</th>
<th>Trend</th>
<th>Inflow Forecast</th>
<th>Daily Bulletin No =</th>
<th>Rainfall in mm</th>
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<td>1</td>
<td>Akela Old Dam</td>
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<td>84.94</td>
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<td>3018.78</td>
<td>1156.21</td>
<td>113.5</td>
<td>113.5</td>
<td>113.5</td>
<td>113.5</td>
<td>113.5</td>
<td>113.5</td>
<td>113.5</td>
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<td>Neelamguda Dam</td>
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<td>1158.5</td>
<td>113.5</td>
<td>113.5</td>
<td>113.5</td>
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<tr>
<td>3</td>
<td>P.O. Jangili</td>
<td>318.92</td>
<td>101.45</td>
<td>0.01</td>
<td>457.73</td>
<td>38.92%</td>
<td>3047.39</td>
<td>1158.5</td>
<td>113.5</td>
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<tr>
<td>4</td>
<td>T.R. Sagar Dam</td>
<td>714.63</td>
<td>101.45</td>
<td>0.01</td>
<td>457.73</td>
<td>38.92%</td>
<td>3047.39</td>
<td>1158.5</td>
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<tr>
<td>5</td>
<td>Akela Old Dam</td>
<td>256.73</td>
<td>271.49</td>
<td>0.01</td>
<td>457.73</td>
<td>38.92%</td>
<td>3047.39</td>
<td>1158.5</td>
<td>113.5</td>
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<tr>
<td>6</td>
<td>N.S. Dam</td>
<td>179.92</td>
<td>271.49</td>
<td>0.01</td>
<td>457.73</td>
<td>38.92%</td>
<td>3047.39</td>
<td>1158.5</td>
<td>113.5</td>
<td>113.5</td>
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</tbody>
</table>

**Flood Forecasting Bulletin for Krishna River**

**Central Water Commission, Lower Krishna Division, Hyderabad**

**Date: 05-Oct-2005**

**Rainfall in mm:**

- **Gokak:** 0.5
- **Almatti Dam:** 0.5
- **Nagarpur:** 0.5
- **Coochbehil:** 0.5

**Inflows Forecast for next 12/24 hours:**

- **Akela Old Dam:** 1772.03
- **Neelamguda Dam:** 1502.28
- **P.O. Jangili:** 318.92
- **T.R. Sagar Dam:** 714.63
- **Akela Old Dam:** 256.73
- **N.S. Dam:** 179.92

**Level Forecast:**

- **Akela Old Dam:** 1772.03
- **Neelamguda Dam:** 1502.28
- **P.O. Jangili:** 318.92
- **T.R. Sagar Dam:** 714.63
- **Akela Old Dam:** 256.73
- **N.S. Dam:** 179.92

**NOT APPLICABLE**
# Flood Forecasting Bulletin for Krishna Division, Hyderabad

**Central Water Commission, Lower Krishna Division, Hyderabad**

**06-Oct-2008 Daily Bulletin No. 114**

| Sl. No. | Forecast No. | Station | Peak Date | Peak Value | Peak Level | Forecast Value | Forecast Level | Flood Forecast | Flood Level | Peak Forecast | Peak Level | Forecast Valid from to | Irtowe Forecast for next 12/24 hrs | Maintained in mm |
|--------|--------------|---------|-----------|------------|------------|----------------|---------------|---------------|-------------|--------------|-------------|-------------|-------------------|-------------------------------|------------------|
| 1      | 1            | Atlavati | 17.05.09  | 196.00     | 196.00     | 196.00         | 196.00         | YES           | YES         | YES          | YES         | 06-05-2009 to 06-06-2009 | 3 85 2000 70626 F | 70626 |
| 2      | 2            | Narsapura | 11.05.09  | 188.00     | 188.00     | 188.00         | 188.00         | YES           | YES         | YES          | YES         | 06.05.2009 to 06.06.2009 | 13 318 5950 656415 F | 5950 |
| 3      | 3             | Kandikatte | 15.05.09  | 198.00     | 198.00     | 198.00         | 198.00         | YES           | YES         | YES          | YES         | 06.05.2009 to 06.06.2009 | 73 378 7000 766489 F | 7000 |
| 4      | 4            | T.D. Barr | 11.05.09  | 192.00     | 192.00     | 192.00         | 192.00         | YES           | YES         | YES          | YES         | 06.05.2009 to 06.06.2009 | 76 326 8000 826344 M | 8000 |
| 5      | 5             | Srisailam Dam | 15.05.09  | 216.00     | 216.00     | 216.00         | 216.00         | YES           | YES         | YES          | YES         | 06.05.2009 to 06.06.2009 | 87 457 11000 461000 F | 11000 |

**NOT APPLICABLE**

**Counter to:** 1. The Chief Engineer, Krishna Godavari Basin, CWG, Hyderabad.
2. The Chief Engineer, Krishna Cos-ordination Circle, CWG, Hyderabad.
3. Executive Engineer (LDB), CWG, Hyderabad.

**By Fax:** 1. The Secretary, & CAD Dept., Government of Andhra Pradesh, Secretariat, Secretariat Building, (HB-425) 5th Floor, SanathNagar, Hyderabad. (040-2543666)
2. The President, Kadapa District, Government of Andhra Pradesh, Kadapa. (0757) 2543666

**Deputy Engineer:** (CWC), Hyderabad. (040-2222462)

**Reserve Information received from District Authorities.**

**LKD/FF/09/2009** 05-06-2009
Annexure – C
CWC, Lower Tungabhadra Sub-Division
On 1st & 2nd October, 2009

MANTRALAYAM FORECAST

GOVERNMENT OF INDIA
CENTRAL WATER COMMISSION
LOWER TUNGABHADRA SUB DIVISION
JALA BHAVAN
H.No. 56-481/B, SYAMALA NAGAR,
KURNOOL-2.

Date: 1/10/2009

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Volume in M Cub.</th>
<th>Stage in Mtr.</th>
<th>At the time of forecasting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/10</td>
<td>1800</td>
<td>315.100</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

The historical level, i.e. 315.800 m, which was previously reached at midnight of 18/11/1992, may likely to touch total at your end.

Future Trend: The inflow is likely to increase and hence the State may take all precautionary measures.

Communicated to Mantralayam W.L. Station on 1/10/09 at 11:30 a.m.

* At 20% variation in forecast can be expected.

Danger Level: 312.000 M
Warning Level: 310.000 M
H.F.L.: 316.000 M
Zero of Gauge: 356.000 M

To
The Mensal Revenue Officer,
Mantralayam, Kurnool Dist.

Copy to:
1. District Collector, Kurnool.
2. Executive Engineer, I.K.D., CWC, Hyderabad.
3. Superintending Engineer, Irrigation Circle, Kurnool.

*Assistant Engineer*

Colour Papers specification:
1. White Paper showing inflow upto 1 lakh cusecs.
2. Blue colour paper above 1 lakh cusecs Moderate Flood.
3. Yellow colour paper above 2 lakh cusecs High Flood.
4. Red colour paper above 3 lakh cusecs very High Flood.
**MANTRALAYAM FORECAST**

**GOVERNMENT OF INDIA**
**CENTRAL WATER COMMISSION**
**LOWER TUNGABHADRA SUB DIVISION**
**JALA BHARATHI**
**H.No. 50-681/B, SYAMALA NAGAR,**
**KURNOOL-2.**

**Grams :** FORECAST  
**Tel :** 08516-293654

**Forecast No.** Advisory No. 4

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Volume M. Cum</th>
<th>In Meters</th>
<th>in cusecs</th>
<th>Water Level in Mts.</th>
<th>Peak Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/10/09</td>
<td>1600</td>
<td>310.500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This is an advisory water level at Mantralayam. The water level is 310.500 m, and it is likely to cross the upstream gauge above the historical level.

**Future Trend:** The inflow is likely to increase/decrease hourly.

**Communicated to Mantralayam W.I. Station on**

**Danger Level:** 312.000 M  
**Warning Level:** 310.000 M  
**Zero of Gauge:** 306.000 M

**To:** The Mandal Revenue Officer, Mantralayam, Kurnool Dist

**Copy to:** 1. District Collector, Kurnool.  
2. Executive Engineer, L.K.D., CWC, Hyderabad.  
3. Superintending Engineer, Irrigation Circle, Kurnool.  

**Assistant Engineer**

**Colour Paper Specification:**
1. White Paper showing inflow upto 1 lakh cusecs.  
2. Blue colour paper above 1 lakh cusecs Moderate Flood.  
3. Yellow colour paper above 2 lakh cusecs High Flood.  
4. Red colour paper above 3 lakh cusecs very High Flood.
MINUTES OF THE TENTH MEETING (DURING THE WATER YEAR 2009-10) OF “CIOKRIP” HELD AT 4:00 P.M. ON 3-10-2009 IN THE CHAMBERS OF CHAIRMAN- CIOKRIP AND THE ENGINEER-IN-CHIEF (ADMIN), I & CAD DEPARTMENT, MALASOUDHA BUILDINGS, HYDERABAD.

PRESENT:
1) SRI M.K.RAHAMAN, Engineer-In-Chief, Admin I & CAD DEPARTMENT.
2) SRI B.S.N REDDY, Engineer-In-Chief, Irrigation I & CAD DEPARTMENT
3) B.V.S.PRAKASA RAO Engineer-in-Chief, TGP
4) Dr. P. RAMA RAJU Chief Engineer, ISWR
5) SRI Y.L.NARASIMHA RAO Chief Engineer, GRID OPERATIONS, A.P.TRANS CO
6) SRI Ch. VENKATARAJA Chief Engineer (PROJECTS), A.P.GENCO
7) SRI V.NAGESWARA RAO, Deputy Chief Engineer, Nagarjuna Sagar Project

CHAIRMAN
MEMBER
MEMBER
MEMBER
MEMBER
MEMBER

The Committee reviewed the flood position in Srisailam, NagarjunaSagar reservoirs and at Prakasam Barrage as on 3-10-2009 at 3.00 PM as noted below.

1) SRI SAILAML:
   Inflow into Srisailam Reservoir : 14,22,620 c/s (falling)
   Level at 3.00 pm : 895.50 ft.
   Out flow from Srisailam : 14,52,000 c/s

2) NAGARJUNASAGAR PROJECT
   Inflow into NSP : 12,82,483 C/S (rising)
   Level at 3.00 pm : 580.20 ft
   Out flow : 9,49,150 c/s
   Hood cushion available (FRL) : 30.31 tmc

3) PRAKASAM BARRAGE
   Inflow from NSP : 5,68,761 c/s (rising)
   Inflow from intermediate catchment : 50,000 C/S
   Depth of water above crest : 14.80 ft
The Committee observed that the flood at Srisailam Reservoir is in the receding trend. The flood cushion available at Nagarjunasagar Reservoir is 30.31 tmc (upto FRL). The flood banks of Krishna River down below Prakasam Barrage is capable of taking discharge of about 10.50 lakh c/s. Therefore, it is desirable to limit the outflow at Nagarjunasagar to 2.50 lakh c/s keeping in view of the capacity of the flood banks. After observing inflows into Srisailam Reservoir for 5 to 6 hours today, the date of next CIOKRIP meeting will be decided.

Sd/- B.S.N REDDY  
MEMBER &  
Engineer – In – Chief, Irrigation  
I & CAD DEPARTMENT

Sd/- B.V.S.PRAKASA RAO  
MEMBER &  
Engineer-In-Chief, TGP

Sd/- Ch. VENKATARAMAIAH  
MEMBER &  
Chief Engineer (PROJECTS),  
A.P.GENCO.

Sd/- M.K.RAHMAN  
CHAIRMAN &  
Engineer-In-Chief, Admin.,  
I & CAD DEPARTMENT.

Sd/- P. RAGA RAJU  
MEMBER &  
Chief Engineer, ISWR

Sd/- Y.L.NARASIMHA RAO  
MEMBER &  
Chief Engineer,  
GRID OPERATION, A.P.TRANSCO

// True Copy//

Deputy Chief Engineer,  
NS Project camp office,  
Hyderabad
MINUTES OF THE ELEVENTH MEETING (DURING THE WATER YEAR 2009-10) OF "CIOPRI" HELD AT 9:00 P.M. ON 3.10.2009 IN THE CHAMBERS OF CHAIRMAN CIOPRI AND THE ENGINEER-IN-CHIEF (ADMN), I & CAD DEPARTMENT, JALASOUDHA BUILDINGS, HYDERABAD.

PRESENT:

1) SRI M.K.RAHAMAN,  
   Engineer-In-Chief, Admn., 
   I & CAD DEPARTMENT.  
   CHAIRMAN

2) SRI B.S.N REDDY,  
   Engineer - In - Chief, Irrigation  
   I & CAD DEPARTMENT  
   MEMBER

3) B.V.S.PRAKASA RAO  
   Engineer-in-Chief, TGP  
   MEMBER

4) Dr. P. RAMA RAJU  
   Chief Engineer, ISWR  
   MEMBER

5) SRI Y.L. NARASIMHA RAO  
   Chief Engineer,  
   GRID OPERATION, A.P.TRANS CO  
   MEMBER

6) SRI Ch. VENKATARAJAM  
   Chief Engineer (PROJECTS),  
   A.P. GENCO  
   MEMBER

7) SRI V. NAGASWARA RAO,  
   Deputy Chief Engineer,  
   Nagarjuna Sagar Project  
   REPRESENTING MEMBER-CONVENER

The Committee reviewed the flood position in Srisailam, Nagarjunasagar reservoirs and at Prakasam Barrage as on 3-10-2009 at 8.00 PM as noted below.

1) SRISAILAM :
   Inflow into Srisailam Reservoir : 13,22,920 c/s (falling)
   Level at 8.00 pm : 895.50 ft.
   Outflow from Srisailam : 14,52,000 c/s

2) NAGARJUNASAGAR PROJECT
   Inflow into NSP : 13,77,366 C/S (rising)
   Level at 0.00 pm : 392.10 ft
   Outflow into River : 9,29,807 c/s
   Flood cushion available (FRL) : 24.43 tmc

3) PRAKASAM BARRAGE
   Inflow : 6,35,419 c/s (rising)
   Depth of water above crest : 15.90 ft
The Committee reviewed the flood position at Srisailam, Nagarjunasagar and Prakasam Barrage and decided as follows:

1. The outflows at Nagarjunasagar is to be increased to 10.00 lakh cfs immediately.

2. The outflows at Nagarjunasagar is to be increased to 10.50 lakh cfs from 4.10.2009 at 6.00 AM.

Sd/- B.S.N REDDY
MEMBER &
Engineer – In – Chief, Irrigation
I & CAD DEPARTMENT

Sd/- B.V.S.PRAKASA RAO
MEMBER &
Engineer-In-Chief, TGP

Sd/- Ch. VENKATARAJAM
MEMBER &
Chief Engineer (PROJECTS),
A.P.GENCO.

Sd/- M.K.RAHAMAN
CHAIRMAN &
Engineer-In-Chief, Admn.,
I & CAD DEPARTMENT.

Sd/- P. RAMA RAJU
MEMBER &
Chief Engineer, ISWR

Sd/- Y.L.NARASIMHA RAO
MEMBER &
Chief Engineer,
GRID OPERATION, A.P.TRANSCO

// True Copy//

Deputy Chief Engineer,
NS Project camp office,
Hyderabad.
MANAGING HISTORIC FLOOD

IN KRISHNA RIVER BASIN
OCTOBER 2009
ANDHRA PRADESH, INDIA

AN EXPERIENCE OF AVERTING CATASTROPHE

Flood Control Centre
Irrigation & Command area development Department
Chief Engineer Irrigation Office,
1st Floor, Jalasoudha, Erramanzil,
Hyderabad - 500 082. A.P.

APWRDC
ANDHRA PRADESH WATER RESOURCES DEVELOPMENT CORPORATION