

VANSADHARA WATER DISPUTES TRIBUNAL

THE REPORT

OF

THE VANSADHARA WATER DISPUTES TRIBUNAL

WITH THE DECISION

**IN THE MATTERS OF WATER DISPUTE REGARDING
THE INTER-STATE RIVER VANSADHARA AND
THE RIVER VALLEY THEREOF**

BETWEEN

THE STATE OF ODISHA

AND

THE STATE OF ANDHRA PRADESH

VOLUME-III

(APPENDIXES)

(Pages A-1 to A-306)

NEW DELHI

SEPTEMBER 2017

I N D E X

VOLUME – III (APPENDIXES)

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REPORT ON THE VISIT OF
VANSADHARA WATER DISPUTES TRIBUNAL TO

(1) PROPOSED NERADI BARRAGE AND SIDE WEIR AT KATARAGADDA

(A) RIGHT BANK OF THE RIVER

(B) LEFT BANK OF THE RIVER

**(2) INSPECTION OF PHYSICAL MODEL OF PROPOSED NERADI BARRAGE
AND SIDE WEIR AT KATRAGADDA AT CENTRAL WATER AND POWER
RESEARCH STATION, PUNE.**

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RESEARCH STATION, PUNE.**

The Vansadhara Water Disputes Tribunal in its sitting on 14.03.2013 passed the following order (copy enclosed as Annexure –I) :-

“ Heard in part

In order to properly appreciate the arguments of the counsel appearing for the parties, it is agreed that a local inspection should be made of the site in question. In view of the aforesaid, both the Governments of Odisha and Andhra Pradesh are directed to make all the arrangements connected with such local inspection to be made by the Tribunal, along with all concerned officials and the concerned Advocates starting from 20th April, 2013 onwards. The necessary itinerary shall be prepared by the representatives of both the Governments sitting with the Registrar of the Tribunal and the date and itinerary shall be communicated to all concerned, including the learned counsel for the parties.

The State Governments of both the States shall also make arrangements for the visit of the Tribunal to the Central Water and Power Research Station, situated at Pune for visual inspection of the Model Side Weir which is proposed and kept in CWPRS, on 26th April, 2013 onwards.

The matter shall now be listed on 08.05.2013 at 11.00 A.M. for further arguments.”

Accordingly, the itinerary was finalised by the representatives of both the governments in consultation with the Registrar of the Tribunal. It was decided to visit the proposed project sites from 22nd to 26th April, 2013 and to visit CWPRS, Pune from 2nd to 3rd May 2013.

(1) SITE VISIT TO PROPOSED NERADI BARRAGE AND SIDE WEIR AT KATARAGADDA

The Tribunal along with its officials and the representatives of the State Governments of Andhra Pradesh and Odisha visited the proposed sites of Neradi Barrage and Side Weir at Kataragadda (shown in Fig. 1 & Fig. 2) on 23rd and 24th April, 2013. (List of participants at Annexure-II). The site visit started from Srikakulam town of Andhra Pradesh.

On day one, Mr. M.A. Raoof, Chief Engineer, Water Resources Department, Government of Andhra Pradesh made a power point presentation (Copy at ANNEXURE – III) before the Hon'ble Tribunal in which the genesis of the dispute, various issues involved and the apprehensions of the State Government of Odisha were highlighted. The Hon'ble Tribunal was informed that both the States had agreed on 30.9.1962 to share the water yield of 115 TMC of Vamsadhara river at Gotta Barrage on 50:50 basis. Odisha agreed for acquisition of 106 acres of land situated within its territory for facilitating construction of Neradi Barrage. The Chief Minister of Odisha on 03.10.1962 informed his counter -part that Andhra Pradesh may now go ahead with the construction of Neradi Barrage. Unprecedented floods occurred in Vansadhara river in September, 1980. Keeping it in view, it was agreed that the Barrage should be designed for a flood discharge of 6 Lakhs cusecs instead of the earlier agreed flood discharge of 2.3 Lakh cusecs. The Tribunal was informed, that, though the land requirement increased from 106 acres to 1326 acres to accommodate the revised figure of the flood, but Government of Odisha insisted that the land acquisition should be restricted to 106 acres only. The Tribunal was further informed that the detailed project report of Neradi Barrage was accepted by the Technical Advisory Committee of Central Water Commission (C.W.C.) in December, 1991. Odisha raised a number of issues regarding the afflux and the height of the protection wall. Therefore, both the States agreed in 1991, that the mathematical model studies may be conducted before proceeding with the construction of Neradi Barrage. These studies were carried out by CWC and the results showed that the river regime is stable and afflux beyond 6 Km. is within the permissible limits. Later on, at the

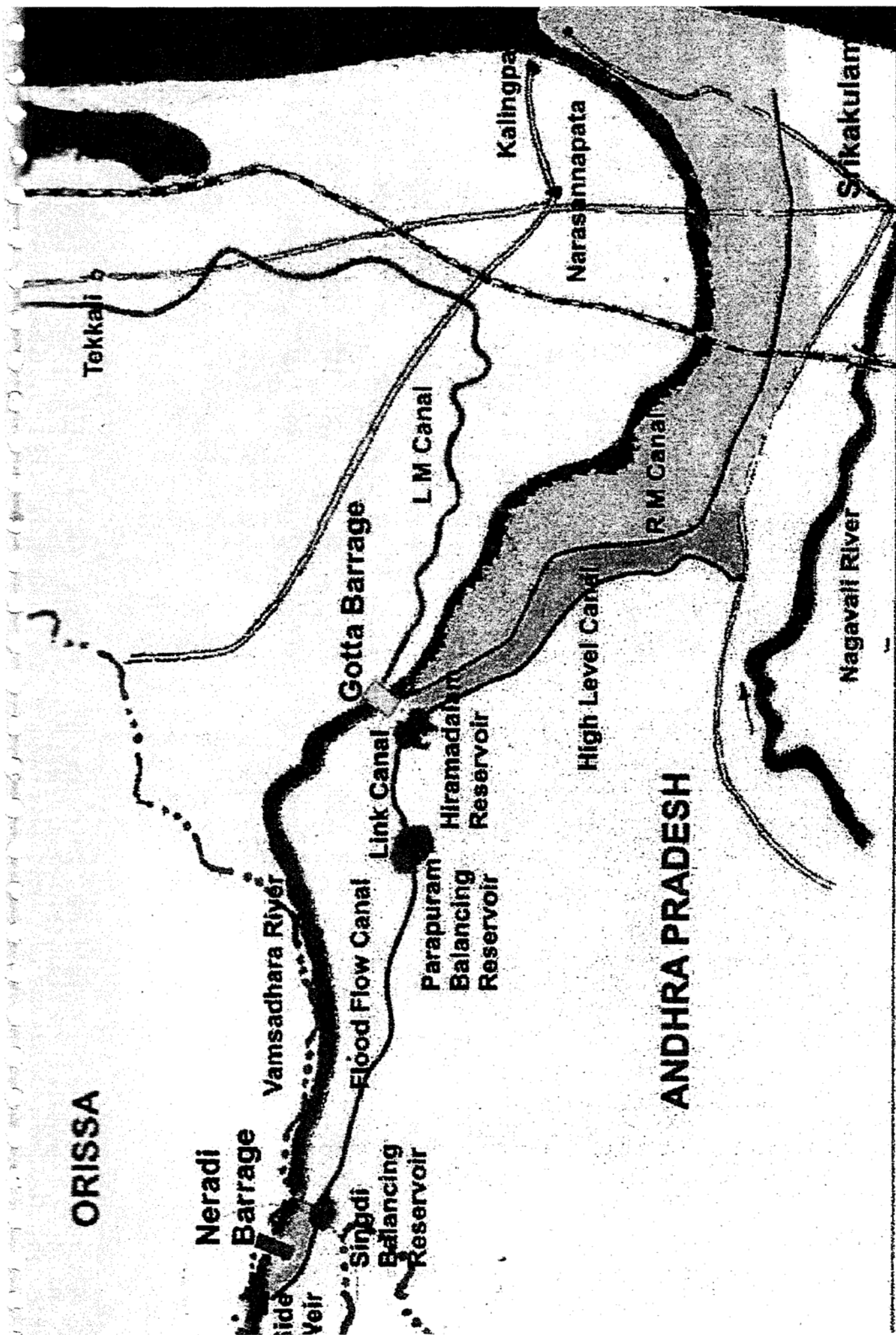
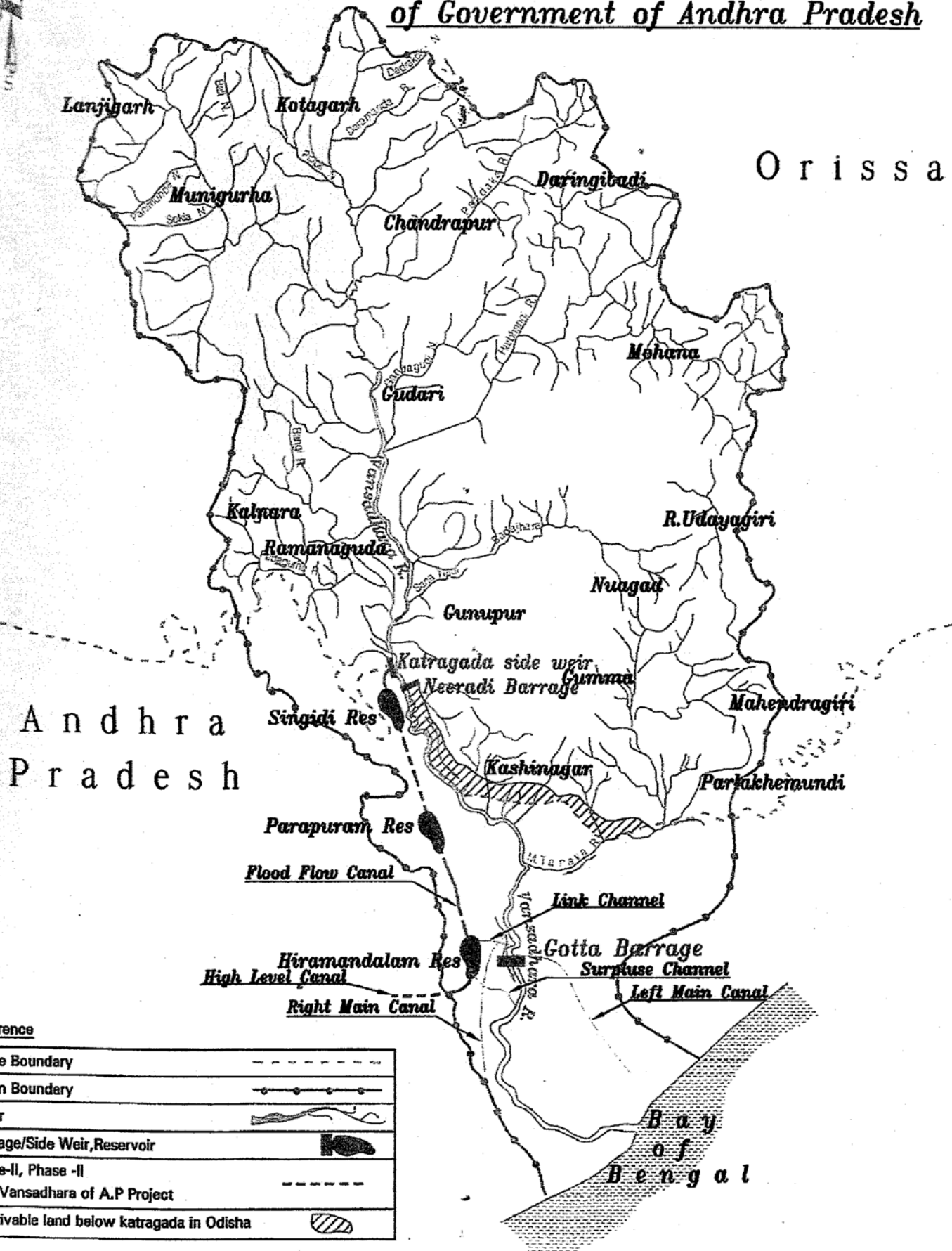


FIG-2

Map of Vansadhara basin indicating
Neradi Barrage/Side Weir Project
of Government of Andhra Pradesh



insistence of Government of Odisha, Andhra Pradesh agreed for conducting the physical model studies by Central Water and Power Research Station (CWPRS). Odisha raised number of objections to the results of both the studies and did not accept these reports. Regarding the Side Weir at Kataragadda, the Chief Engineer, Government of Andhra Pradesh informed the Tribunal that, as Neradi Barrage was getting delayed, Andhra Pradesh proposed to take up construction of a Side Weir at Kataragadda as a temporary measure to utilise at least partially the benefits out of its own share of water. The Tribunal was informed that, Odisha has reservation about such construction of a side weir as it apprehends that the river bed on their side may get dried up, river course may change due to morphological changes and that their downstream requirements of 30,000 acres of irrigation and drinking water needs of 18 villages may get adversely affected. A.P.'s view is that there is no reasonable basis of these apprehensions and sought Tribunal's intervention to use about 8 TMC water through the Side Weir till Neradi Barrage comes into operation, as it is of imminent requirement of State of Andhra Pradesh.

The Tribunal decided that, on day one, it would make a visit to the proposed Neradi Barrage site and the Side Weir at Kataragadda from the right bank of the river lying in Andhra Pradesh, and on day two, these sites would be visited from the opposite bank lying in Odisha territory.

(1.A) VISIT TO THE RIGHT BANK OF THE RIVER

The Tribunal along with the concerned officers first visited the proposed Neradi Barrage site. It was observed that, substantial amount of water was flowing in the river on that day, because of sudden and untimely heavy rainfall in Andhra Pradesh during the preceding 2 to 3 days. On being asked, Andhra Pradesh State Officers stated that, quantum of water would be of the order of 1000 cusecs. As per the two State Governments, river forms the boundary line between the two States in the vicinity of the proposed project sites. However, Andhra Pradesh officials stated that, river on that day was flowing entirely in Odisha territory and the right bank on which the Tribunal Members were standing was not Andhra Pradesh territory but Odisha Territory. Andhra Pradesh officials pointed out to the Tribunal, that there was only a narrow strip of irrigation land on the left bank in Odisha territory and the area was dotted

with hillocks and there was also a railway line passing parallel to the river. Some flood protection works could also be observed along the left bank of river in Odisha territory. Large scale maps of the river basin and various projects components were displayed by A.P. Government at the camp site for the reference of the Hon'ble Tribunal.

During the on-site discussions, representatives from Odisha stated that Neradi Barrage should only be constructed, if it fulfilled the conditions of acquiring of 106 acres of land and restricting the back water flow to 3 Km. upstream of the barrage, even if it involved a change in the design as well as the location of the barrage. A.P. representatives insisted that the barrage be constructed only at that very site since Odisha had agreed to it in 1962 itself. Moreover, the State Government of Andhra Pradesh has already spent substantial amount of money for constructing balancing Reservoirs at Singidi and Parapuram and a mega Reservoir at Hiramandalam to provide irrigation water to about 1.07 Lakh acres of land. The Tribunal advised the Odisha officials to submit their various options to Andhra Pradesh Government which could be responded to by them for reaching an amicable solution, if possible, to these contentious issues.

The Hon'ble Tribunal then visited the proposed site of Side Weir at Kataragadda. Odisha officials argued before the Tribunal that the construction of the Side Weir would change the course of the river. They pointed out that the location of the side weir is on the curve of the river bank and also that there is a natural high ground in the middle of the river bed which will bifurcate the river flow. They contended that after the construction of the side weir these physical characteristics will cause morphological changes in the river which will adversely affect the interests of Odisha. Andhra Pradesh officials maintained that the Side Weir was a temporary arrangement to draw only 8 TMC of water to meet the partial needs of their State. They told the Tribunal, that the Side Weir would be submerged, once the barrage at Neradi was completed. Odisha officials were of the view that the sill level of the Side Weir could be raised further and the length of the Side Weir which is 300 m could be reduced to about 165 m, as it would be sufficient to serve the intended purpose. Andhra Pradesh officials stated, that, it was possible to get the sufficient discharge over the Side Weir only during 55 days in a year with

the dimensions already fixed and the physical Model studies at CWPRS Pune have concluded that this amount would be around 8 TMC. The Hon'ble Tribunal suggested that State of Odisha should submit alternative proposals to State of Andhra Pradesh to ensure that total annual spill through the proposed side weir does not exceed 8TMC and thereafter State of Andhra Pradesh could submit counter proposals, and if so done, a common meeting ground could possibly be arrived at.

The Tribunal then visited the Hiramandalam Reservoir site. The water from Neradi Barrage would be brought to this reservoir through a high level canal passing through Singidi and Parapuram balancing reservoirs. It was observed that 70% of the work of Hiramandalam Reservoir has been completed. The Hon'ble Tribunal was then also taken to Gotta Barrage which was completed in the year 1978. Odisha representatives pointed out to the silt accumulated upstream of this Barrage and stated that similar situation would arise upstream of Neradi Barrage also when constructed. The Andhra Pradesh officials countered it by saying that this is a natural phenomena and can be taken care of through flushing and other desilting measures.

(1.B) VISIT TO THE LEFT BANK OF THE RIVER

On 24.04.2013, the Tribunal alongwith the concerned officers first visited the Circuit House at Paralakhemundi in the Odisha territory. Shri S.C. Mahapatra, Principal Secretary, WRD, Government of Odisha welcomed the Hon'ble Tribunal. A brief note (enclosed as ANNEXURE-IV) on the Inter-state dispute between Odisha and Andhra Pradesh on proposed Neradi Barrage and Kataragadda Side Weir sites was submitted to the Members of the Tribunal. This note, inter alia, outlines the status of this dispute since 1961. The reservations of the Govt. of Odisha regarding the mathematical Model Studies conducted by CWC for Neradi Barrage and the results of physical Model studies conducted by CWPRS, Pune on Neradi Barrage and Side Weir at Kataragadda have also been given in detail. The Tribunal along with the concerned representatives of both the State Governments then started for carrying out the site inspection of the proposed sites in Odisha territory.

On its way to proposed Neradi Barrage site, the Tribunal made a stopover at the Gauge and Discharge (G&D) site of CWC at Kashinagar. The CWC officers explained about the nature of the data being collected by them at that site. From the data provided by the CWC officers, it was observed that the water discharges in the river on 19th, 20th, 22nd and 23rd April, 2013 were 90.52, 271.52, 940.97 and 663.92 cusecs respectively. The drawing of the river cross-section was also shown to the Tribunal. The Hon'ble Tribunal desired that the G & D data being maintained by CWC at this site since its inception as well as the river cross-sections taken over the years should be obtained from the Central Water Commission for the reference of the Tribunal by writing necessary letters to the concerned CWC Officers.

The Tribunal then visited Sara Village which is near the left abutment of proposed Neradi Barrage.

After this, the Tribunal visited the river bank near Badigam village which is opposite to the Kataragadda Side Weir on the other bank. The inspection of this site was obstructed and could not be carried out due to the protests of the residents of the area.

The Tribunal, thereafter, returned back to Srikakulam after a brief halt at Paralakhemundi circuit house.

INSPECTION OF PHYSICAL MODEL OF PROPOSED NERADI BARRAGE AND KATRAGADDA WEIR AT CENTRAL WATER AND POWER RESEARCH STATION, (CWPRS), PUNE.

The Tribunal along with its officials visited the Central Water and Power Research Station, Pune on 3rd May, 2013 to inspect the physical Model of Neradi Barrage and Side Weir at Kataragadda (Fig. 3). The Counsel and Technical Officers representing the Governments of Andhra Pradesh and Odisha were also present during this inspection. The list of the participants is annexed as ANNEXURE-V.

The Chairman and the Members of the Hon'ble Tribunal were welcomed by Dr. I.D. Gupta, Director and other Senior Officers of CWPRS, Pune. Dr. Gupta also made a power point presentation regarding the activities of CWPRS. The Hon'ble Tribunal was informed that this Institute was established in 1916 and its sphere of activities has evolved continuously from time to time. It was renamed as "CWPRS" in 1951. Dr. Gupta stated that CWPRS is a Premier Research Institute in Hydraulics and Allied areas. It has multi-disciplinary expertise to provide research and design solutions to optimise the design of water resources, power and coastal projects. This Institute receives references from Central/State Governments, Municipal Corporations, Ports and Public/Private Sector undertakings etc. Major functions of CWPRS include project specific studies supported by basic research leading to safe and optimum design of projects/project components. Dr. Gupta also informed the Tribunal that this Institute has ample infrastructure facilities for physical model studies pertaining to River Engineering, Reservoir and Appurtenant structures, River and Reservoir systems modelling, coastal and offshore engineering and foundation structures. Number of slides pertaining to the physical model studies of various water resources projects located all over India were shown through the power point presentation. Dr. Gupta also pointed out that mathematical model studies of siltation in reservoirs, water surface profile of various rivers and earthquake response of various dams have also been carried out in CWPRS. Besides these major functions, CWPRS has also carried out

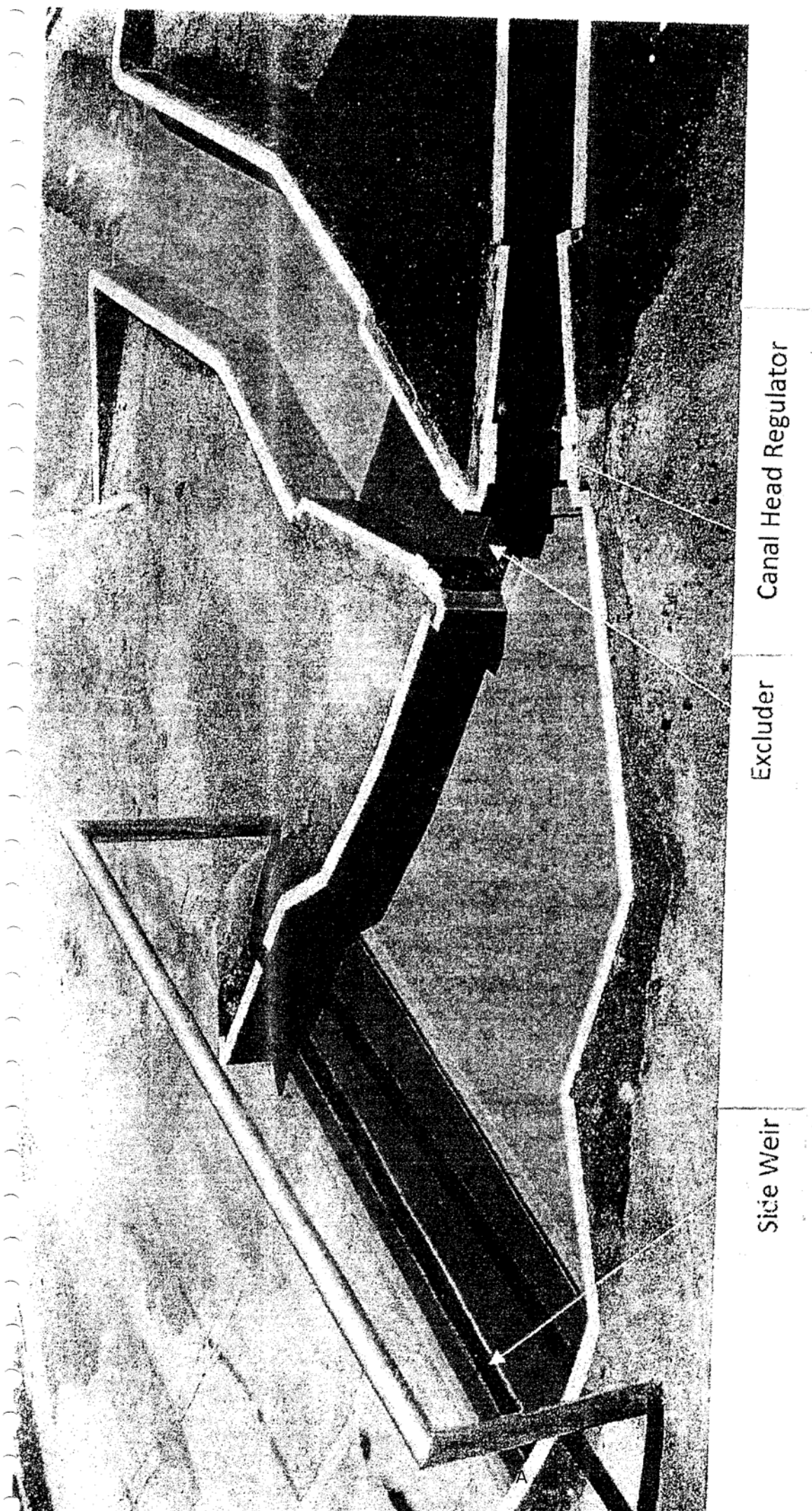


Fig 3 Layout of Katragada side weir in the model

laboratory studies and field studies for dam instrumentation, gauging and seismological investigations.

Dr. Gupta also made a power point presentation (copy at Annexure VI) regarding the model studies for Side Weir at Kataragadda.

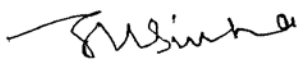
During the power point presentation made by the Director, CWPRS, it was observed that the physical Model studies of Neradi Barrage and Side Weir were carried out in the year 2005 and 2007 respectively. The Tribunal felt that fresh data should be provided to CWPRS for it to decide, if any changes are required in the Model studies done so far and it directed accordingly. The Tribunal further directed that fresh river cross sections on the agreed locations be carried out jointly by the two party states under the overall guidance of Central Water Commission from 15th to 22nd May 2013. The up-to-date G&D data available with Central Water Commission should also be supplied to CWPRS, Pune for making comparison of the data and coming to a conclusion whether any changes are required to be made in the Model studies. The tribunal passed an order (Copy enclosed as ANNEXURE-VII) regarding this aspect under Section 9(2) of the Inter State River Water Disputes Act.

The Tribunal, thereafter, visited the physical model of Neradi Barrage and Side Weir at Kataragadda. The model has been made on the scale of 1:200 horizontal and 1:40 vertical. The model covers the river reach 15 Kms. Upstream to 10 Kms downstream of Neradi Barrage. At the time of the inspection of the Tribunal, the quantum of flow in the river was about 100 cumecs. It was observed that with this discharge no flow was passing over Kataragadda side weir. The flow in the river was then gradually increased and it was observed that the flow of water over Kataragadda weir starts only when the flow in the river exceeds 150 cumecs.

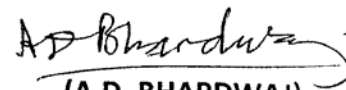
The Director, CWPRS explained to the Tribunal that for low as well as high flow stages in Vansadhara river, flow conditions with and without Side Weir were almost similar. In a reply to a point raised by Odisha representatives, it was explained that in physical model study for Katragadda Side Weir carried out by CWPRS, Pune cross sections of river at different locations have been considered and thus the natural high ground in the middle of the river bed has also been incorporated in the study. Pointing to the eddy

formations near the Side Weir near the abutment walls of the Side Weir, a proper flair of the abutment has been recommended for streamlined/smooth entry to the flow towards Side Weir. It was observed by the Tribunal that only a part of the river water was going over the sill of the Side Weir and major portion of water was flowing in the river.

On the conclusion of this inspection, the Hon'ble Tribunal thanked the Director and the other officers of CWPRS, Pune.



(S.K. SINHA)
ASSESSOR



(A.D. BHARDWAJ)
ASSESSOR



(GHULAM MOHAMMED) J
MEMBER



(B.N. CHATURVEDI) J
MEMBER



(Dr. MUKUNDAKAM SHARMA) J
CHAIRMAN

Dated 16.7.2013

**BEFORE THE VANSADHARA WATER DISPUTES TRIBUNAL
NEW DELHI**

IN THE MATTER OF :

Water disputes between the State of Odisha and Andhra Pradesh
regarding the Inter-State river Vansadhara and the river valley
thereof.

I.A.No. 1/ 2010 State of Odisha vs State of Andhra Pradesh
I.A.N o.2/ 2010 State of Andhra Pradesh vs State of Odisha

14.03.2013: This matter was called on for hearing before the Tribunal today.

CORAM: HON'BLE DR. JUSTICE MUKUNDAKAM SHARMA, CHAIRMAN
 HON'BLE MR.JUSTICE B.N. CHATURVEDI, MEMBER
 HON'BLE MR.JUSTICE GHULAM MOHAMMED, MEMBER

FOR GOVERNMENT OF ODISHA

1. Shri Mohan V. Katarki, Advocate
3. Shri R.S. Jena, Advocate-on-Record

FOR GOVERNMENT OF ANDHRA PRADESH

1. Shri C.S. Vaidyanathan, Senior Advocate
2. Shri S.S.Prasad, Senior Advocate,
3. Shri Badana Bhaskar Rao, Additional Advocate General
4. Shri A. Satya Prasad, Senior Advocate
5. Shri Y. Rajagopala Rao, Advocate-on-Record
6. Shri M.Vishnu Vardhan Reddy, Advocate

ORDER

I.A.No.1/2010

Heard in part.

In order to properly appreciate the arguments of the counsel appearing for the parties, it is agreed that a local inspection should be made of the site in question. In view of the aforesaid, both the Governments of Odisha and Andhra Pradesh are directed to make all the arrangements connected with such local inspection to be made by the Tribunal, along with all concerned officials and the concerned Advocates starting from 20th April, 2013 onwards. The necessary itinerary shall be prepared by the representatives of both the Governments, sitting with the Registrar of the Tribunal and the date and itinerary shall be communicated to all concerned, including the learned counsel for the parties.

The State Governments of both the States shall also make arrangements for the visit of the Tribunal to the Central Water and Power Research Station, situated at Pune for visual inspection of the Model Side Weir which is proposed and kept in CWPRS, on 26th April, 2013 onwards.

The matter shall now be listed on 8.5.2013 at 11.00 A.M for further arguments.

.....sd/-..... J
(DR.MUKUNDAKAM SHARMA)
CHAIRMAN

.....sd/-..... J
(B.N. CHATURVEDI)
MEMBER

.....sd/-..... J
(GHULAM MOHAMMED)
MEMBER

**LIST OF TEAM OF VWDT, OFFICIALS OF ANDHRA PRADESH & ODISHA AND
ADVOCATES PRESENT DURING THE SITE VISIT.**

I. V.W.D.T. TEAM

1. Justice Dr. Mukandakam Sharma, Hon'ble Chairman.
2. Justice B.N. Chaturvedi, Hon'ble Member.
3. Justice Ghulam Mohammed, Hon'ble Member.
4. Sri A.D. Bhardwaj, Assessor.
5. Sri S.K. Sinha, Assessor.
6. Sri B.V. Sharma, Registrar, VWDT.

II. ANDHRA PRADESH

A. TECHNICAL TEAM

1. Sri C. Muralidhar, Engineer-in-Chief, Irrigation, Hyderabad,
2. Sri M.A. Raoof, Chief Engineer, Inter State & Water Resources,
3. Sri K. Jalandhar, Chief Engineer, North Coast,
4. Sri B. Nagendra Rao, Superintending Engineer, IS & WR, Hyderabad,
5. Sri B. Rambabu, Superintending Engineer, B.R.R. Vamsadhara Project Circle, Srikakulam.
6. Sri L.V. Ramana Murthy, Dy. Director, IS & WR, Hyderabad,
7. Sri N. Rambabu, Executive Engineer, B.R.R. Vamsadhara Project Investigation Division, Amadalavalasa.
8. Sri P. Sudhakara Rao, Executive Engineer, B.R.R. Vamsadhara Project Construction Division, Amadalavalasa.
9. Sri B. Ravindra, Executive Engineer, B.R.R. Vamsadhara Project Division No.1, Amadalavalasa.
10. Sri H.S. Suresh, Deputy Executive Engineer, IS & WR, Hyderabad.
11. Sri P. Murali Krishna Deputy Executive Engineer, O/o Chief Engineer, North Coast.

- 12.Sri DNSS Kumar, Deputy Executive Engineer, B.R.R. Vamsadhara Project Investigation Division, Amadalavalasa.
- 13.Sri P. Nageswara Rao, Deputy Executive Engineer, B.R.R. Vamsadhara Project, Investigation Division, Amadalavalasa.
- 14.Sri R. Ramachandra Rao, Deputy Executive Engineer, B.R.R. Vamsadhara Project Construction Division, Hiramandalam.
- 15.Sri Srinivasa Rao, Deputy Executive Engineer, B.R.R. Vamsadhara Project Construction Division, Hiramandalam.
- 16.Sri A. Ramakrishna, Deputy Executive Engineer, B.R.R. Vamsadhara Project Division No.1, Amadalavalasa.
- 17.Sri P. Vasudeva Rao, Deputy Executive Engineer, B.R.R. Vamsadhara Project Division No.1, Amadalavalasa
- 18.Sri B. Seetha Ram, Asst. Executive Engineer, B.R.R. Vamsadhara Project, Circla Office, Srikakulam.

B. LEGAL TEAM

1. Sri C.S. Vaidyanathan, Senior Advocate.
2. Sri BadanaBhaskara Rao, Addl. Advocate General.
3. Sri A. Satya Prasad, Sr. Advocate.
4. Sri M. Subrahmanyam, Advocate.
5. Sri M. Vishnu Vardhan Reddy, Advocate.
6. Sri Y. Rajagopal Rao, Advocate-on-Record.

III. ODISHA

TECHNICAL TEAM.

1. Sri S.C. Mahapatra, Principal Secretary, WRD
2. Sri B. Panda, Engineer-in-Chief, Water Resources.
3. Sri M.K. Misra, Chief Engineer, PP& F.
4. Sri R.K. Swain, Chief Engineer, RVN Basin.
5. Er. R.C. Tripaty, Ex. EIC (WR), Odisha.
6. Dr.Yoganarasimhan, Expert VWDT.

7. Er. C.V. Prasad Consultant Advisor to DOWR.
8. Er. M.R. Shukla, S.E, VWD Cell, New Delhi.
9. Er. Arun Kr. Padhi, S.E. Southern Investigation Circle.
10. Dr. A.S. Rao, Deputy Director, PP & F.
11. Er. Harihar Mohanthy, J.E.
12. Er. Venkatesh, J.E.

ADVOCATES

1. Sri. Raju Ramachandran, Sr. Advocate.
2. Sri. Mohan V. Katarki, Advocate.

WELCOME

OF

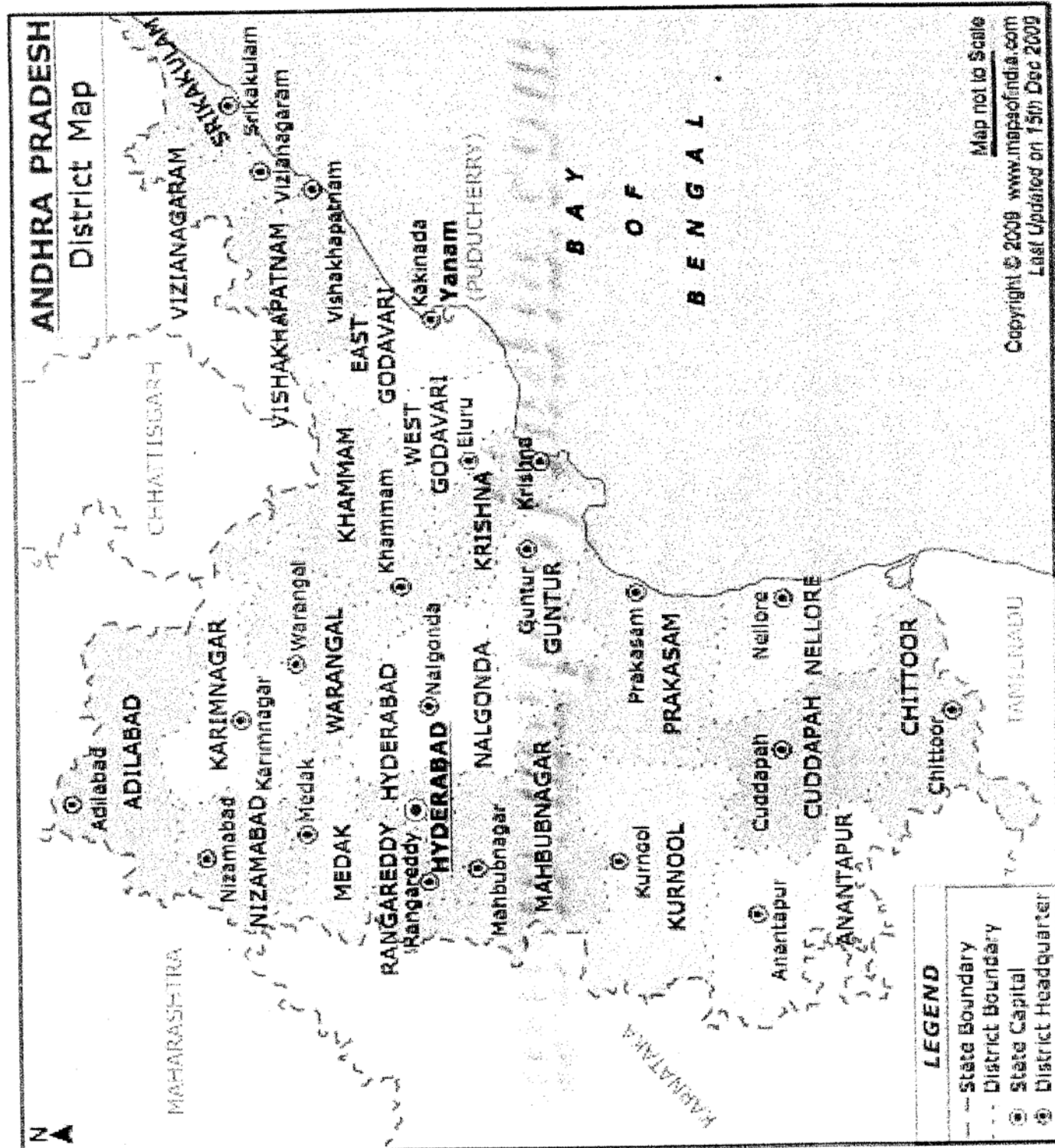
HON'BLE CHAIRMAN

AND

MEMBERS

LO

VAMSADHARA WATER DISPUTES TRIBUNAL

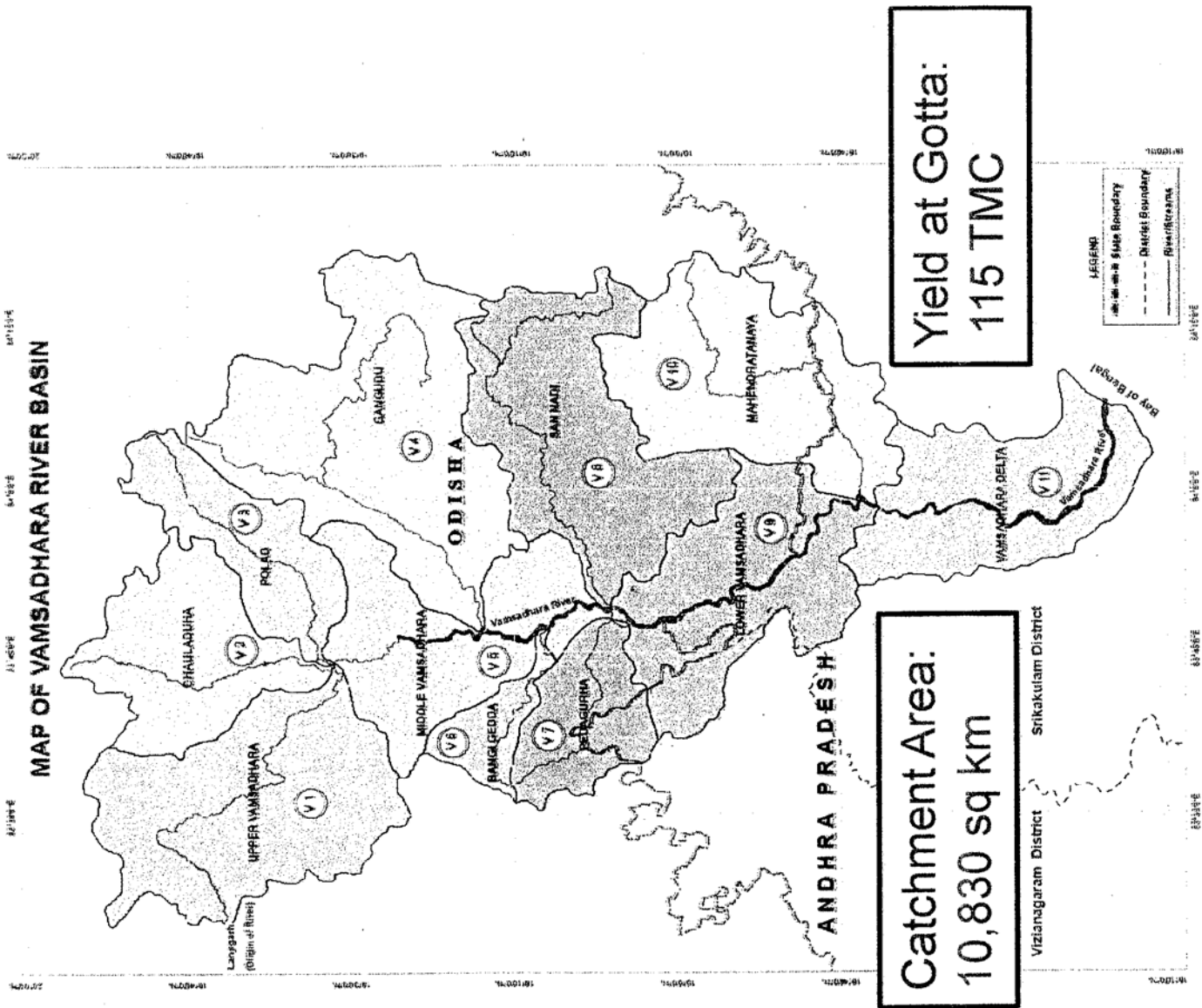


SRIKAKULAM DISTRICT

S No	Description	Area in Acres
1	Geographical area	14,42,300
2	Culturable Area	8,99,000
3	Irrigated Area	2,55,000
4	Forest Area	1,70,000
5	Population	25,37,600 (No's)
• Most of the population depend on Agriculture. • AP being the lower riparian State, required irrigation potential could not be created, eventhough abundant water in Vamsadhara is available, • Thus Srikakulam remained as one of the most backward districts.		

VAMSADHARA RIVER BASIN

- Vamsadhara River originates in the Eastern Ghats near Lanjigarh of Kalahandi District in Orissa.
- Length of the river in Orissa is 154 km.
- It flows as a common boundary of Orissa and A.P. for a length of 29 km. (Km 154 to km 183)
- Remaining length of the river in A.P. is 82 km.



Yield at Gotta:
115 TMC

Catchment Area:
10,830 sq km

S.NO	NAME	CAPACITY (MCM)	F.A.L. (m)
1	GOTTA	0.612	115.00
2	NETADI	0.612	215.00
3	SINGIDI	0.068	212.00
4	PANAPURAM	9.606	224.00
5	MURAMANTALAM	14.69	220.00

STORAGES

VAMSADHARA RIVER

ODISHA

ANDHRA PRADESH

BAY OF BENGAL

--- Inner State Border ---

NOT TO SCALE

INTER-STATE AGREEMENTS

- On 30th September, 1962 both the States agreed that yield of Vamsadhara River at Gotta as 115 TMC and would be shared on 50:50 basis.
- The Chief Minister of Orissa on 3rd October, 1962 addressed to AP that it may now go ahead with construction of Neradi barrage.
- Odisha agreed for acquisition of 106 acres of land for the Neradi Barrage, when the design discharge was 2.30 lakh cusecs.

INTER-STATE AGREEMENTS cont...

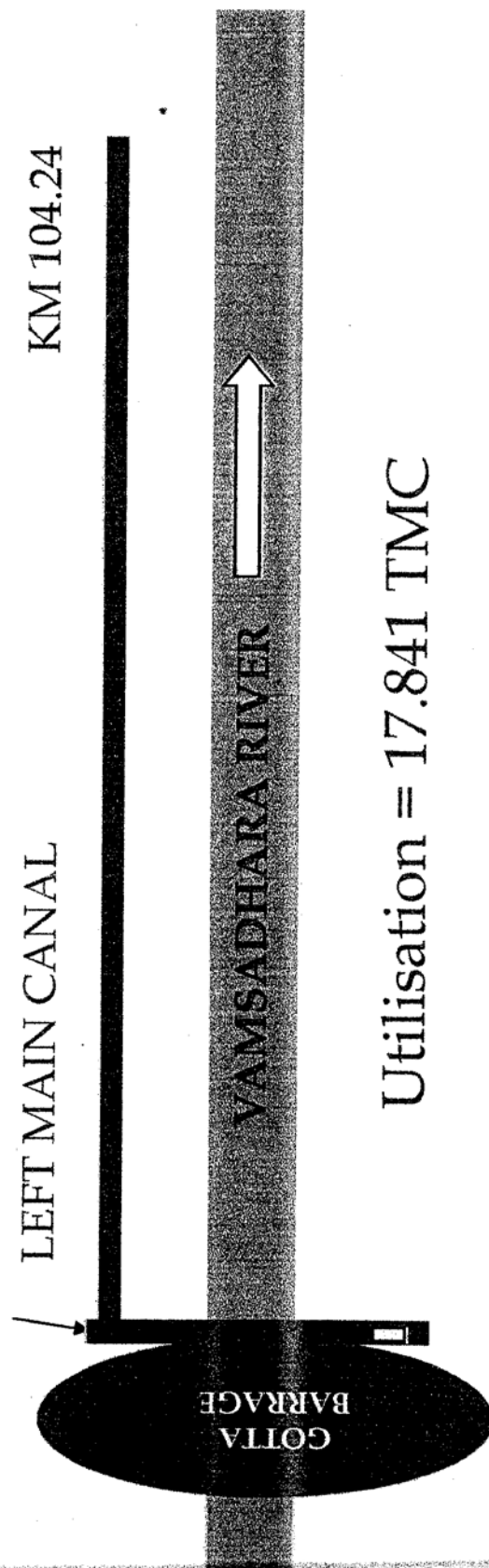
- Andhra Pradesh and Orissa concluded that design proposed for Flood Banks and Drainage sluices of Neradi Barrage were generally acceptable.
- AP agreed to provide a sluice, as desired by Orissa, on Left Bank of Neradi Barrage to meet their requirements.

VAMSADHARA PROJECT of 1969

In 1969, Andhra Pradesh proposed the Vamsadhara Project, to be done in two stages.

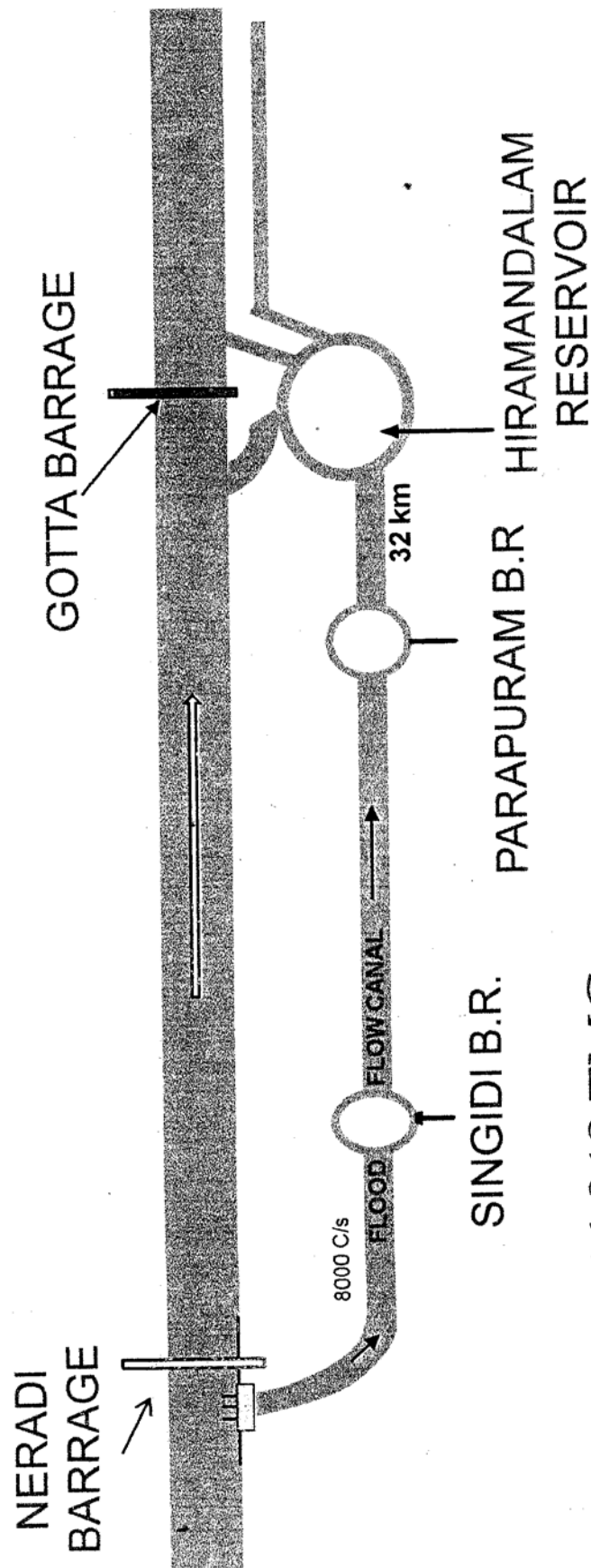
Stage-I:

Barrage at Gotta with an FRL of +125 feet having a capacity of 0.612 TMC to irrigate 1,48,230 acres on left side.



Stage-II:

- Barrage at Neradi with a pond level of +235 feet having a capacity of 0.61 TMC to irrigate 1,07,280 acres apart from stabilising ayacut under Gotta LMC.



Utilisation = 16.048 TMC

(Including Drinking needs of about 1 TMC)

SEPTEMBER, 1980 FLOODS

- Un-precedented floods occurred in Vamsadhara river in Sept, 1980.
- AP assessed the MFD as 4.31 lakh cusecs and C.W.C. concurred with this assessment but Orissa differed.
- However, in the inter-State meeting, it was decided that the barrage be designed for a discharge of 6 lakh cusecs.
- This revision of Max Flood Discharge necessarily required an acquisition of 1326 acres of land in Odisha.
- Odisha on one hand demanded for revision of design discharge from 2.30 lakh cusecs to 6 lakh cusecs and on the other hand insisting on land acquisition of 106 acres as against the actual requirement of 1326 acres of land for high flood.

Protection Wall proposed to limit Land Acquisition

- A P proposed a flood protection wall of 3.8 km long to limit land acquisition to 106 acres on the left side of Vamsadhara River.
- Odisha accepted the plan of flood protection wall, catch drain, outfall structure.
- Neradi Barrage (Vamsadhara Project Stage-II) was accepted by the TAC of CWC on 04-12-1991.

Issues raised by odisha on Neradi Barrage

- Odisha raised an issue about the height of the Protection Wall and it has to be decided subject to Model studies.
- Both States agreed in 1991, that Mathematical Model Studies (MMS) are enough and Physical Model Studies (PMS) are not required as the banks are formed with stiff sandy clay and river has a stable regime.
- MMS Report by Central Water Commission show that:
 - River regime is stable
 - Afflux beyond 6 km is within permissible limits.
- However, AP agreed for conducting of PMS by CWPRS as requested by Odisha.
 - The PMS results fairly supported the results of MMS.
- But Odisha did not accept reports of both the studies.

Need to take up Side Weir at Katragada

- As Neradi Barrage was delayed, A.P. proposed to take up Side Weir at Katragadda.
 - It is a temporary measure.
 - It is within AP's territory.
 - to utilise water within its share,
 - to derive at least partial benefits.

Issues raised by Odisha on Side Weir

- Odisha apprehends that the river bed on left side may get dried up.
- Their downstream requirements of 30,000 acres of irrigation and drinking water needs of 18 villages may get affected.
- Shifting of river course due to morphological changes.

Functions of Side Weir

1. Side Weir is proposed within the territory of AP to draw 8 TMC of water.
2. There is no submergence in Odisha due to Side Weir.
3. It can draw water when the flows in the river are more than 4000 cusecs.
4. The CWPRS studies substantiated that water into the Side Weir starts spilling when the flow in the river is more than 5300 cusecs.
5. These flows are sufficient to meet the regular downstream requirements of Odisha and Andhra Pradesh.

Seeking Redressal

- The present utilisations by AP and Odisha are 25 TMC and 8 TMC respectively and about 82 TMC is going unutilised into sea.
- Side Weir is the need of the hour for AP, till Neradi Barrage comes into operation.
- AP already spent an amount of Rs.630 crores on Vamsadhara Project Stage-II.
- Construction of Neradi Barrage is imminent requirement of State of AP to utilise its legitimate share of water and to serve this backward region.

THANK YOU ALL



**GOVERNMENT OF ODISHA
DEPARTMENT OF WATER RESOURCES**

**A BRIEF NOTE
ON
INTER-STATE DISPUTE BETWEEN
ODISHA AND ANDHRA PRADESH ON PROPOSED
NERADI BARRAGE AND KATRAGADA
SIDE-WEIR PROJECTS OF ANDHRA PRADESH
ON RIVER VANSADHARA**

**A BRIEF NOTE
ON
INTER-STATE DISPUTE BETWEEN ODISHA AND ANDHRA PRADESH ON
PROPOSED NERADI BARRAGE AND KATRAGADA SIDE-WEIR PROJECTS
OF ANDHRA PRADESH ON RIVER VANSADHARA**

INTRODUCTION

The river Vansadhara originates in South West part of Lanjigarh in the district of Kalahandi, Odisha. The river, after traversing 154 Km in the State of Odisha, forms a common border between the States of Odisha and the State of Andhra Pradesh for a length of 29 Km. After the end of common border, the river further flows in Andhra Pradesh for 86 Km before entering the Bay of Bengal. About 80% of the drainage area lies in the State of Odisha.

A Map of Vansadhara basin indicating the Neradi barrage and Side Weir projects of Andhra Pradesh is enclosed.

INTER STATE ALLOCATIONS

In the Inter-State meeting held on 30th September 1962, it was agreed that *"From the data available it has been estimated that the yield of Vamsadhara river at Gotta Reservoir is 115.00 T.M.C"*. Further it was decided in the said meeting that *"the yield of Vamsadhara Basin is just sufficient to meet the requirements of both the States. The water of Vamsadhara basin may consequently be utilised by both Andhra Pradesh and Orissa States on a fifty: fifty bases"*.

NERADI BARRAGE

In the Inter-state conference between the Chief Ministers of Andhra Pradesh and Orissa at Hyderabad on 17th and 18th July, 1961 it was inter alia decided that *"The Andhra Pradesh representatives stated that they wanted to execute the irrigation project at Neradi, which entails the acquisition of 106 acres of land in Orissa territory and they wanted Orissa Government's concurrence to go ahead with the Project. On behalf of Orissa it was stated that while Orissa Government had no objection, they wanted to safe-guard against the waterlogging of their area and therefore had asked for certain details. As soon as these details are received, Orissa Government would communicate their concurrence to the Project."* The understanding on submergence was reiterated in the interstate meetings held on 27.7.1980, 22.6.1981, 15.1.1987 and 22.11.1991.

On the backwater effect of the Neradi barrage, in the inter-state meeting held on 10.6.1992 inter alia it was agreed that *"Andhra Pradesh Engineers, however, assured that the backwater effect will be limited to 3 Kms. Sharing of water would be on 50:50 basis. It was agreed in principle that Orissa Government would have no objection to the Government of Andhra Pradesh going ahead with construction of the barrage, but the height of the barrage would be subject to mathematical model studies and hydrological data."*

In the interstate meeting held on 30th December 1994 between Hon'ble Chief Minister, Orissa and Hon'ble Chief Minister, Andhra Pradesh, inter alia it was agreed that".

(2) No area in Orissa will be submerged as a result of construction of the proposed Neradi barrage, except 106 acres of land to be acquired in Orissa State for various purposes as indicated in the Project Report.

(3) To ensure that the backwater stretch is limited only to 3 kms on the upstream, the river has to be widened by removing constriction between the chainage 10.37 to 13.65 kms to the section as suggested in the supplementary mathematical model run by the CWC. The Government of Orissa, in consultation with C.W.C will however conduct sensitivity studies within a period of 3(three) months incorporating varying 'n' values which has not been carried out so far by the CWC. This study will indicate the water surface profile upstream and downstream of the barrage and the extent of likely backwater stretch in Orissa. Based on the sensitivity study the height and length of the wall may need revision, the design of which will need to be agreed by the Orissa Government."

In the inter-state meeting held on 22.1.2008, it was noted that:

"In view of the limitations of the Katragada side weir, the Chairman desired to know the problems associated with Neradi barrage, which was conceived to serve both the States, After brief discussions, following three constraints were noted; Submergence in Orissa has to be limited to agreed extent.

- The back-water effect should be limited to 3 km upstream of the barrage.
 - *There is a general feeling that the siltation upstream of the barrage would aggravate floods in Orissa, which has to be addressed*
- The Chairman was of the view that in case the option for Neradi barrage is considered, the above aspects have to be duly addressed.” (Emphasis supplied)*

RESULTS OF MATHEMATICAL MODEL STUDIES CONDUCTED BY CWC, ON NERADI BARRAGE

In the Mathematical model studies conducted by CWC in the year 2000, it is indicated under Conclusions that

“However, with the construction of the flood protection wall on the left bank extending 3.0 km upstream of the barrage, the maximum afflux is of the order of 46 cm and extends up to R.D. 6.0 km i.e., up to 9.0 km upstream of the barrage.”

It is to submit that the backwater effect goes beyond the agreed 3 Km upstream. However, CWC has considered a Manning's 'n' value of 0.018 with some adjustments for higher discharges as mentioned at para 5.4 of the mathematical study report of April 2000 as against the agreed 'n' values of 0.03 in main channel and 0.04 for the overbank flow which has been agreed in the inter-state meeting held on 9.2.1985.

RESULTS OF PHYSICAL MODEL STUDIES CONDUCTED BY CWPRS, PUNE ON NERADI BARRAGE

In the Physical Model Studies conducted by the CWPRS in the year 2005, it is found that:

“Backwater length after construction of Neradi Barrage would be of the order of 6 km upstream of barrage for a discharge equivalent to 16,990 cu m/s according to hydraulic scale model as well as HEC-6”

But the Model studies were carried out without the 3.8Km long protection wall on the left side in Odisha territory and hence are of no relevance.

AGGRADATION OF RIVER BED

The comparison of cross section taken in the year 1980 and 2012 at Kashinagar (Source: CWC) reveals that there is aggradation of the river (Drawing enclosed). This indicates the aggradation of river bed in the post-construction period of Gotta barrage. Similarly the Neradi barrage, if constructed, may cause aggradation of river bed in the upstream affecting the Gunupur town which is situated only 16 km upstream of the proposed Neradi barrage.

SIDE WEIR AT KATRAGADA

A Side Channel Weir on the river Vansadhara on its right bank at Katragada is proposed by Government of Andhra Pradesh. According to Andhra Pradesh, the Side-Weir is a temporary measure. This structure is in the reach where the center line of the river forms the boundary between Andhra Pradesh and Odisha and is intended to divert flood waters to cater the en-route storages with a combined storage capacity of 20.03TMC besides providing en-route irrigation to 20000 Acres. The designed capacity of flood flow channel taking off from Katragada Side Weir is 181.25 Cumecs. The proposed Side Weir has a length of 300 m. Physical model studies have been conducted by GOAP through CWPRS, Pune. As the model studies were conducted with rigid bed model, these studies can not reveal any morphological changes likely in the post construction scenario of Side Weir Project.

RESULTS OF PHYSICAL MODEL STUDIES CONDUCTED BY CWPRS, PUNE ON KATRAGADA SIDE WEIR

The CWPRS,Pune , in its report in 2007 inter -alia observed that :

" Morphological changes in Vamsadhara River near Katragada side weir cannot be assessed from the model studies. However, it is felt that the river channel has not shown any tendency to vitiate from time to time. It is felt that even after the construction of side weir, the conditions may not alter drastically. However, a close watch on the river behavior from year to year is required to be kept."

It is emphasized that the TOR of the model doesnot have any scope for studying the morphological changes and therefore the studies are of no relevance as it cannot conclusively comment on the possible morphological changes in the river over a period of time.

UNCERTAINTY OF FLOOD FLOW DISCHARGE OVER SIDE WEIR

The ratio between the flow in Vansadhara River and diverted flow through Side-Weir will vary throughout the operating stage. The way in which the ratio varies depend on a number of factors including the channel geometry (Which determine the velocity of flow) weir crest geometry, crest level of the weir relative to river bed level, length of the weir alignment and the flow conditions downstream of the weir. With all these, the discharge over the Side-Weir is uncertain as some of the above said parameters vary during the flood flow with sediment transport and bed aggrading. There are various coefficients of discharge for the flow over the Side-Weir as proposed by different researchers, resulting in different magnitudes of discharge over the Side-Weir.

EXPECTED AVULSION OF RIVER.

Avulsion is the rapid abandonment of a river channel and the formation of a new channel and is possible in aggrading rivers. If the river could breach its natural levees during a flood, it would spill out on to a new course with a shorter route.

Vansadhara is an active river as exhibited by the breaches in banks and embankments and change of its course during floods.

It is mentioned clearly in the project report (Ref:-Vansadhara Project DPR-2006, page-51) that,

"At the proposed site of Side-Weir at Katragada, the river bifurcates into two courses with a high ground in between, thus facilitating the low flows hugging the left side (Odisha state) as well as the right side of the river (Andhra Pradesh side). The river at Katragada is narrow and there is a natural saddle at Katragada. When the river discharges waters above berm level, the river spills over right side bank and again joins the river at a downstream point. This particular site is selected for the purpose of diverting the river flood water into the proposed flood flow canal duly utilizing the natural saddle on the right margin"

Just upstream of the site of the proposed Side-Weir, the bank is high and rigid and acts as an attracting spur which is being attacked during floods. A part of this high ground is proposed to be cut. The re-entry of the secondary channel that is formed during the flood flow is proposed to be blocked and the flood flow canal alignment facilitates the river to avulse. This is also corroborated with the point bars formed on the opposite bank. The planning and execution of the Side Weir Project, while providing benefits to Andhra Pradesh may cause change of River Course due to likely changes of morphology of the river.

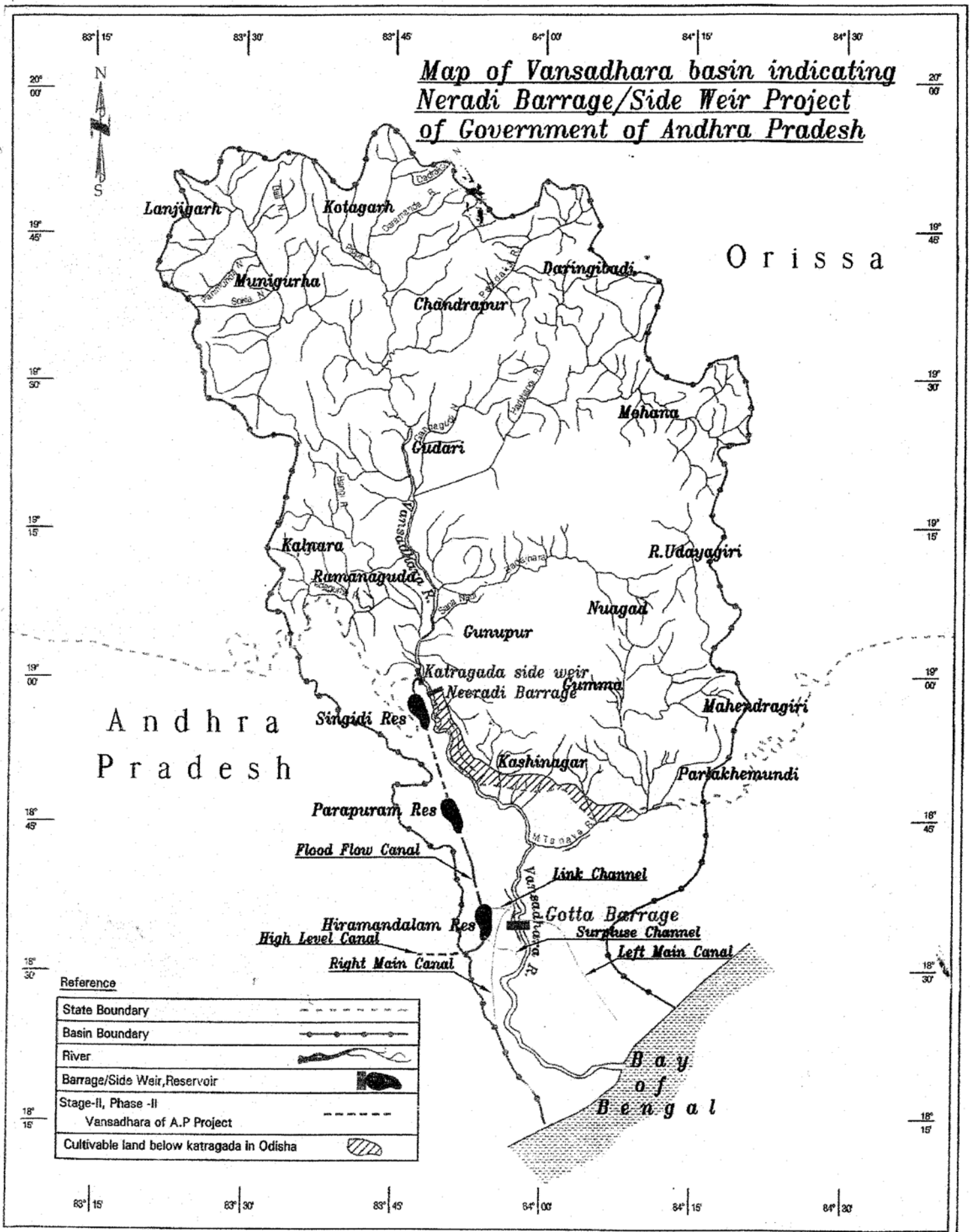
DOWNSTREAM RIVER AGGRADATION:

Due to the lateral loss of water into the Side-Weir, the sediment transport capacity in Vansadhara River is reduced yielding to aggradation and the formation of a local sediment deposit in the downstream weir alignment. The reduced cross section generates backwater effects through contraction and expansion losses. Accompanied with supplementary roughness induced by bed forms the flow over the side weir increases in an uncontrolled way, since the extent of the morphological bed changes is not known a priori.

In view of flow over Side-Weir being uncertain and the diversion through side weir will increase in course of time as mentioned above and the likely morphological changes induced due to Side Weir, the irrigation needs (at Present through lift irrigation) as well as the drinking / other needs of villages lying on the left bank in Odisha will get deprived. A map showing the existing lift irrigation points and the villages below Katragada up to inter-state boundary (Gotlabhadra) village likely to be affected is annexed.

ANNEXURES

1. Map of Vansadhara Basin indicating Neradi Barrage/Side Weir Project of Govt. of Andhra Pradesh.
2. Lay out of Vansadhara Project.
3. Location of Existing Lift Irrigation Projects & Planned Lift Projects in Odisha side on river Vansadhara from Katragada upto Gotlabhadra village. .
4. Comparison of river cross section at Kashinagar (source: CWC).



VANSADHARA PROJECT

(NOT TO SCALE)



SIDE CHANNEL WEIR (KATRAGADA)
Side Weir: 300 M long
with crest level at
+70.40 M (broad crest)
with regulator & silt
excluder.

GUNUPUR
KATRAGADA
16 KMS
1.5 KM

NEERADI BARRAGE (STAGE-II)

NEERADI BARRAGE
Pond Level= +71.63 M
U/S M.F.L for 6,00,000 C/s = + 74.85 M
D/S M.F.L for 6,00,000 C/s = + 74.40 M
Length of barrage between the
abutments=696.39 M
No. and size of spillway vents=30 Nos
of 18.29 M X 3.66 M

FLOOD FLOW CHANNEL
Length 34 Kms
Sec. 36.50X5.084 Mts,
Q=8000Cusecs.(Ultimate Stage)
Fall 1 in 12000 A=20000 Acs.

PRESENT PROPOSAL

SINGIDI BALANCING RESERVOIR
FRL +70.87 M. Capacity = 1.94 MCM
(0.069 TMC)

FLOOD FLOW CANAL

PARAPURAM BALANCING RESERVOIR
FRL=+68.24M, Capacity=17.17 MCM
(0.606 TMC)

ANDHRA PRADESH

ORISSA

MAHENDRA TANKA
46 KMS

HIRAMANDALAM RESERVOIR
FRL +67.056, Capacity=19.05 TMC

LINK CANAL
Length=2.67 Km
Q=4000Cusecs.

PH-I of Stage-II
(H/R & RMC)

GOTTA BARRAGE (STAGE-I)

LEFT MAIN CANAL
Length : 104.2 Km
Spout : 8800 Hb

SURPLUS CHANNEL
Length=1.08 Km
Q=30870 Cusecs.

HIGH LEVEL CANAL
Length= 30 Km. Q=130
Cusecs
Sec. 5.50 M X 1.20 M,
A=5000Acs.

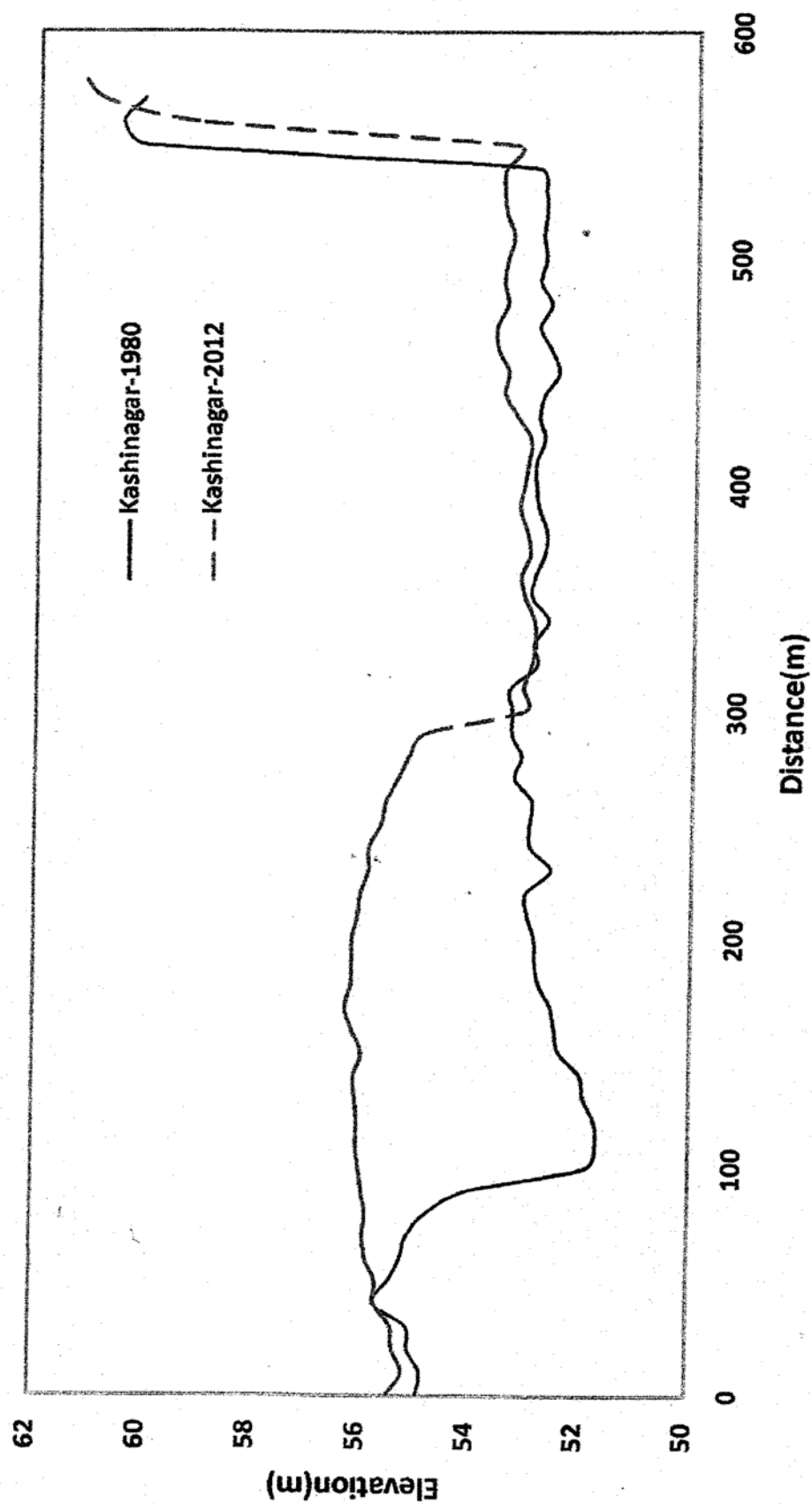
RIGHT MAIN CANAL
Length=52.973 Km,
Q=1496 Cusecs
A=82280 Acs.

LEGEND
State Boundary -----
Stage-I -----
Right Main Canal -----

RIGHT MAIN CANAL

[illegible]

Comparison of River Cross-Section at Kashinagar (Source: CWC)



**LIST OF PARTICIPANTS DURING INSPECTION OF PHYSICAL MODEL AT
CWPRS,PUNE**

VWDT MEMBERS

1. Justice Dr. Mukandakam Sharma, Hon'ble Chairman.
2. Justice B.N. Chaturvedi, Hon'ble Member.
3. Justice Ghulam Mohammed, Hon'ble Member.
4. Sri A.D. Bhardwaj, Assessor.
5. Sri S.K. Sinha, Assessor.
6. Sri B.V. Sharma, Registrar, VWDT.

CWPRS OFFICIALS:

1. Dr. I.D. Gupta, Director.
2. Sri M.N. Singh, Joint Director.
3. Sri R.G. Patil, Chief Research Officer
4. Sri Arun Kumar, Research Officer
5. Sri R.M. Papani, Lab Assistant.
6. Sri T.V. Shinde, Lab Assistant.

ANDHRA PRADESH OFFICIALS:

1. Sri M.A. Raoof, OSD & Chief Engineer, ISWR
2. Sri B. Nagendra Rao, Superintending Engineer
3. Sri L.V. Ramana Murty, Executive Engineer.
4. Sri V. Ajay Kumar, Executive Engineer.
5. Sri G.V. Subramanyam, Executive Engineer.
6. Sri R. Koteswar Rao, Dep. Exe. Engineer.
7. Sri H.S. Suresh, Dep. Exe. Engineer.
8. Sri A.R.N. Sharma, Dep.Exe. Engineer.
9. Sri J.V. Rama Rao, Asst. Exe. Engineer.

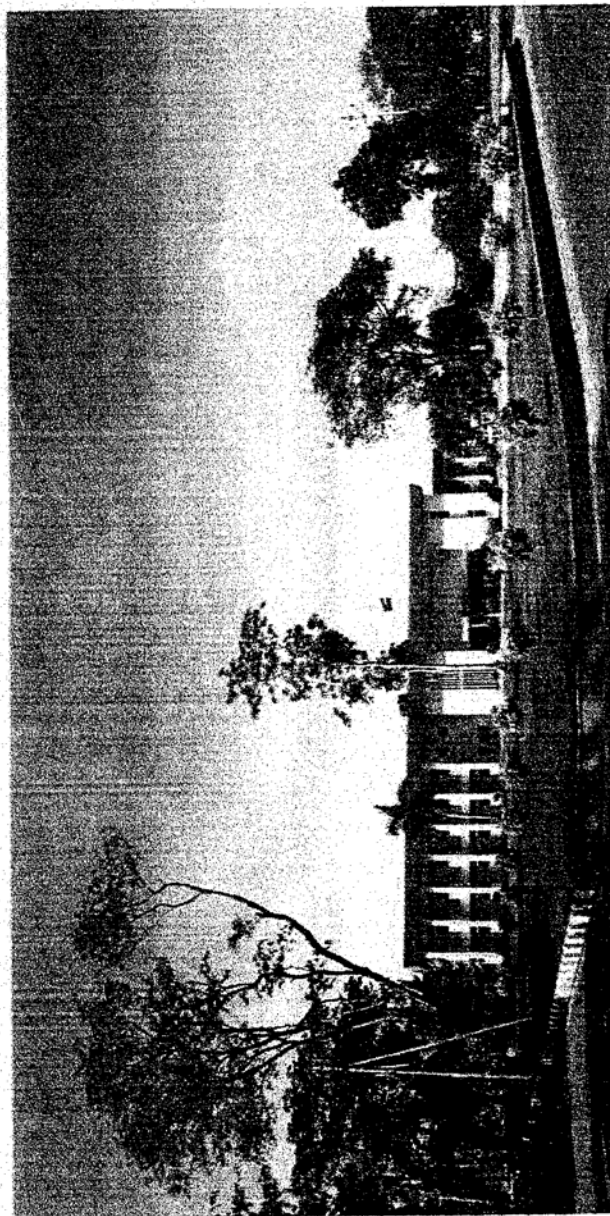
ANDHRA PRADESH LEGAL TEAM:

1. Sri Raju Ramachandran, Sr. Advocate.
2. Sri Mohan V. Katarki, Special Counsel.

ODISHA OFFICIALS

1. Sri Manoj Kumar Misra, C.E. P.P. & F.
2. Sri C.V. Prasad, C.A. on Inter-State Water Dispute.
3. Dr. Yoganarasimhan, Expert.
4. Sri M.R. Shukla, SE, VWDC, New Delhi.
5. Sri A.S. Rao, D.D. O/o CE PP & F
6. Sri A. Ramagopal Rao, EE.

MODEL STUDIES FOR KATRAGADA SIDE WEIR



Annexure - VI

For
Vamsadhara Water Dispute Tribunal (VWDT)

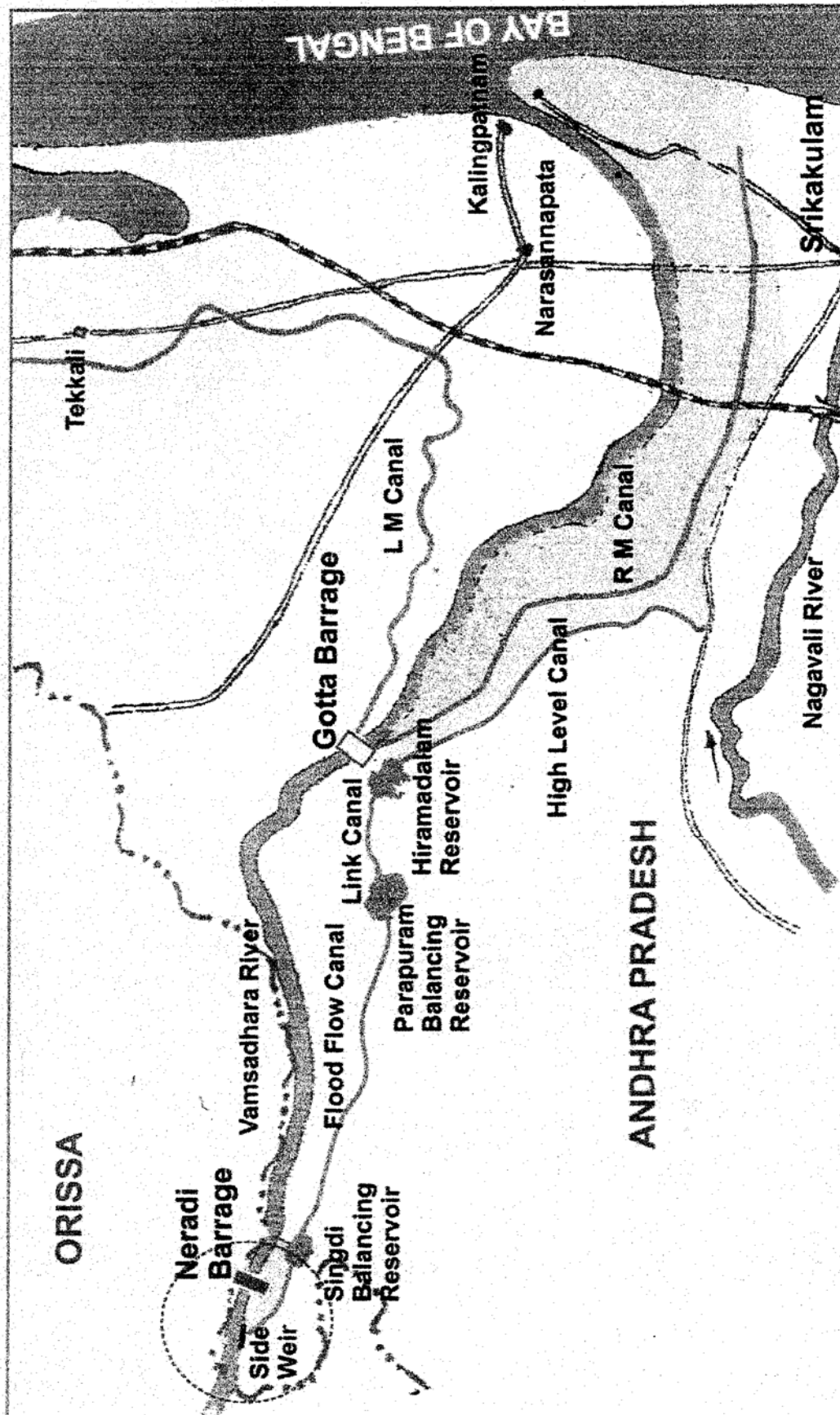
03rd May 2013

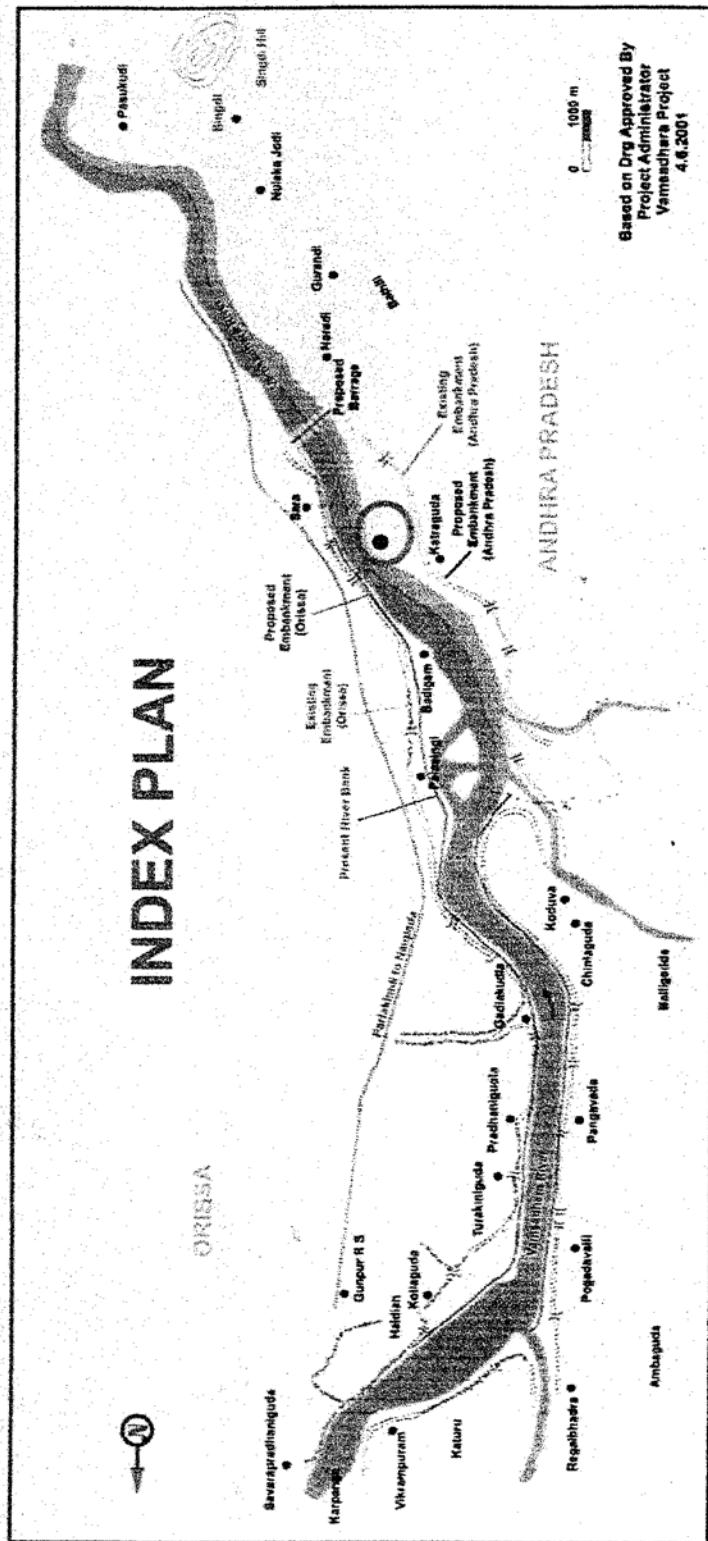


Vamsadhara Water
Dispute Tribunal (VWDT)

03rd May 2013

LOCATION MAP





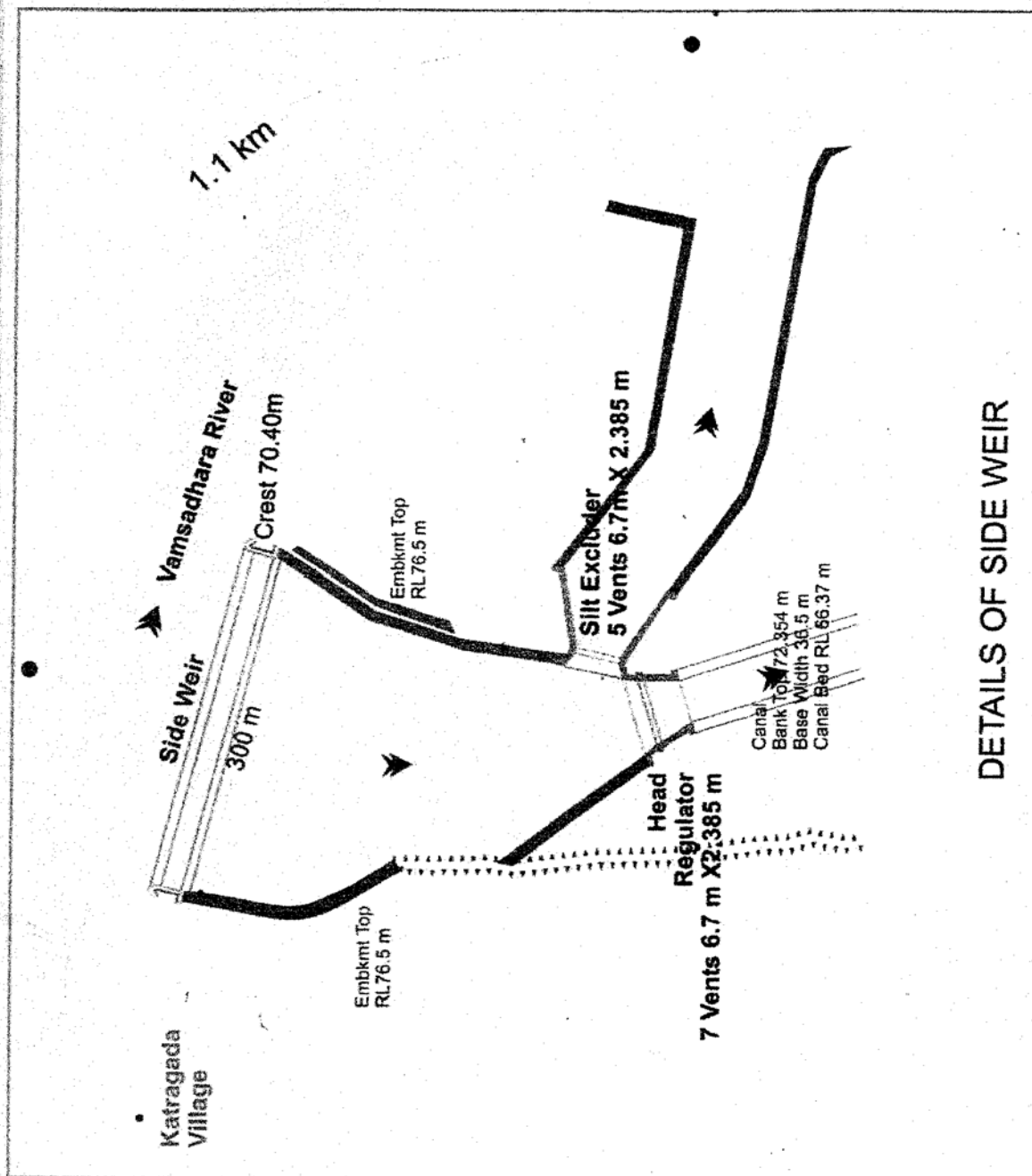
- **Originates in the Eastern Ghats (Koraput District, Odisha), Flows 154 Km in Orissa**
- **Flows 29 Km between Andhra Pradesh and Odisha**
- **Flows 89 Km in Andhra Pradesh and finally empties into Bay of Bengal near Kalingapatnam**



Vamsadhara Water
Dispute Tribunal (VWDT)

03rd May 2013

DETAILS OF SIDE WEIR



DETAILS OF SIDE WEIR



Vamsadhara Water
Dispute Tribunal (VWDT)

03rd May 2013

KATRAGADA SIDE WEIR SALIENT FEATURES

River	Vamsadhara
Location	Katragada Village
District	Srikakulam
Length of Side Weir	300 m
Sill Level	R L 70.40 m
Av Bed Level of River	R L 69.70 m
Design Discharge	181 m³/s
Canal H/R Discharge	226 m³/s
F S L of Canal	R L 71.454 m
Head Regulator	7 Bays -6.7 m X 2.385 m
Escape	5 Bays -6.7 m X 2.385 m



TERMS OF REFERENCE

- ❖ To determine flow over Katragada Weir for discharges 150, 200, 400 m³/s in Vamsadhara river.
- ❖ To assess flow conditions for discharges 150, 200, 400, 8495 and 16990 m³/s with and without side weir
- ❖ Water levels at upstream of side weir for above discharges.
- ❖ To determine discharge in canal and water levels in river at u/s of weir & in the pond area
- ❖ To assess drop in water level in Vamsadhara river

KATRAGADA SIDE WEIR MODEL

SCALE

Horizontal - 1:200

Vertical - 1:40

REACH REPRODUCED

12 km upstream to 2 km
downstream of proposed
Side Weir



Vamsadhara Water
Dispute Tribunal (VWDT)

03rd May 2013

DATA

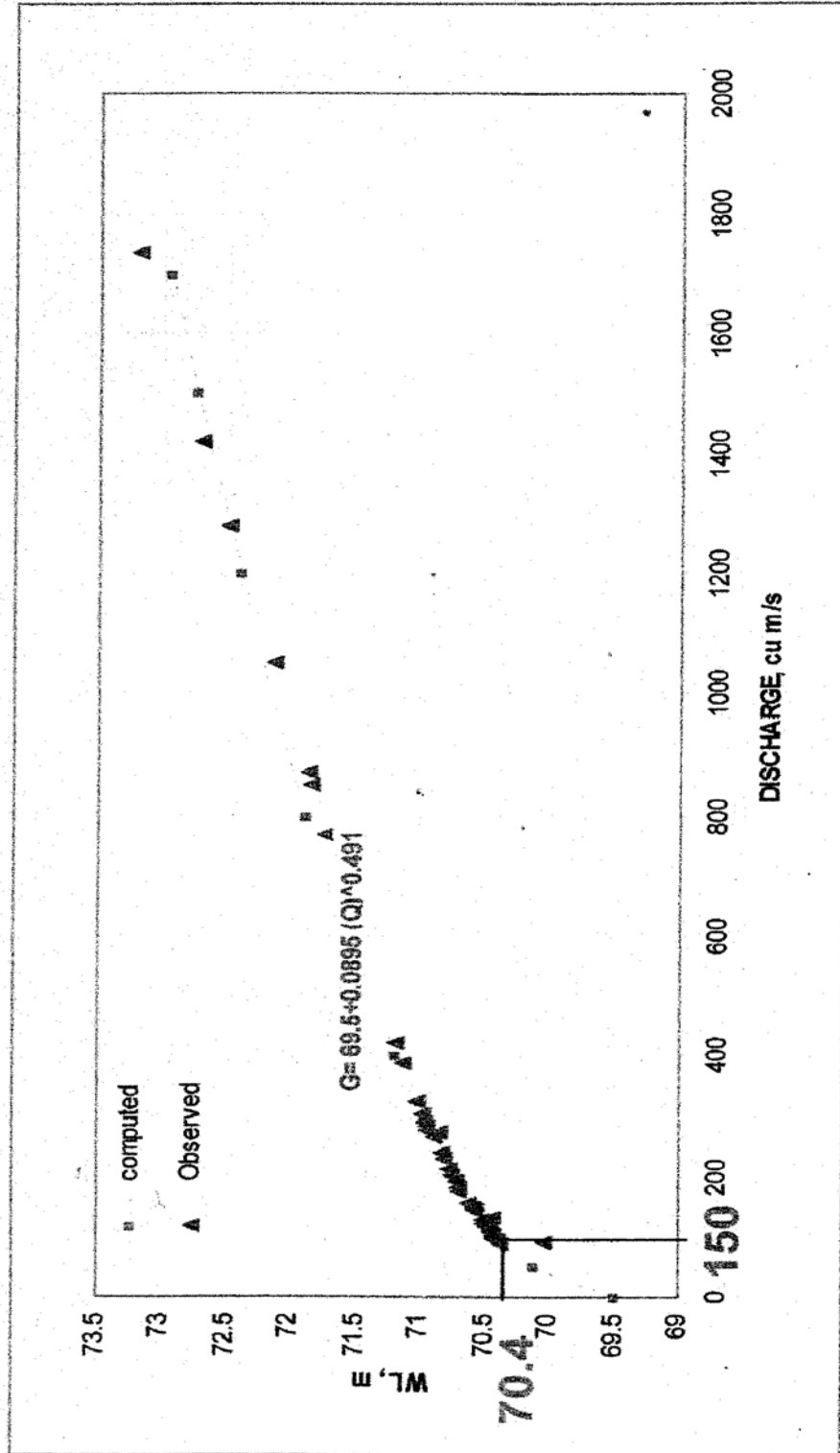
a) Survey data

- (i) C/s of river from 12 km u/s to 2 km d/s of proposed side weir**
- (ii) Details of weir, head regular and silt flushing channel.**

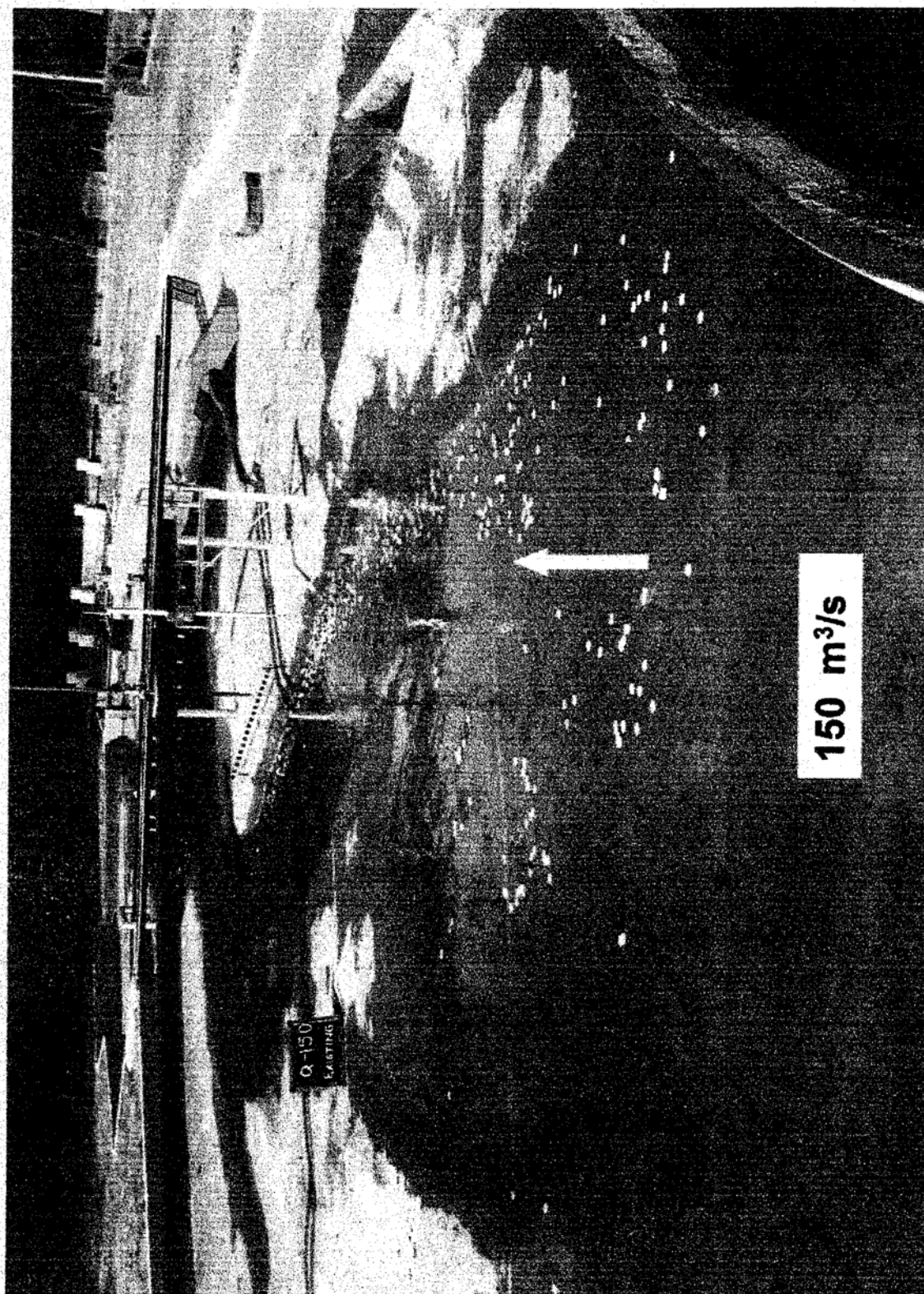
b) Hydraulic data

- (i) Daily gauge discharge data at Gunpur, near 12 km u/s of proposed side weir from June, 1996 to Aug. 2002.**
- (ii) Daily gauge discharge data at Kashinagar, 20 km d/s of proposed side weir from 1971 to 2002.**
- (iii) Gauge-discharge data at Katragada from Aug 1985 to Sep 1985**

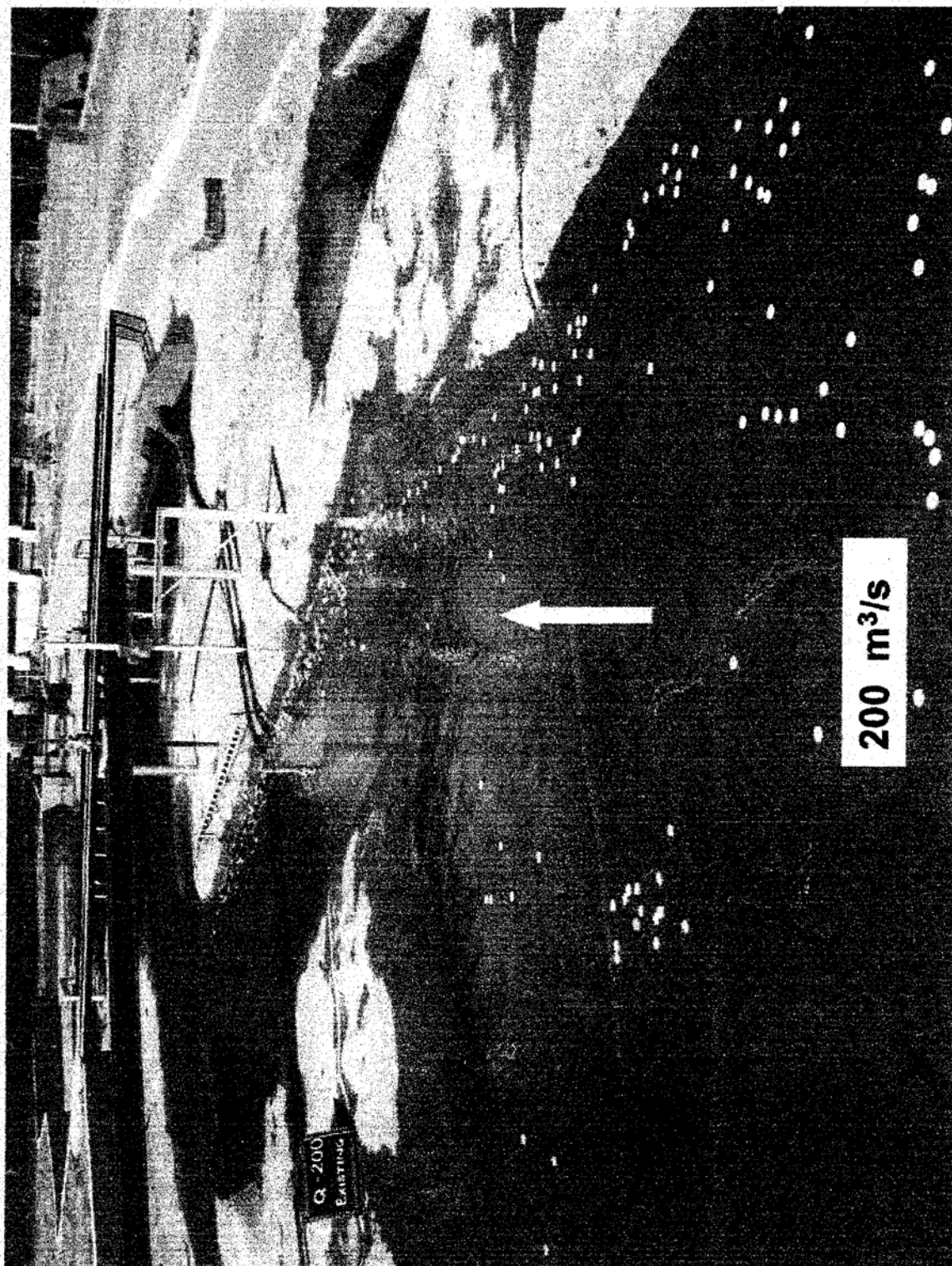
Gauge – Discharge Curve at Katragada



FLOW CONDITIONS – WITHOUT WEIR



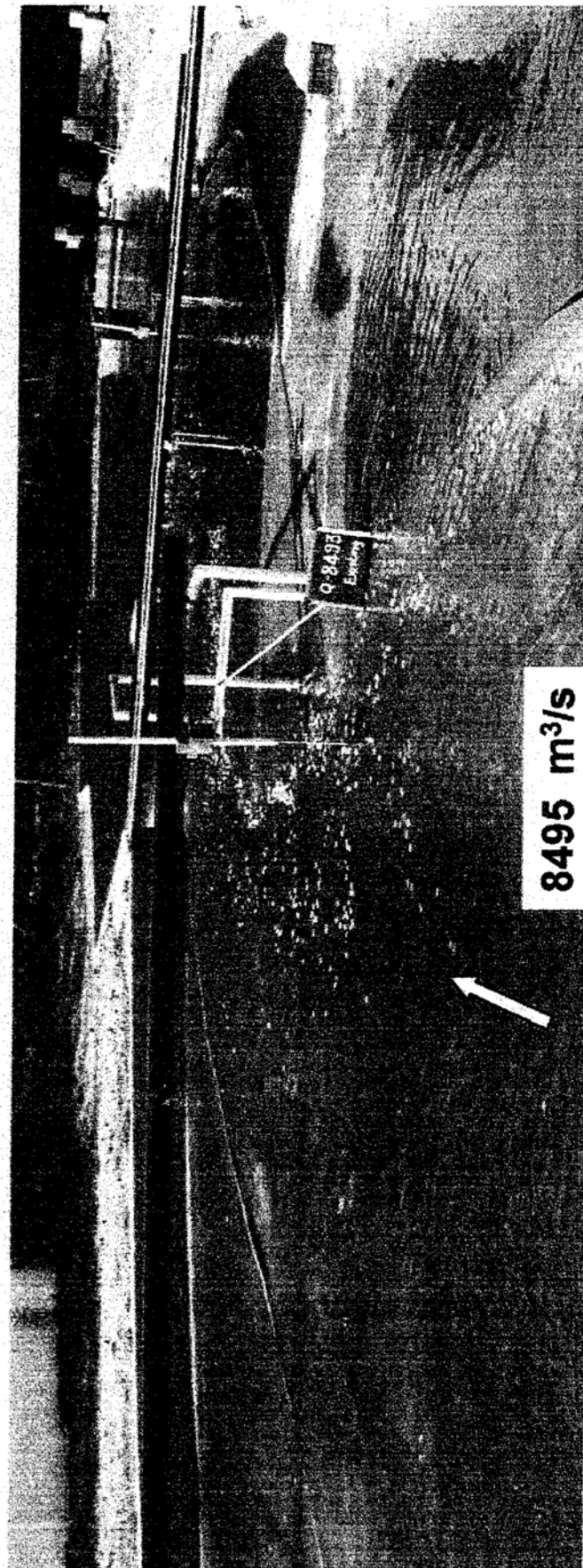
FLOW CONDITIONS – WITHOUT WEIR



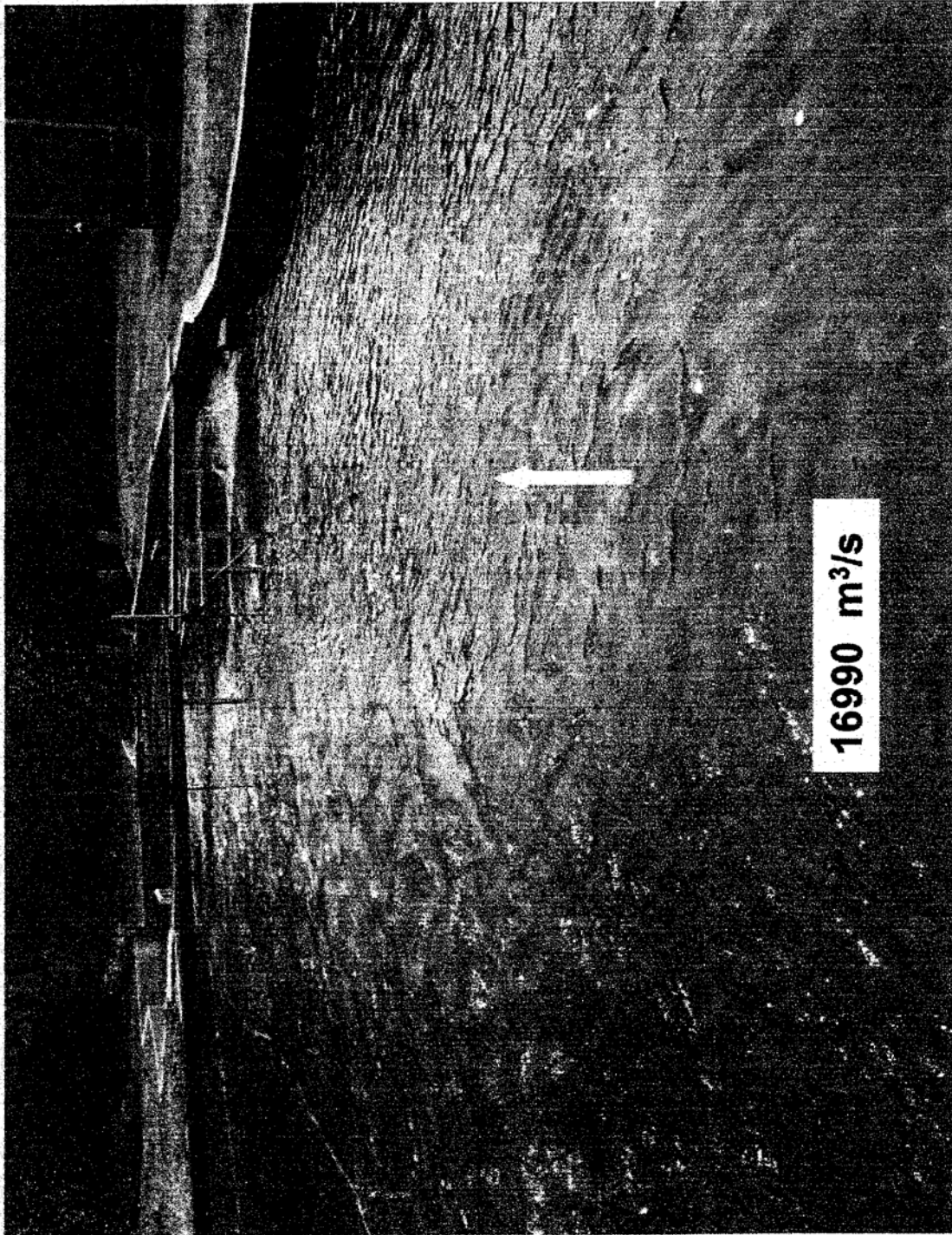
FLOW CONDITIONS – WITHOUT WEIR



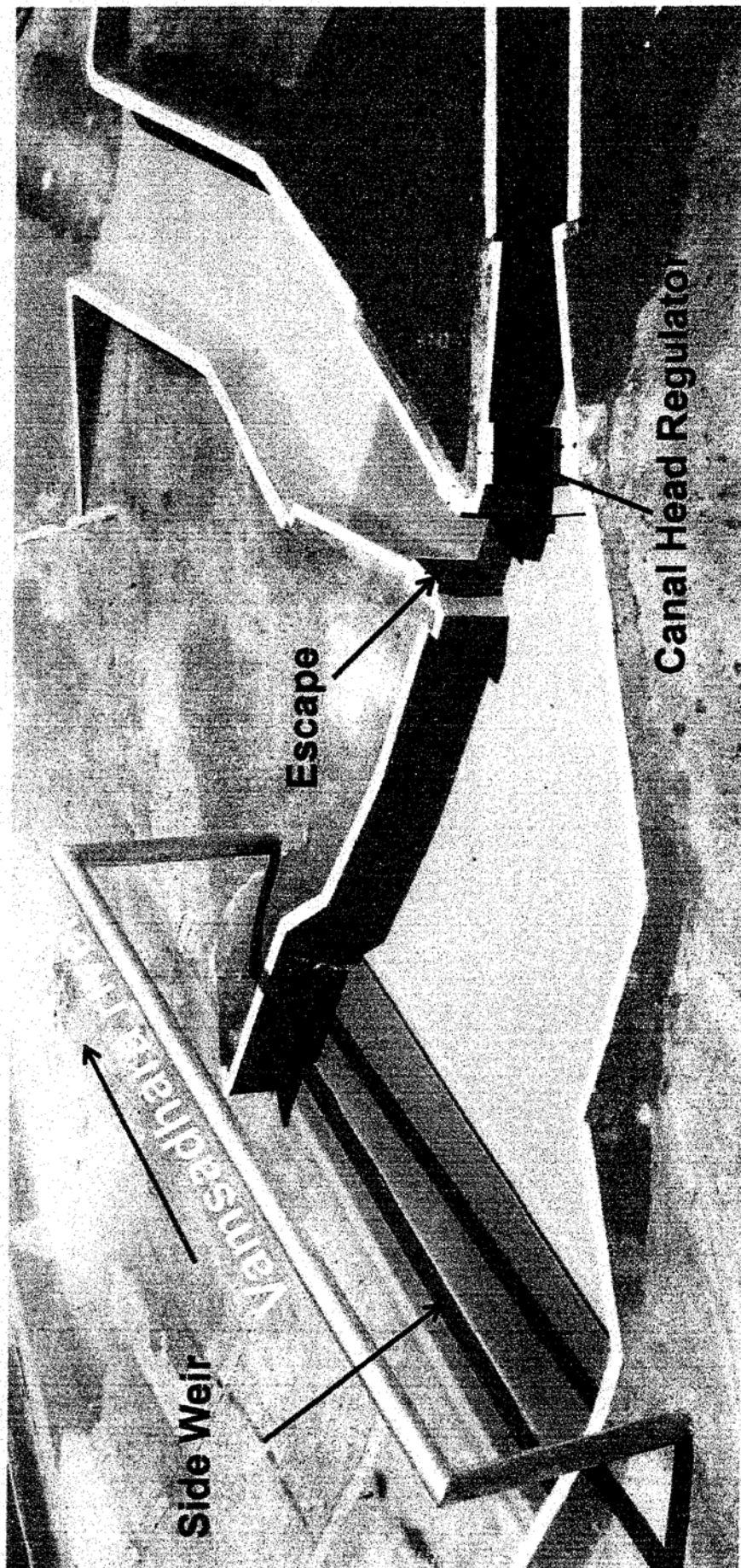
FLOW CONDITIONS – WITHOUT WEIR



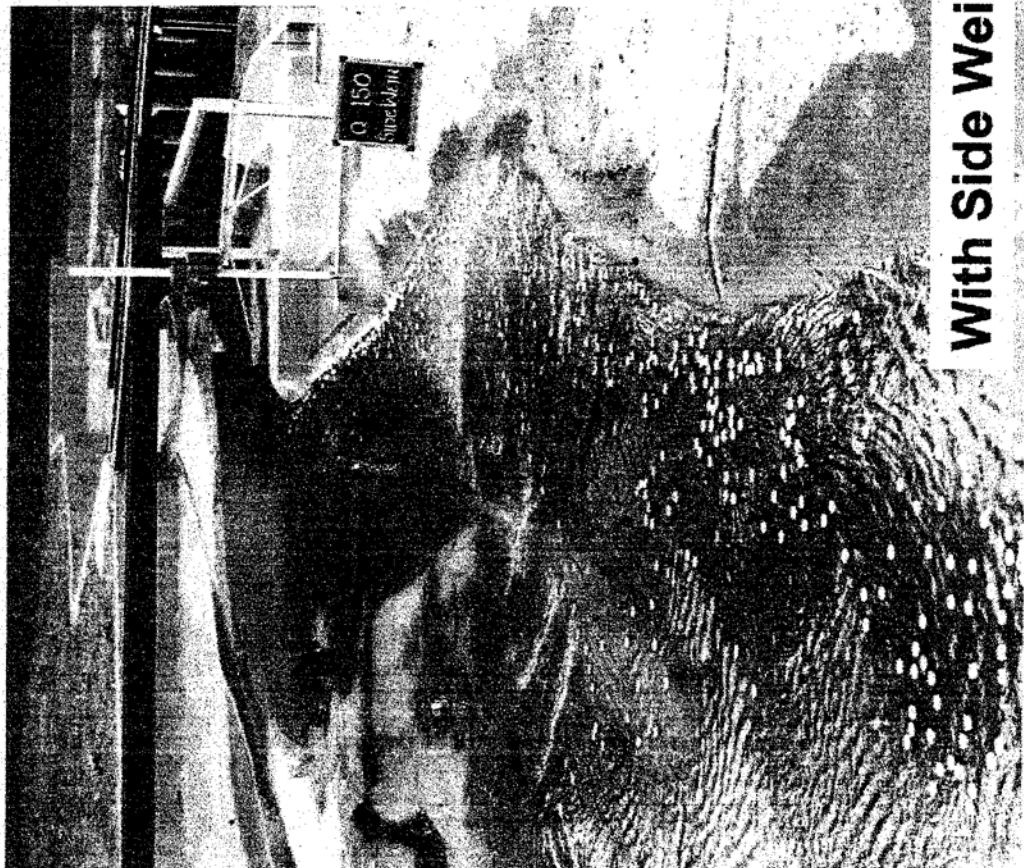
FLOW CONDITIONS – WITHOUT WEIR



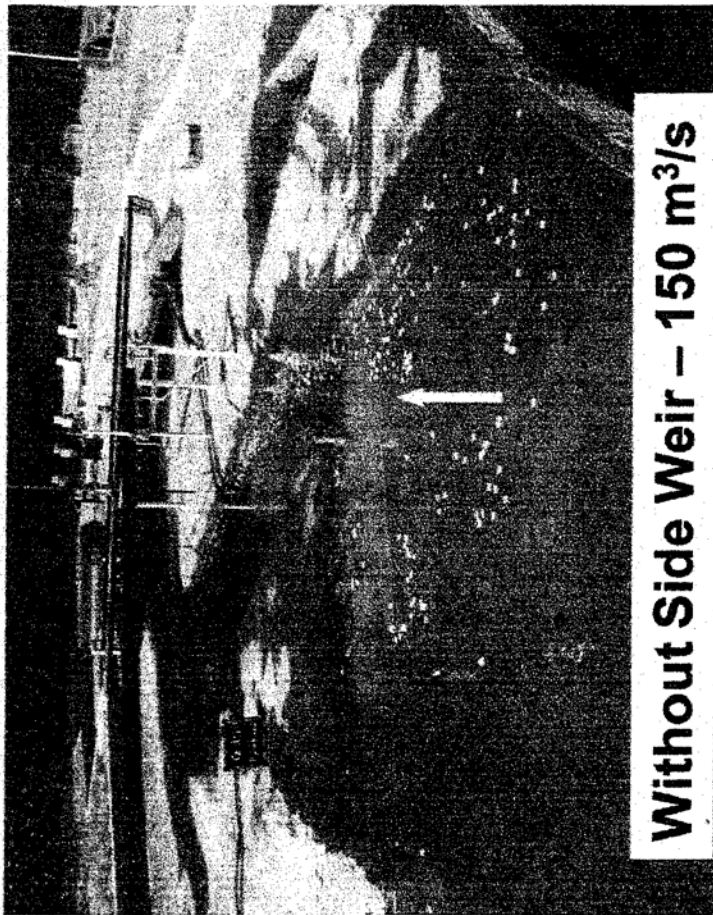
SIDE WEIR LAYOUT



FLOW CONDITIONS - COMPARISON



With Side Weir – 150 m³/s



Without Side Weir – 150 m³/s

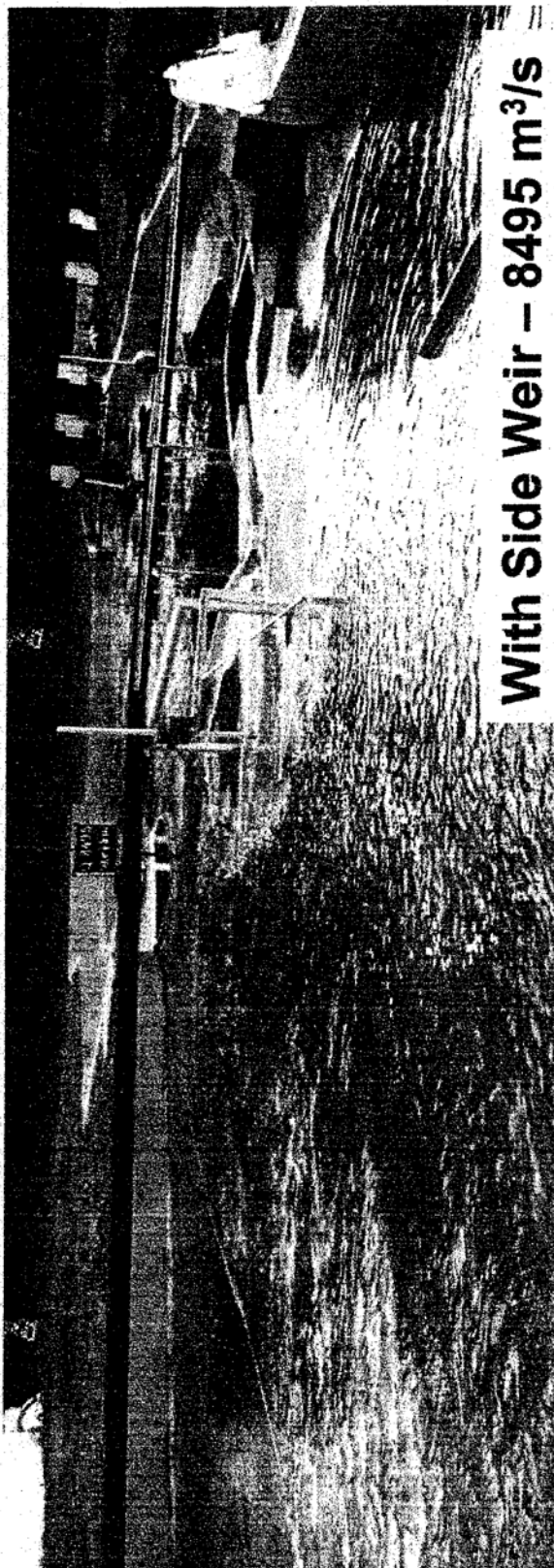
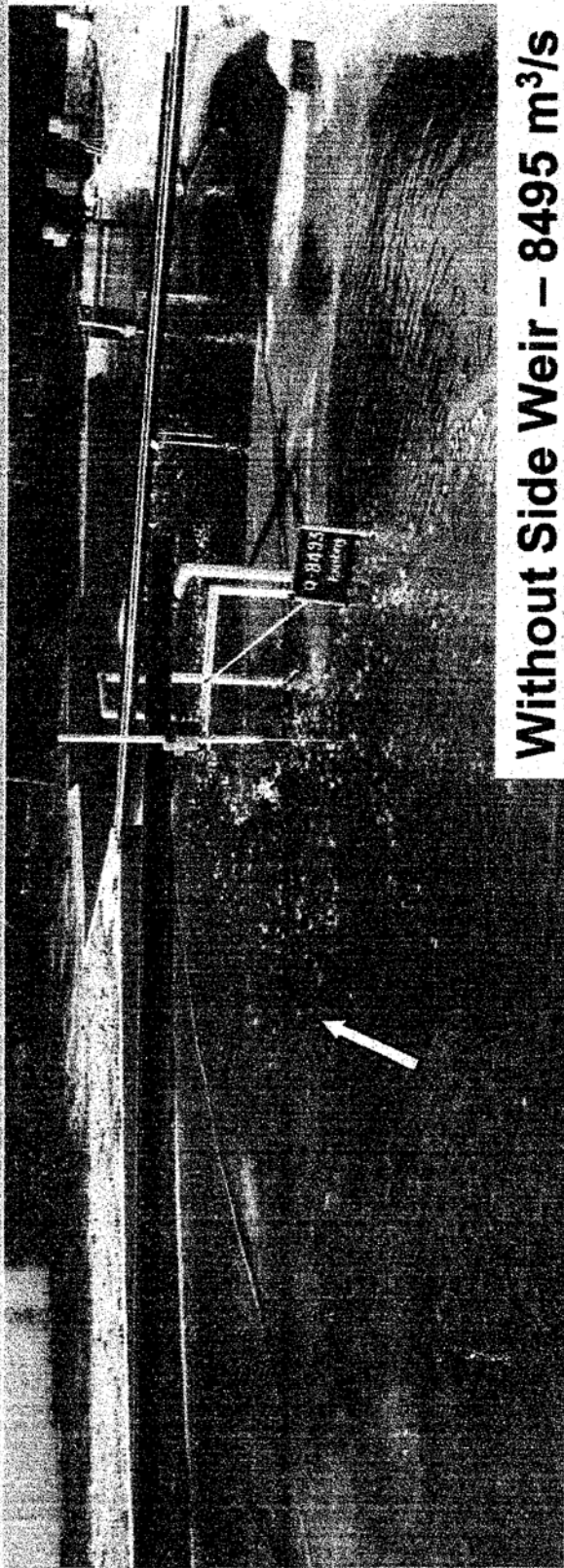
FLOW CONDITIONS



FLOW CONDITIONS



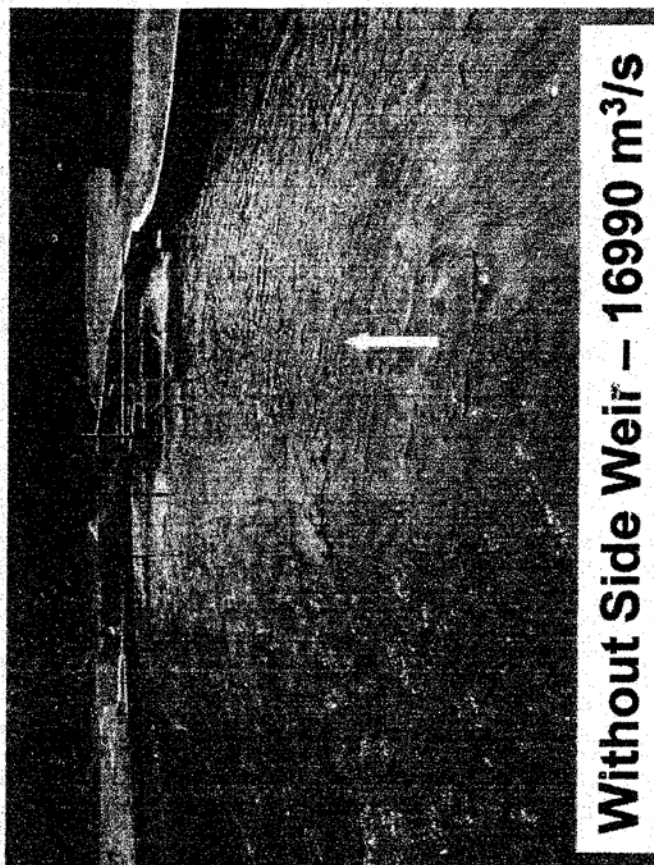
FLOW CONDITIONS



FLOW CONDITIONS



With Side Weir – 16990 m³/s



Without Side Weir – 16990 m³/s

**Determining quantum of flow over Katragada Weir for
discharges 150, 200, 400 m³/s in Vamsadhara river**

DISCHARGE PASSING OVER SIDE WEIR

Vamsadhara Q (m³/s)	Side Weir Q (m³/s)
150	Negligible
200	29
400	145

CONCLUSIONS

- ❖ Flow conditions are similar WITH & WITHOUT Side Weir for all discharges viz. 150, 200, 400, 8495 and 16990 m³/s
- ❖ For discharges 150, 200 and 400 m³/s in Vamsadhara river negligible, 29 and 145 m³/s discharges respectively were observed in the side weir.
- ❖ There is a drop of 0.20 to 0.25 m in the water level of Vamsadhara river at 2 km downstream of side weir for discharges 150, 200 and 400 m³/s.



**BEFORE THE VANSADHARA WATER DISPUTE TRIBUNAL
CAMP OFFICE; CWPRS, KDK, PUNE**

IN THE MATTER OF :

Water disputes between the State of Odisha and Andhra Pradesh regarding the Inter-State river Vansadhara and the river valley thereof.

State of Odisha

Complainant

Vs

State of Andhra Pradesh

Respondent

DATED : 03.05.2013

CORAM : HON'BLE DR. JUSTICE MUKUNDAKAM SHARMA,
HON'BLE MR. JUSTICE B N CHATURVEDI,
HON'BLE MR. JUSTICE GHULAM MOHAMMED,

CHAIRMAN
MEMBER
MEMBER

FOR GOVERNMENT OF ODISHA

1. Shri Raju Ramachandran, Sr. Advocate
2. Shri Mohan V Katarki, Advocate
3. Dhti M K Misra, Chief Engineer and Team

FOR GOVERNMENT OF ANDHRA PRADESH

1. Shri S S Prasad, Sr. Advocate
2. Shri Y Rajagopala Rao, Advocate-on-Record
3. Shri M A Rauf, Chief Engineer and Team

O R D E R

The Tribunal visited the Central Water and Power Research Station (CWPRS), Pune on 03.05.2013. During the power point presentation made by the Director, CWPRS, it was observed that since the physical Model studies of Neradi Barrage were carried out in the year 2007, the Tribunal felt that fresh data should be provided to CWPRS for it to decide, if any changes are required in the Model studies done so far and it directed accordingly. The Tribunal further directed that fresh river cross sections on the agreed locations be carried out jointly by the two party states under the overall guidance of Central Water Commission from 15th to 22nd May 2013. The up-to-date G&D data available with Central Water Commission should also be supplied to CWPRS, Pune for making comparison of the data and coming to a conclusion, whether any changes are required to be made in the Model studies. This decision shall be taken by CWPRS within 10 days of the receipt of the data. The data may be supplied in soft as well as in hard form. CWPRS will submit their comments within 10 days and if it is decided that a fresh study is to be made, the same should be completed within three months thereafter.

No fresh notice would be sent to the counsel/parties and this order itself shall be treated as the notice as it is passed in the presence of the counsel/parties of both the states. Both the states will extend their full cooperation in executing this order, *passed under section 4*

Q. in Ad.

Co. Sec.

su
(Dr. Mukundakam Sharma)
Chairman

su
(B N Chaturvedi)
Member

su
(Ghulam Mohammed)
Member



Vansadhara Water Disputes Tribunal

Ministry of Water Resources
Government of India



REPORT ON THE VISIT OF VANSADHARA WATER DISPUTES TRIBUNAL TO THE SITE OF PROPOSED NERADI BARRAGE

REPORT ON THE VISIT OF
VANSADHARA WATER DISPUTES TRIBUNAL
TO THE SITE OF PROPOSED NERADI BARRAGE

- (A) TECHNICAL PRESENTATION BY (i) GOVT. OF ODISHA
(ii) C.W.C.
- (B) VISIT TO THE SITE OF PROPOSED NERADI BARRAGE
- (C) TECHNICAL PRESENTATION BY GOVT. OF ANDHRA PRADESH

**REPORT ON THE VISIT OF VANSADHARA WATER DISPUTES TRIBUNAL TO THE
SITE OF PROPOSED NERADI BARRAGE**

(A) TECHNICAL PRESENTATION BY (i) GOVT. OF ODISHA (ii) C.W.C.

(B) VISIT TO THE SITE OF PROPOSED NERADI BARRAGE

(RIGHT BANK)

(C) TECHNICAL PRESENTATION BY GOVT. OF ANDHRA PRADESH

The Vansadhara Water Disputes Tribunal in its sitting on 22nd January 2014 passed an order (copy enclosed as Annexure-I). Part of the order is as follows:

“The Tribunal proposes to visit the site of proposed Neradi barrage as also Pune to see the Model prepared by the CWPRS and also allow the State officials to make their presentations, if any and for that purpose an Itinerary has been prepared, which is circulated”.

In its next hearing on 6.3.2014, the Tribunal passed an order (copy enclosed as Annexure II). Part of the order is as follows:

“There is yet another application i.e. I. A. No. 12 of 2014 filed by the applicant, seeking modification in the programme of hearing technical presentation by both the States and also postponement of the dates fixed for inspection of Model and the Site. After hearing the counsel appearing for the parties, we find no reason to change the dates for initial programme i.e. from

18.3.2014 to 25.3.2014 as it is agreed to go ahead with the programme as it is.

So far as the request of the counsel appearing for the applicant regarding the visit to the Odisha side of the Barrage is concerned, the same would be decided at a later stage, when we meet next”.

So far as the visit to CWPRS at Pune for inspection of the Model of the Neradi Barrage is concerned, the same stands now cancelled in view of the difficulties expressed by the counsel appearing for the parties and the dates for the postponed visit to the said site would be decided on the next date.”

Accordingly, the Tribunal made the visit to Odisha and Andhra Pradesh from 18th March to 25th March 2014.

(A) TECHNICAL PRESENTATION BY (i)GOVT. OF ODISHA (ii) C.W.C

The State Government of Odisha gave Technical Presentation before the Tribunal at Puri in Orissa on 18th March 2014. Chief Engineer, Mahanadi & Eastern Rivers Organisation, Central Water Commission, Bhubaneswar also made a brief technical presentation regarding the organizational set up and functions of his office. The List of participants is enclosed as Annexure-III.

A (i) TECHNICAL PRESENTATION BY GOVT. OF ODISHA

The Technical Presentation before the Tribunal was made by the Consultant, representing State of Odisha. (Copy of Presentation enclosed as Annexure-IV).

In his Technical Presentation, the Consultant outlined the various developments pertaining to Neradi barrage since the year 1961. He stated that Andhra Pradesh had proposed construction of Neradi Project which required 106 acres of land to be acquired in the territory of Odisha. He further stated that as per the agreement of 4th September 1962, the Neradi barrage would provide irrigation to Andhra Pradesh for first crop only. He also mentioned that as per agreement of 30th September, 1962, the yield of Vansadhara river at Gotta reservoir is 115 TMC and the water of river Vansadhara would be utilized by both Andhra Pradesh and Odisha on fifty: fifty basis.

He also brought to the notice of the Tribunal that on 27th July 1980 it was agreed by both the States that Andhra Pradesh would confine acquisition of Orissa land to an area of 106 acres which would be exclusive of the river bed and that it was further agreed that the project report should be revised for ensuring water from Neradi barrage during first crop period and all flow thereafter or beyond first December is let down in the river for use by both the States.

Taking into consideration the unprecedented flood during the monsoon season of 1980, it was also agreed to design the Neradi barrage for a flood of 6 lakh cusecs. It was also agreed that backwater

effect would be limited to 3 Km. Subsequently, mathematical model studies were done by CWC to ascertain the extent of backwater as well as any morphological changes in the river. Government of Odisha pointed out that during the year 2001 it was decided that only mathematical model studies are not enough and that Physical model studies also need to be conducted which will be more reliable. These studies were done by CWPRS, Pune.

The Consultant in his presentation also mentioned that the joint study in respect of river Vansadhara by Govt. of Odisha, Andhra Pradesh and CWC had arrived at the annual yield figure of 105 TMC in the year 2007. He also stated that the total planned water utilization of Odisha is 62.542 TMC and that of Andhra Pradesh is 66.721 TMC.

The Consultant also made a number of observations, significant of those are as follows:

- That both the States of Odisha and Andhra Pradesh have agreed to utilize the water of Vansadhara on 50:50 basis though the catchment area in Odisha is 83% of the total catchment of Vansadhara Basin.
- Yield assessment is to be done in realistic manner using long term observed discharge data rather than statistical approach by developing rainfall runoff relations.

- Provisions for environmental flow requirements and coastal region development should also be considered. In the Mathematical Model studies carried out by CWC, the value of 'n' considered is low as compared to the agreed value of 'n' between the two States. The long term effect of aggradation of river bed profiles due to sedimentation has not been considered.
- In the physical Model studies carried out by CWPRS, Pune, the flood protection wall on the left side in Odisha territory has not been considered to know the extent of backwater effect. Development of backwater with continuous aggradation of river bed due to sediment inflow has also not been considered.
- In its latest technical report (August 2013) CWPRS has calibrated the Model with water levels observed in 1980 with the cross sections of river taken in the year 2013. This is not acceptable.
- Number of issues were also attempted to be raised regarding the side weir at Katragadda.

Observations of the Tribunal during presentation

- Regarding the point raised about 83% catchment area in Odisha, the Tribunal was of the view that sharing of water on 50:50 basis is already a settled issue between the two State Govts.

- Regarding the comments of the Consultant pertaining to Model studies carried out by CWC and CWPRS, It was decided that Government of Odisha may take up their objections with the respective agencies for their consideration under intimation to the Tribunal. The Assessors in the Tribunal will monitor the developments in this regard.
- Regarding the yield reassessment, it was pointed out that the Joint Working Group, in the best of their wisdom, decided to consider the data from the year 1982-2006 which is also fairly a long period of data for 24 years and the yield thus assessed has been accepted by the riparian States.
- Concerning the other issues pertaining to ecology and environment, it was brought out that these issues are taken care of by CWC and other relevant Ministries during the Techno-Economic Appraisal of the detailed project report for clearance by the Technical Advisory Committee for Irrigation, Flood control and multipurpose projects of Ministry of Water Resources, Government of India.
- Regarding the issues pertaining to the side weir at Katragadda, the Chairman of the Tribunal observed that the Hon'ble Supreme Court is considering this matter and therefore, decision of the Supreme Court would be followed and complied with.

A (ii) Technical presentation by CWC

Chief Engineer, Mahanadi & Eastern Rivers Organisation (MERO), Central Water Commission, Bhubaneswar (Odisha) made a brief presentation (Copy of the presentation is enclosed as Annexure-V). Through the presentation, the Hon'ble Members of the Tribunal were apprised of the organizational set up of CWC office of Bhubaneswar. He further informed the Tribunal that there were 9 river basins under Mahanadi & Eastern Rivers Organisation (MERO) including Vansadhara. The functions of MERO included Flood Forecasting, collection and compilation of Hydrological data, bringing out Water Year Book and appraisal of medium irrigation projects and monitoring of projects under Accelerated Irrigation Benefit Programme.

Referring to Vansadhara basin, he stated that CWC was maintaining seven observation stations out of which five were collecting gauge data and two stations at Gunupur and Kashinagar were collecting gauge, discharge, silt and water quality data. In addition 3 flood forecasting stations are also being maintained by CWC in Vansadhara Basin. To a query from the Tribunal, he informed that Vansadhara being a small catchment, the flood warning to the local administration was of the order of few hours only.

When the Hon'ble Chairman enquired about the Inter-State issues of Vansadhara river basin the Chief Engineer, CWC mentioned that these

issues are dealt at CWC Headquarters at Delhi. The Hon'ble Chairman desired that the concerned official of CWC from Headquarters should be present during the technical presentation by the State of Andhra Pradesh at Hyderabad.

(B) VISIT TO THE SITE OF PROPOSED NERADI BARRAGE (Right Bank)

The Tribunal alongwith concerned officers (List of participants is enclosed as Annexure VI) visited the site of proposed Neradi Barrage on 21.3.2014 from right bank lying in the State of Andhra Pradesh. On being enquired, State Government officials informed that the discharge in the river as observed by CWC on that day, at Kashinagar was 339 Cusecs. Some flood protection works could also be observed along the left bank of the river which falls within the area of Odisha territory. The Andhra Pradesh State officials pointed out the axis of the proposed Neradi barrage which had been marked with the help of Flag poles. It was stated that the total length of the barrage at the site was about 700 m.

Large scale maps of the river basin and various components of the proposed project were displayed by the Andhra Pradesh Government at the camp site for the reference of the Hon'ble Tribunal. The maps included natural flood plan, flood plan with barrage, area of submergence with barrage, layout of the barrage and the section of protection work on the left bank. The salient features of the proposed barrage were also

displayed. The Hon'ble Tribunal asked the officials of the State of Andhra Pradesh to provide natural flood plan map without the proposed barrage and flood plan map with barrage, area of submergence with barrage, layout of the barrage, section of the protection wall and salient features of the proposed project.

The State of Andhra Pradesh had arranged for the inspection of the longitudinal section and other topographic features of the river upstream of the proposed barrage. The Tribunal travelled in the bed of the river 3 kms upstream of the proposed barrage. The officials of the State of Andhra Pradesh in presence of all concerned including officials of State of Odisha explained that Bathili village is the first village in Andhra Pradesh from where the common boundary between the two States starts. At this location the river width has increased to 1.6 kms, thereby reducing the scope of flooding on account of the increase in the carrying capacity of the river. The Hon'ble Tribunal requested for the supply of the detailed computation of sub-mergence area due to back water so that the extent of flooding in both the States could be appreciated. The Tribunal inspected the elevated ground in the bed of the river nearly 3kms upstream of the proposed barrage. At this location the river was flowing towards left bank. Thus there is a change in the flow pattern of the river, at some locations it is flowing towards the left bank area (Odisha) and at some places towards the right bank (Andhra Pradesh). During the inspection it was explained by the officials of the State of Andhra Pradesh that during the 1980 unprecedented flood, even this elevated mound was completely submerged. The Hon'ble Tribunal desired to know whether removal of this mound would help in reducing the submergence area. It was

explained by the officials that any intervention should be evaluated through mathematical models and decision taken accordingly. During the detailed deliberations the following issues were flagged for further consideration:

1. Possibility of de-silting of the river as a measure to reduce the submergence area and back water effect.
2. Provision of protection wall on both right bank and left bank, as provision of protection wall only on the left bank i.e. Odisha would increase the possibility of flooding the area on right bank in Andhra Pradesh.
3. With the provision of protection wall, the extent of back water may increase but it would protect the cultivable land and villages from flooding and this would not have any adverse effect. Further it may also be brought out that after a certain distance, upstream of the barrage, the afflux as well as the submergence area would decrease.

C. TECHNICAL PRESENTATION BY GOVT. OF ANDHRA PRADESH

Chief Engineer (ISWRD) made a technical presentation before the Tribunal on 24.03.2014. List of the participants is enclosed as Annexure- VII.

In his presentation, (copy enclosed as Annexure-VIII), Chief Engineer (ISWRD) stated that Srikakulam District is one of the most backward Districts in Andhra Pradesh and most of its population is dependent on agriculture. He informed the Tribunal that water of Vansadhara Basin is not being effectively used and on an average 80 TMC is going down to sea unutilized annually. For

the sake of Hydrological assessment, Vansadhara Basin has been divided into 11 sub- basins. The Tribunal desired to know the impact of this sub-division on the Dispute and concluded that it was not relevant to the work of Tribunal. He further informed the Tribunal that water from Neradi barrage would be taken to the command area through two balancing reservoirs at Singidi and Parapuram and would be stored in Hiramandalam reservoir having gross capacity of 16.69 TMC. He further informed the Tribunal that height of the Neradi barrage is 15 ft. and length is about 2285 ft. Though, the barrage was originally designed for a flood of 2.1 lakh Cusecs but at the instance of Odisha, Andhra Pradesh agreed to redesign the barrage for a discharge of 6 lakh Cusecs. He, however, pointed out to the Tribunal that there was no engineering basis or standard methodology used by the Govt. of Odisha for arriving at this figure. After the unprecedented flood of 1980, Andhra Pradesh had proposed flood protection wall 3.8 km long to limit the land acquisition on Odisha side to 106 acres. This proposal was acceptable to Govt. of Odisha.

The Tribunal desired to know the extent of additional land required beyond 106 acres if the proposed protection wall is extended upto 5 kms. The officials of Andhra Pradesh agreed to work out this figure and provide to the Tribunal. They subsequently provided the tentative figure of 119 acre of additional land required for extending the protection wall from 3 km to 5 km. This tentative figure is subject to confirmation by Government of Odisha.

The officials of Andhra Pradesh submitted that the flood of the order of 6 lakh cusecs may occur once in more than 500 years and after 1980 flood Odisha has strengthened the flood bank on its side by constructing need based protection wall in number of stretches. It was also stated that the inundation due to 6 lakh Cusecs flood lasted only for couple of hours and the latest guidelines issued by MoWR suggest that land is to be acquired between full reservoir level (FRL) and maximum water level (MWL) if duration of submergence exceeds 15 days. It was also pointed out to the Tribunal that the stand of Odisha clearly shows that it prefers to limit the land acquisition rather than preventing flooding the upstream areas with embankment.

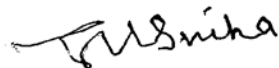
The Tribunal then sought the comments/observations of Govt. of Odisha on this presentation. The consultant representing the State of Odisha mentioned that the area of submergence of 106 acres and back water effect upto 3 kms could still be adhered to though the design flood has been raised from 2.4 lakh cusecs to 6 lakh cusecs by either increasing the water way or increasing the height of the gate. In this regard, the Tribunal desired that Government of Odisha could submit a feasible proposal to substantiate its stand. The Assessors of the Tribunal pointed out that the various design parameters such as water way, crest level of the under sluices, crest level of the spill way, height of the gate etc. are determined as per the relevant national guideline issued by the Bureau of Indian Standard, Central Water Commission and Central Board of Irrigation and Power. The Hydraulic performance of the various design parameters are further verified by the physical model studies. Further the Consultant representing State of Odisha made certain observations about the physical as well as mathematical model studies carried out by

CWPRS, Pune. The consultant mentioned non-inclusion of mobile bed, 3.8 kms. protection wall and adoption of a low value of Manning's coefficient. The Assessors clarified that the various objections in regard to the model studies raised by the State of Odisha should have been raised before CWPRS, Pune. It was pointed out by them that many of such objections have received attention already and attended to by the officials of CWPRS, Pune. The Chairman enquired about the availability of this correspondence in Tribunal office. It was clarified that the Tribunal is not informed of the correspondence between the State of Odisha and CWPRS, to which the State of Odisha said that all their observations have not been answered by CWRS, Pune. The Hon'ble Chairman suggested for providing copies of such communications to the Tribunal and that one more opportunity may be provided to the officials of the State of Odisha to visit CWPRS along with officials of Andhra Pradesh so that all their observations and all their objections are attended to. This would also be monitored by the Assessors, so that in future there is no confusion about the conclusion of the model studies. The officials of Govt. of Odisha also stated that the command area of 107280 acres has not been mentioned in any agreement and that the Govt. of Andhra Pradesh proposes to provide water for second crop which is against the agreement. It was also pointed out by them that the pond capacity of 0.6 TMC will exceed 106 acres.

The Tribunal observed that both the State Govts. have given utilization figures in excess of 60 TMC each. This is much more than the yield in the river which is 105 TMC. Therefore no water would be left in the river after all the planned projects are in place. This may be detrimental to environmental

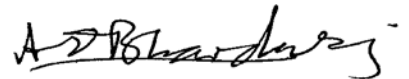
protection and would have ^{for} ^{the} ecological impact. Both the State Govts. need to give serious consideration towards this aspect.

The Chairman of the Tribunal then thanked the officials of both the State Govts. for making the presentations and for making necessary arrangements for the site visit of the Tribunal.



(S.K. SINHA)

ASSESSOR



(A.D. BHARDWAJ)

ASSESSOR



(GHULAM MOHAMMED) J
MEMBER



(B.N. CHATURVEDI) J
MEMBER



(DR. MUKUNDAKAM SHARMA) J
CHAIRMAN

Dated 28.4.2014

**BEFORE THE VANSADHARA WATER DISPUTES TRIBUNAL
NEW DELHI**

IN THE MATTER OF:

Water disputes between the State of Odisha and Andhra Pradesh
regarding the Inter-State river Vansadhara and the river valley
thereof.

State of Odisha vs State of Andhra Pradesh

22.1.2014: This matter was called on for hearing before the Tribunal today.

**CORAM: HON'BLE DR. JUSTICE MUKUNDAKAM SHARMA, CHAIRMAN
 HON'BLE MR.JUSTICE B.N. CHATURVEDI, MEMBER
 HON'BLE MR.JUSTICE GHULAM MOHAMMED, MEMBER**

FOR GOVERNMENT OF ODISHA *

1. Shri Mohan V.Katarki, Advocate
2. Shri R.S. Jena, Advocate-on-Record
3. Shri SidharthPanda, Advocate
4. Shri Sanjeev Das, Advocate

FOR GOVERNMENT OF ANDHRA PRADESH

1. Shri C.S.Vaidyanathan, Senior Advocate
2. Shri S.S.Prasad, Senior Advocate
3. Shri BadanaBhaskar Rao, Additional Advocate General
4. Shri A Satya Prasad, Senior Advocate
5. Shri Y. Rajagopala Rao, Advocate-on-Record
6. Shri M.VishnuVardhan Reddy, Advocate

ORDER

In terms of the directions issued earlier, both the parties have filed their list of witnesses. The State of Odisha has given the list with the names of 4 witnesses to be examined on behalf of the State of Odisha, whereas, the State of Andhra Pradesh has submitted a list of witnesses with 3 names. Both the lists of witnesses are taken on record. Now both the States shall file the Affidavits of these witnesses by way of Examination-in-Chief, in terms of the earlier order.

The Tribunal proposes to visit the site of proposed Neradi Barrage as also Pune to see the Model prepared by the CWPRS and also allow the State officials to make their presentations, if any and for that purpose an Itinerary has been prepared, which is circulated.

It is also proposed to have the issues already framed, recast and a proposed draft thereof is circulated amongst the parties, to which response shall be made on the next date.

Re-notify on 6.3.2014 at 11.00 A.M for further directions, if any.

.....sd/-..... J
(DR.MUKUNDKAM SHARMA)
CHAIRMAN

.....sd/-..... J
(B.N. CHATURVEDI)
MEMBER

.....sd/-.....J
(GHULAM MOHAMMED)
MEMBER

**BEFORE THE VANSADHARA WATER DISPUTES TRIBUNAL
NEW DELHI**

IN THE MATTER OF :

Water disputes between the State of Odisha and Andhra Pradesh
regarding the Inter-State river Vansadhara and the river valley
thereof.

I.A.No.11/ 2014	State of Odisha	vs	State of Andhra Pradesh
I.A.No.12/2014	State of Odisha	vs	State of Andhra Pradesh

6.3.2014: This matter was called on for hearing before the Tribunal today.

CORAM:	HON'BLE DR. JUSTICE MUKUNDAKAM SHARMA,	CHAIRMAN
	HON'BLE MR.JUSTICE B.N. CHATURVEDI,	MEMBER
	HON'BLE MR.JUSTICE GHULAM MOHAMMED,	MEMBER

FOR GOVERNMENT OF ODISHA

1. Shri Raju Ramachandran, Sr. Advocate
2. Shri Mohan V.Katarki, Advocate
3. Shri R.S. Jena, Advocate-on-Record
4. Shri Sidharth Panda, Advocate
5. Shri Sanjeev Das, Advocate

FOR GOVERNMENT OF ANDHRA PRADESH

1. Shri C.S.Vaidyanathan, Senior Advocate
2. Shri S.S.Prasad, Senior Advocate
3. Shri Y. Rajagopala Rao, Advocate-on-Record

ORDER

The matter is listed today for directions, in view of the earlier order passed directing the applicant to file their Affidavits by way of evidence. However, when the matter is called out, a request is made by Mr. Raju Ramachandran, Senior Advocate appearing for the applicant seeking for further time to enable them to file the same. There is a strong opposition by Mr. C.S. Vaidyanathan, Senior Advocate appearing on behalf of the State of Andhra Pradesh against the aforesaid prayer. However, considering the nature of the request, two weeks further time from today is granted as one last opportunity, making it clear that no further prayer for extension will be entertained under any circumstances. The Affidavits shall now be filed on or before 21st of March, 2014.

In view of the delay in filing the aforesaid Affidavits by the applicant, the time for filing the Affidavits by the respondents is also enlarged. They are given time for filing their Affidavits on or before 30.4.2014.

There is yet another application i.e. I.A.No.12 of 2014 filed by the applicant, seeking modification in the programme of hearing technical presentation by both the States and also postponement of the dates fixed for inspection of Model and the Site. After hearing the counsel appearing for the parties, we find no reason to change the dates for initial programme i.e. from 18.3.2014 to 25.3.2014 as it is agreed to go ahead with the programme as it is.

So far as the request of the counsel appearing for the applicant regarding the visit to the Odisha side of the Barrage is concerned, the same would be decided at a later stage, when we meet next.

So far as the visit to CWPRS at Pune for inspection of the Model of the Neradi Barrage is concerned, the same stands now cancelled in view of the

difficulties expressed by the counsel appearing for the parties and the dates for the postponed visit to the said site would be decided on the next date.

The issues which were framed on 21.8.2013 would now be re-framed as suggested by all concerned, as follows:

1. Whether, the reference dated 19.03.2010 of the Union of India, under Section 5(1) of the Inter State River Water Disputes Act, 1956 with regard to the water disputes emerging from the complaint dated 28.07.2009 filed by the State of Andhra Pradesh is not maintainable?

[1(No change)]

2. Whether the State of Odisha is justified in objecting to or delaying the Neradi Barrage by not honouring the binding Inter-State Agreements and not allowing the construction of Neradi Barrage.

[3&4 clubbed]

3. Whether the State of Odisha is not obliged to make available the agreed extent of 106 acres of land to the State of Andhra Pradesh for the construction of the Neradi Barrage having agreed to do so as far back as in 1961?

[5 (No change)]

4. Whether the State of Odisha is justified in stating that the land required for acquisition should be confined to 106 acres, on account of the Neradi Barrage, as initially agreed, when they insist on additional protective measures like embankments etc., on its side on account of the 1980 flash floods?

[6(No change)]

5. Whether the construction of Neradi barrage by the State of Andhra Pradesh across Inter State River Vansadhara is subjected to any agreed conditions? If so, whether the agreed conditions are the following:

- (i) That the submergence in the territory of Odisha shall be limited to 106 acres excluding the river bed in the State of Odisha; and
- (ii) That the back water effect shall be limited to 3 km upstream of the barrage both in non-silted and silted conditions.

[2&9 clubbed]

6. Whether the back water effect of the Neradi barrage as planned by the State of Andhra Pradesh goes beyond 3 km from the barrage upto Gunupur and whether the State of Andhra Pradesh has no legal right to cause submergence or back water effect in the territory of the State of Odisha without its consent?

[8&10 clubbed]

7. Whether the State of Odisha is not barred from undertaking projects under which it has been proposed/proposing to unilaterally divert the waters of Inter State River Vamsadhara to another basin jeopardizing the basin requirements of river Vamsadhara?

[7 (No change)]

8. Whether the State of Odisha is justified in objecting to the drawal of waters by the State of Andhra Pradesh through Side Weir especially when the proposed drawal is within its territory and share and whether the State of Andhra Pradesh is bound to take the consent of the State of Odisha before execution of the Side Weir Project on the right bank?

[12&14 clubbed]

9. Whether the Side Weir as proposed by the State of Andhra Pradesh would in any way adversely affect any interests of the State of Odisha in the downstream of Katragadda?

[11 (N0 change)]

10. Whether the drawal of waters through Side Weir,as proposed by the State of Andhra Pradesh would in any way diminish the share of waters of the State of Odisha?

[13(No change)]

- 11.Whether, the Side Weir at Katragada planned by the State of Andhra Pradesh to divert water from the right bank of the Inter-State river Vansadhara is likely to change or alter the Inter-State border in the common reach of the river below Katragada and If so, is the above material issue for consideration by this Tribunal in the context of the present dispute?

[15&16 clubbed]

12. Whether the Side Weir at Katragada planned by the State of Andhra Pradesh to divert water from the Inter-State riverVansadhara is likely to affect the morphology of the river Vansadhara in the downstream reach of Katragada due to aggradation of the river bed caused by siltation and If so, whether the above is a material issue for consideration by the Tribunal in the context of the present dispute?

[18&19 clubbed]

13. After the construction of the Side Weir at Katragada by the State of Andhra Pradesh, will there be any material change in volume or pattern of flows on the left bank of the river falling in the territory of the State of Odisha? If so, will it adversely affect the existing water requirement of the inhabitants in the State of Odisha?

[17 (No change)]

14. Whether an Inter-State regulatory body is necessary for implementation of the decision to be given by this Hon'ble Tribunal?

[20 (No change)]

15. To what relief?

[21 (No change)]

The reframed issues shall now be given to the parties. I.A. Nos. 11 and 12 of 2014 stand disposed of in terms of the aforesaid order.

The matter shall now be listed for directions on 13th May, 2014 at 11.00 A.M.

.....sd/-..... J
(DR. MUKUNDAKAM SHARMA)
CHAIRMAN

.....sd/-..... J
(B.N. CHATURVEDI)
MEMBER

.....sd/-..... J
(GHULAM MOHAMMED)
MEMBER

Annexure-III

**LIST OF PARTICIPANTS IN THE TECHNIAL PRESENTATIONS HELD
AT PURI ON 18.3.2014**

I V.W.D.T. TEAM

1. Justice Dr. Mukandakam Sharma, Hon'ble Chairman.
2. Justice B.N. Chaturvedi, Hon'ble Member
3. Justice Ghulam Mohammed, Hon'ble Member
4. Shri A.D. Bhardwaj, Assessor
5. Shri S.K. Sinha, Assessor
6. Shri B.V. Sharma, Registrar

II ODISHA

A TECHNICAL TEAM

1. Sri Santosh Kumar Tripathy, Engineer-in Chief, Deptt of Water Resources.
2. Sri S.K. Pattanayak, Engineer-in-Chief, Deptt. of Water Resources.
3. Sri P.K. Mohanty, Chief Engineer, Dam Safety
4. Sri K.R. Acharya, Chief Engineer, PP&T
5. Dr. A. Sudarshan Rao, Deputy Director, Project Planning
6. Sri Ajay Kumar Nayak, Asstt. Ex. Engineer,
7. Sri Manoj Kumar Jena, Asstt. Ex. Engineer.
8. Sri AdiKanda Patra, Asstt. Executive Engineer
9. Sri Harihar Mohanty, Asstt. Engineer,
10. Sri C.V. Prasad, Consultant Advisor.

CENTRAL WATER COMMISSION

1. Sri A.S.P. Sinha, Chief Engineer, CWC, Bhubaneswar
2. Sri Atul Kumar Nayak, Superintending Engineer, CWC, Bhubaneswar
3. Sri T. Prasad, Asstt. Engineer, CWC, Bhubaneswar

III ANDHRA PRADESH

A TECHNICAL TEAM

1. Sri A. Ramakrishana Rao, Chief Engineer, IS&WR
2. Sri K. Jalandhar, Chief Engineer, North Coast Project
3. Sri B. Nagendra Rao, Superintending Engineer, ISUR Hyderabad
4. Sri B. Sekhar Rao, Dy. Executive Engineer
5. Sri M.S. Tilak, Assistant Executive Engineer

B LEGAL TEAM

1. Sri C. S. Vaidyanathan, Sr. Advocate
2. Sri A. Satya Prasad, Sr. Advocate
3. Sri S. Satya Narayana Prasad, Sr. Advocate
4. Sri Badana Bhaskara Rao, Addl. Advocate General
5. Sri M. Vishnu Vardhan Reddy, Advocate
6. Sri Y. Rajagopala Rao, A.O.R

GOVERNMENT OF ODISHA



DEPARTMENT OF WATER RESOURCES

**TECHNICAL PRESENTATION
ON
VANSADHARA INTER-STATE DISPUTE**

GOVERNMENT OF ODISHA



DEPARTMENT OF WATER RESOURCES

**TECHNICAL PRESENTATION
ON
VANSADHARA INTER-STATE DISPUTE**

1

DESCRIPTION OF VANSADHARA BASIN

•Origin:	-	Near Village Lanjigarh in Kalahandi district of Odisha
•Total Catchment Area	-	10830 Sq.Km
•Catchment area in Odisha	-	8960 Sq.Km
•Catchment Area in A.P	-	1870 Sq.Km
•Catchment Area at Gotta Barrage	-	9731 Sq.Km
•Total Length of River upto Sea	-	239 Km
•Length of river in Odisha	-	154 Km
•Common inter-state boundary	-	29 Km

2

VANSADHARA BASIN MAP



3

GOOGLE MAP SHOWING LOCATION OF SIDE WEIR WITH FLOOD FLOW CHANNEL



Inter-State Agreements/ Meetings

07.07.1956 -Agreement reached between Govt. of A.P & Odisha for construction of a reservoir at Gotta with FRL 157 ft.

- Due to involvement of submergence of costly lands in Andhra Pradesh and resistance of Project affected people, alternative proposals were explored. and Gotta reservoir is replaced by a barrage at the same location at a later stage.
- While investigation were on, Dr. K.L.Rao, inspected Vamsadhara Project site of A.P on 28.12.1968.It was decided to execute Vamsadhara Project in two stages.

5

18.7.1961

- Hon'ble Chief Ministers of both Andhra Pradesh and Orissa agreed to Neradi Barrage and 106 Acs of land would need to be acquired in Orissa for the irrigation project.

04.09.1962

- The Neradi Irrigation proposes to provide, on the Andhra Pradesh side for first crop only.

6

30.09.1962

It is recorded that

- From the data available it has been estimated that the yield of Vamsadhara river at Gotta Reservoir is 115.00 TMC.
- The water of Vamsadhara basin may consequently be utilized by both Andhra Pradesh and Orissa States on fifty : fifty basis, though Odisha intercepts about 83% of the total catchment of Vansadhara basin.

7

WATER AVAILABILITY

The Yield of Vansadhara basin has been estimated at different points of time as follows

115 TMC (1962)

70 .45 TMC (2000)

75% Dep.Yield approved by Hydrology Directorate, CWC considering the yield series at Gotta barrage
(Data considered 1971 – 1997)

105 TMC (2007)

Joint study by Govt. of Odisha, A.P & CWC by developing Rainfall – Runoff relations using statistical approach
(Data considered 1982-2006)

8

- Water utilisation by respective States is linked to the Water availability at 75% dependability.
- Therefore, Yield assessment is to be done in a realistic manner using long-term observed discharge data rather than statistical approach by developing Rainfall-Runoff relations to arrive at correct assesement of yield.
- Long-term observed discharge data from 1971 – 2013 (43 years) is available at CWC G&D site Kashinagar.
- Sharing of water would be on 50 : 50 basis.
- Provisions for environmental flow requirements and coastal region development should also be considered.

9

PLANNED UTILISATIONS OF ODISHA & ANDHRA PRADESH

- Total Planned Water Utilisation of Odisha - 62.542 TMC
- Existing Water Utilisations of Odisha - 18.88 TMC
- Ongoing Water Utilisations of Odisha - 3.557 TMC
- Total of Existing and Ongoing utilizations - 22.437 TMC
- Total Planned Utilisation of Andhra Pradesh - 66.721 TMC

10

EXISTING & ONGOING WATER UTILISATIONS OF ODISHA

Existing Projects:

Badanala Med. Project	4.74 TMC
Harabhangi Med. Project	7.62 TMC
Minor (flow) Projects	6.52 TMC
Total Existing Utilizations	18.88 TMC

Ongoing Projects:

Chheligada Project	1.956 TMC
Mahendratanya Weirs	0.72 TMC
Minor (flows) Projects	0.881 TMC
Total Ongoing Projects Utilization	3.557 TMC

Apart from above there are river lift projects utilising water from main river, the command area of such projects will come under the proposed projects in future.

11

27.07.1980

- Andhra Pradesh will confine acquisition of Orissa lands to 106 acres and that the 106 acres acquisition would be exclusive of the river bed.
- The chief engineer, Irrigation, Orissa pointed out that the Original agreement provided for utilization during the first crop period at Neradi Barrage. It was agreed that the project report should be revised for ensuring water from Neradi barrage during first crop period and all flow thereafter or beyond first December is let down in the river for use by both the states.

12

15.01.1987

- Chief Ministers of Andhra Pradesh and Orissa were agreeable to taking up the Neradi Project on Vamsadhara River, by acquiring only 106 acres of land in Orissa keeping in view the interests of Orissa as envisaged in the Agreement of 1961 between the two States.
- The Chief Minister of Andhra Pradesh even agreed to redesign and modify the parameters of the project so as to limit the land acquisition in Orissa to the extent of 106 acres only.

13

10.06.1992

In a meeting taken by the Hon'ble Chief Ministers of both the States it was recorded

- "Mathematical Model has a linkage with the aggradation of the river bed which in turn will affect the Orissa portion by floods beyond the stipulated 3 Kms. Andhra Pradesh Engineer however, assured that the backwater effect will be limited to 3 kms. Sharing of water would be on 50:50 basis."

14

15.02.2001

It was recorded that

- Government of Orissa Officers pointed out that people of Gunupur and surrounding areas are very much apprehensive, in view of devastating experience of 1980 floods.
- This being a sensitive issue, all the design parameters are to be checked very carefully before taking any decision.
- It was further pointed out that only mathematical model studies are not enough. Physical model studies are to be conducted, which will be more reliable.

15

NERADI BARRAGE

Neradi barrage was agreed with the following conditions

- Andhra Pradesh will confine acquisition of Orissa lands to 106 acres and that the 106 acres acquisition would be exclusive of the river bed
- Backwater effect will be limited to 3 Km in the upstream
- Withdrawal of water from Neradi barrage during the first crop period and all flow thereafter or beyond first December is let down in the river for use by both the States.

16

Mathematical Model studies of Neradi barrage conducted by CWC

- The backwater effect extends upto 9 Km upstream of the barrage with protection wall of 3.0 Km under movable bed condition.
- Low Manning's rugosity coefficient "n" of 0.018 considered with due adjustments of variations of 10%, 15% & 20% for higher discharges
- In the inter-state meeting dated 09.02.1985, the value of 'n' decided is 0.04 for over bank and 0.03 for main channel. It was also indicated in the inter-state agreement dated 29.12.1995 that the published literature on 'n' indicates values even upto 0.1 for banks with vegetation and trees/bushes.
- Long-term effect of aggradation of river bed profiles due to sedimentation has not been considered.

17

Physical Model Studies of Neradi Barrage conducted by CWPRS, Pune

- The flood protection wall on the left side in Odisha territory has not been considered in the model to know the extent of back water effect.
- Development of backwater with continuous aggradation of river bed due to sediment inflow has not been considered.

18

Side Weir proposals by Govt. of Andhra Pradesh

While issues relating to Neradi Barrage were still pending, without the approval of Central Water Commission (CWC) and concurrence of Government of Orissa, the Government of Andhra Pradesh initiated a project (Vanshadhara Stage-II, Phase-II) to divert the water of Vanshadhara river by cutting the right bank of the river near village Katragada in Andhra Pradesh at about 14.5 km. downstream of Gunupur to divert the flood water through a flood flow canal and store at a reservoir near Hiramandalam with two balancing reservoirs at Singidi and Parapuram in between. From Hiramandalam reservoir water would be further transferred to Gotta barrage and also through high level canals to provide irrigation in Andhra Pradesh.

19

12.04.2005

It is recorded that

- Andhra Pradesh Government have agreed to drop the side weir proposal in case Neradi Barrage is through.
- Commissioner Cum Secretary, DoWR, Orissa suggested that in order to resume discussion on Neradi Barrage, the proposed Katragada side weir project should be shelved.

20

13.02.2006

▪ Being aggrieved by the action of Andhra Pradesh to implement the side weir project, the Government of Odisha filed a Complaint on behalf of the state of Odisha to the Ministry of Water Resources , Government of India.

▪ GoI is requested to Constitute a Water Dispute Tribunal under Sec.4(1) of the ISWD Act, 1956 and Refer to the Tribunal, the water dispute and matters concerned to relevant to the disputes emerging from this letter of Complaint.

21

▪ Govt. of Orissa filed a Writ Petition No. 443(Civil) in the Hon'ble Supreme Court of India with a prayer to constitute a Water Dispute Tribunal to resolve the dispute.

▪ Hon'ble Supreme Court of India in its Judgement directed the Govt. of India to constitute a Water Dispute Tribunal.

22

Physical Model Studies of Katragada Side Weir conducted by CWPRS, Pune

- The model, primarily made for Neradi Barrage is too small and hence not suitable for low flow studies required to assess the impact of Katragada side weir. Therefore, a larger model (1:100 Horizontal or lower) for Katragada side weir is required. (Ref: Inter-state meeting held on 22.1.2008 at Bhubaneswar)
- Rigid bed model has been used in the study. Rigid bed models cannot predict morphological changes.
- The model for Katragada Side Weir should depict Mobile Bed conditions; preferably undistorted or with minimum distortions. (Ref: Inter-state meeting held on 22.1.2008 at Bhubaneswar)
- For morphological studies, dominant discharge should be considered with “bank full” conditions. (Ref: Inter-state meeting held on 22.1.2008 at Bhubaneswar)
- The effect of sediment inflow has not been considered.

23

Impacts of Side Weir

- The discharge over side weir is unpredictable. There are several formulae for discharge over the Side weir with varying coefficient of discharges.
- The length of Side weir is 300m which is almost equal to the river width at this site.
- The side weir height kept 0.70m above average bed level in the calculations (Demarchi equation).
- In the DPR-2006 AP has taken river width to be 165m and height of the side weir to be 0.70m in the calculations (Demarchi equation).
- The tendency of the river at the weir site is to deposit the sand on the left bank. The aggradation of river bed is clearly visible from the right bank. The flow conditions and the river cross section is very conducive to divert a large quantity of water on the right bank and to take it away from the main river thus, depriving the flow of water in the main river.

24

▪ Whenever there is a lateral flow through the side weir, there is a reduction of flows in the main river. Due to reduction of flows in the main river, the sediment carrying capacity of the river is reduced due to slower velocities and results in deposition of sediment at the downstream end of side weir. This phenomenon continues for a long period and ultimately result in aggradation of river bed in the downstream of the weir consequently allowing all the lean flows in to the side weir.

▪ Thus the side weir proposal is infeasible in terms of technical, economical and environmental considerations and not acceptable to Odisha

25

▪ At the proposed site of side weir at Katragada, the river bifurcates into two courses with a high ground in between, thus facilitating the low flows hugging the left side (Orissa State) as well as the right side of the river (Andhra Pradesh side). The river at Katragada is narrow and there is a natural saddle at Katragada. When the river discharges water above berm level, the river spills over right side bank and again join the river at downstream point. This particular site is selected for the purpose of diverting the river flood water into the proposed flood flow canal duly utilizing the natural saddle on the right margin.

▪ The bypass channel in which the river flows during floods can be seen clearly in the Google map.

26

Joint Surveys Conducted by Govt. of Andhra Pradesh & Odisha under the guidance of CWC

- As per Orders of VWDT, Joint surveys have been conducted in the reach 15 Km upstream to 10 Km downstream of proposed Neradi barrage location under the guidance of CWC

27

Mathematical Model studies of Neradi barrage conducted by CWPRS (Technical Report No. 5098 of August 2013)

- To limit the acquisition of land in Odisha territory to 106 Acs, A.P has proposed a masonry protection wall of 3.8 Km length. This has not been considered in the mathematical model study to know the extent of backwater effect.
- The sediment load movement has not been considered in the study.
- The Calibration of the Model was done with water levels observed in 1980 for the maximum flood with the cross sections of river taken in the year 2013 instead of using the cross sections at that time. This is not acceptable.

28

- Fresh cross sections could not be compared with the earlier cross sections as stated by CWPRS and at the same time CWPRS stated that there is no variation in the cross sections taken now and the earlier ones. These two statements are contradicting to each other.
- When comparison of the old and new cross sections was not possible, It is not correct to say that there is no variation in the cross sections.

29

Other Observation

- The crest level of Side Weir is kept at 70.40m which is 0.9m above the average bed level 69.50m as per drawings. But the fresh cross sections taken during May 2013 indicates that the average bed level is 72.53m (2 km u/s of Neradi Barrage)which is above the crest level of the side weir.
(Refer : Table-2 ,P-6 of CWPRS T.R.No.5098 Aug 2013).

The Tribunal has allowed Andhra Pradesh to draw 8 TMC of water but the working tables indicates that the drawl over side weir is more than 8 TMC in 18 out of 26 years. A table extracted from working tables is given below.

(Ref: Hydrology & Water Requirement of Phase-II of Stage-II Volume 2006 , P-15-40).

30

Year	Drawl through FFC (TMC)	*Drawl > 8.0 TMC
1972-73	15.04	*
1973-74	4.66	
1974-75	3.11	
1975-76	28.1	*
1976-77	25.89	*
1977-78	7.541	
1978-79	22.34	*
1979-80	15.59	*
1980-81	14.61	*
1981-82	21.77	*
1982-83	11.59	*
1983-84	22.3	*
1984-85	4.22	
1985-86	14.07	*
1986-87	11.301	*
1987-88	0.88	
1988-89	16.697	*
1989-90	11.38	*
1990-91	49.8	*
1991-92	39.4	*
1992-93	38.13	*
1993-94	6.27	
1994-95	30.34	*
1995-96	32.536	*
1996-97	6.453	
1997-98	7.95	

31

Lift from Gotta Barrage

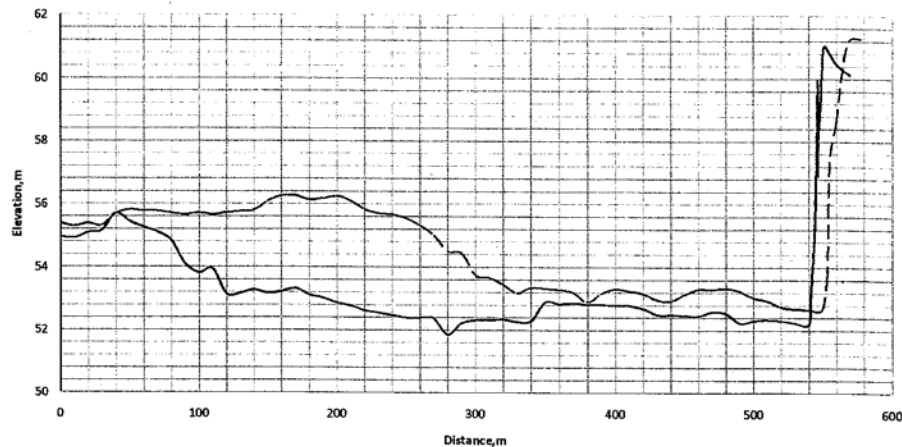
- Alternatively Andhra Pradesh should plan to lift 8TMC from Gotta Barrage to Hiramandalam keeping reservoir level for a live Storage to 8TMC. The lift head will be considerably reduced and lift will be techno-economically viable without any inter state ramifications.

32

Aggradation of River bed at Kashinagar

Comparison of Aggradation at Kashinagar Due to Construction of Gotta Barrage

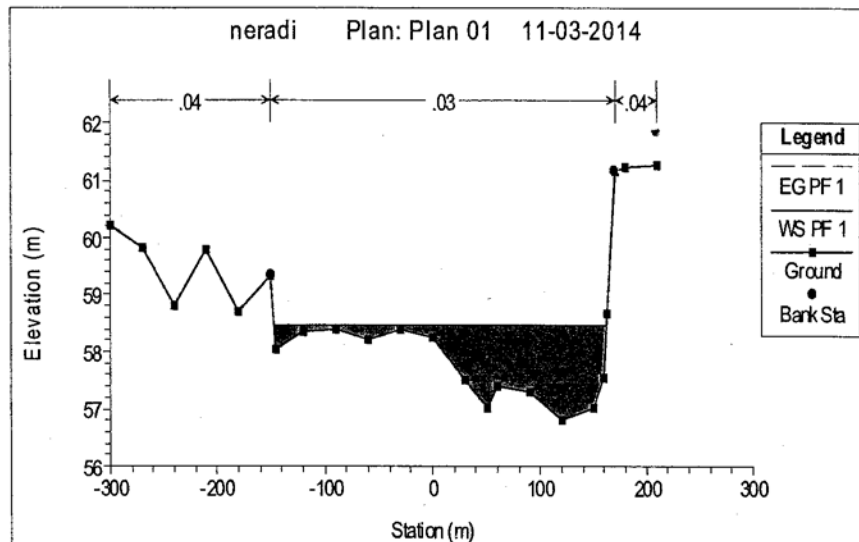
A comparison of the cross section of river taken at Kashinagar in the year 1980 and 2012 clearly indicated that there is visible aggradation at the site.



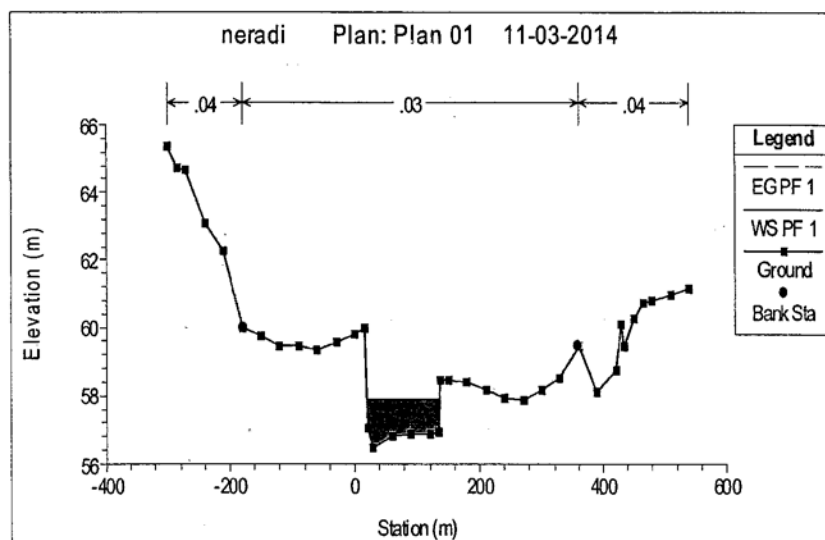
33

Water levels for a flow of 4000 cusecs at different cross sections in river Vansadhara

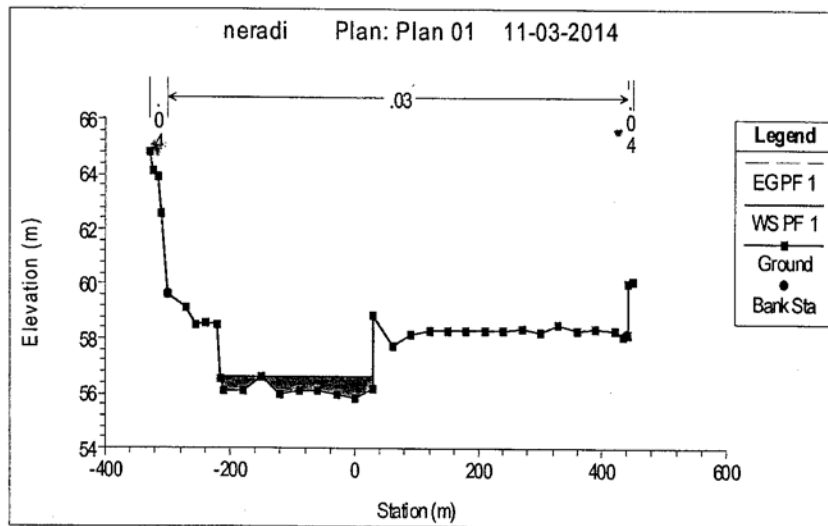
- The Water levels at different cross sections in river Vansadhara are shown in subsequent slides when a discharge of 4000 cusecs is simulated through the mathematical model, HEC-RAS.



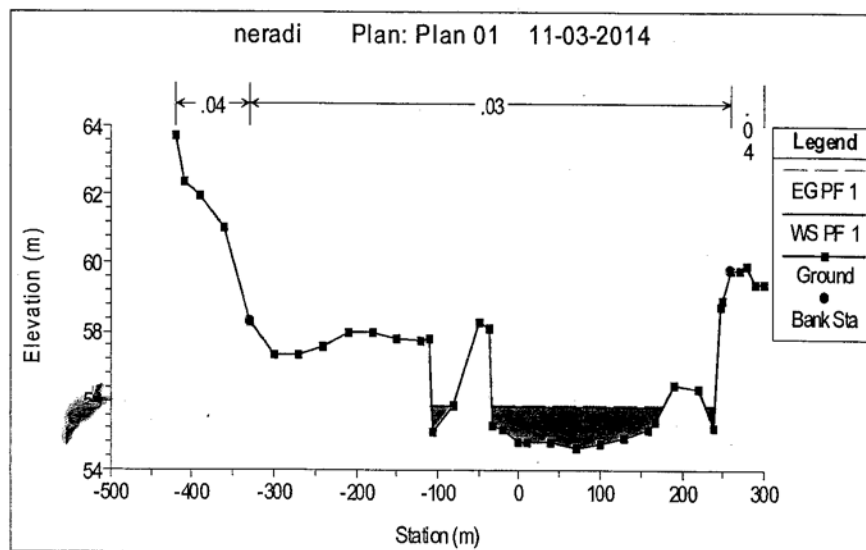
Cross-section at 11.0 km d/s of Neradi barrage



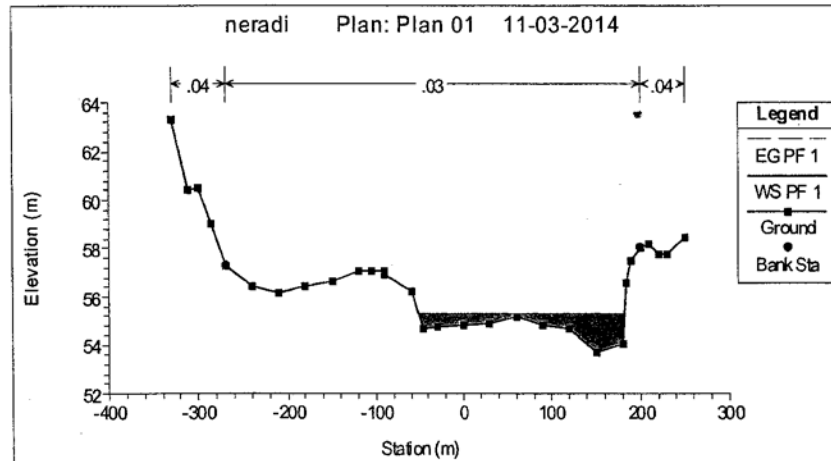
Cross-section at 12.0km d/s of Neradi barrage



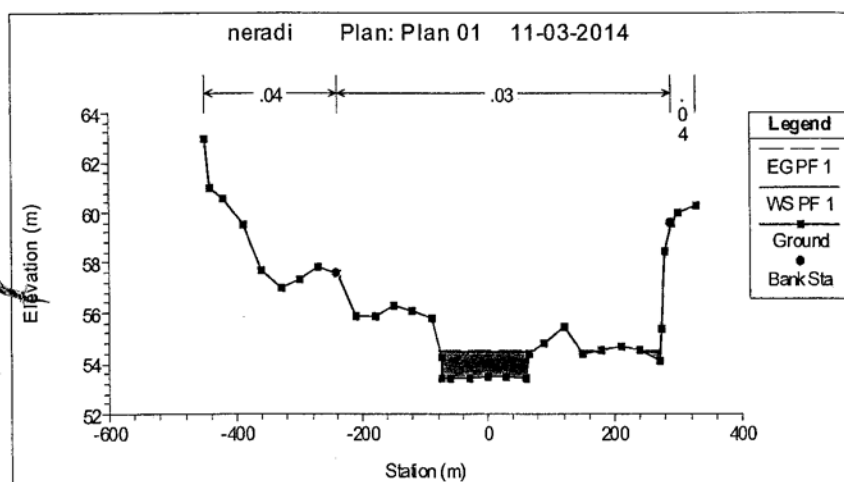
Cross-section at 13.0 km d/s of Neradi barrage



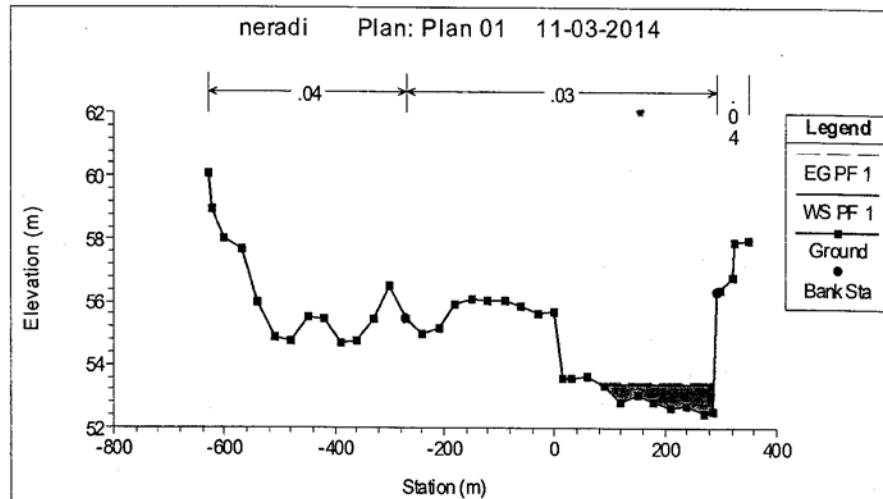
Cross-section at 14.0km d/s of neradi barrage



Cross-section at 15.0 km d/s of Neradi barrage



Cross-section at 16.0km d/s of Neradi barrage



**Cross-section at 17.0km d/s of Neradi barrage
(Kashinagara CWC gauging site)**

Conclusions

- Water utilisation by Govt. of A.P and Govt. of Odisha is linked to the estimation of water availability on a realistic manner based on long-term observed flow data at kashinagar and computing the availability at Gotta and for the basin as a whole.
- Sharing of water would be on 50:50 basis.
- Andhra Pradesh should reformulate the Neradi barrage proposals to keep back water in upstream to 3km and submergence to confine to 106 Acres and using jointly surveyed fresh cross sections.
- As a temporary measure Andhra Pradesh may think of alternatives within its territory.

THANK YOU

43

**Presentation
on**

**MAHANADI & EASTERN RIVERS
ORGANISATION (MERO)**

**CENTRAL WATER COMMISSION
BHUBANESHWAR (ODISHA) .**

18/19.03.2014

CENTRAL WATER COMMISSION
MAHANADI & EASTERN RIVERS ORGANISATION

ORGANISATIONAL SET UP

MAHANADI & EASTERN RIVERS ORGANISATION
 Bhubaneswar
 Chief Engineer

Office of the Chief Engineer
 M&ERO, Bhubaneswar
 Superintending Engineer (Co-ordination)

Hydrological Observation Circle
 Bhubaneswar
 Superintending Engineer

Monitoring & Appraisal Directorate
 Bhubaneswar
 Director

Eastern Rivers Division
 Bhubaneswar
 Executive Engineer

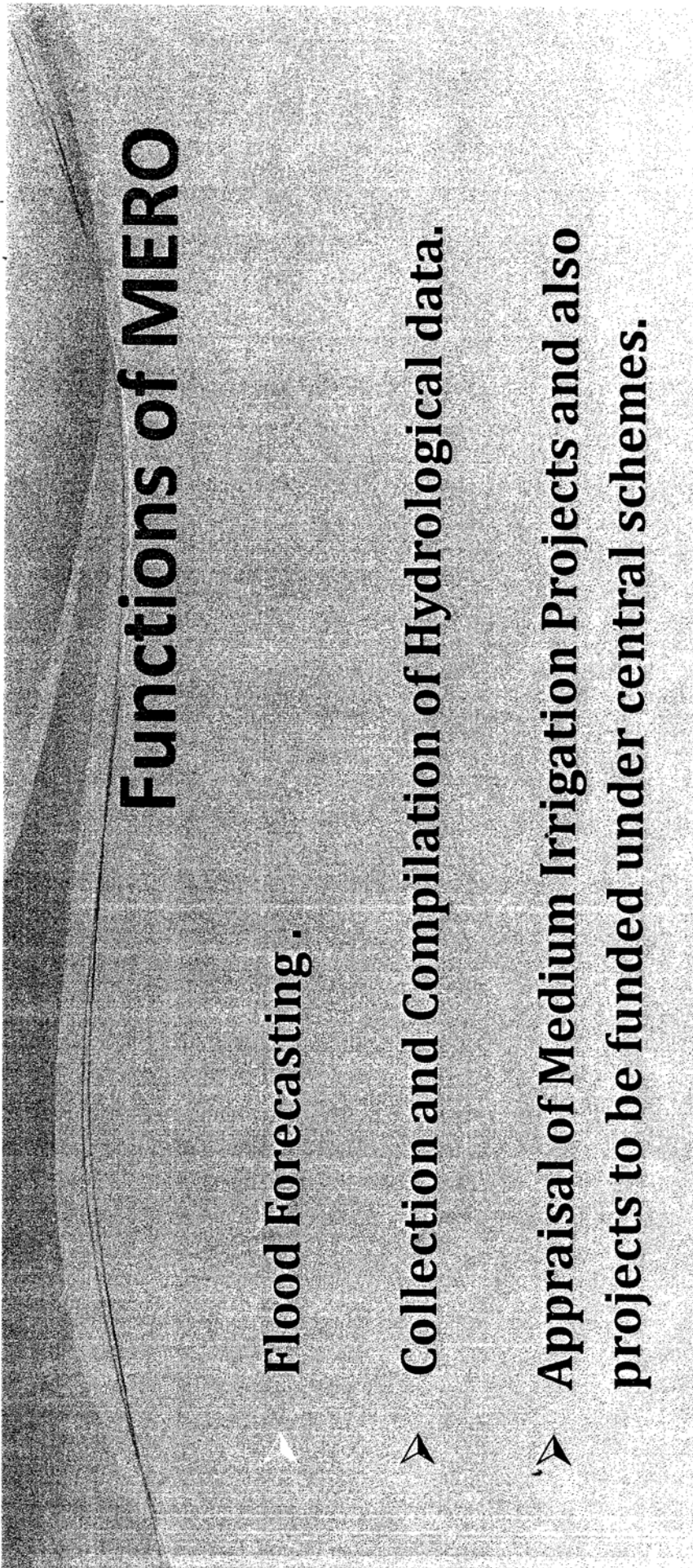
Baitarni Sub-division, Bhubaneswar
 Subarnarekha Sub-division, Balasore
 Brahmani Sub-division, Rourkela
 Vamsadhara Sub-division, Berhampur

Mahanadi Division
 Burla
 Executive Engineer

Upper Mahanadi Sub-division, Raipur
 Middle Mahanadi Sub-division-I, Raipur
 Middle Mahanadi Sub-division-II, Burla
 Lower Mahanadi Sub-division, Bhubaneswar

River Basins under MERO

- Mahanadi
- Baitarni
- Brahmani
- Subarnarekha
- Vamsadhara
- Burhabalang
- Rushikulaya
- Sarada
- Nagavali



Functions of MERO

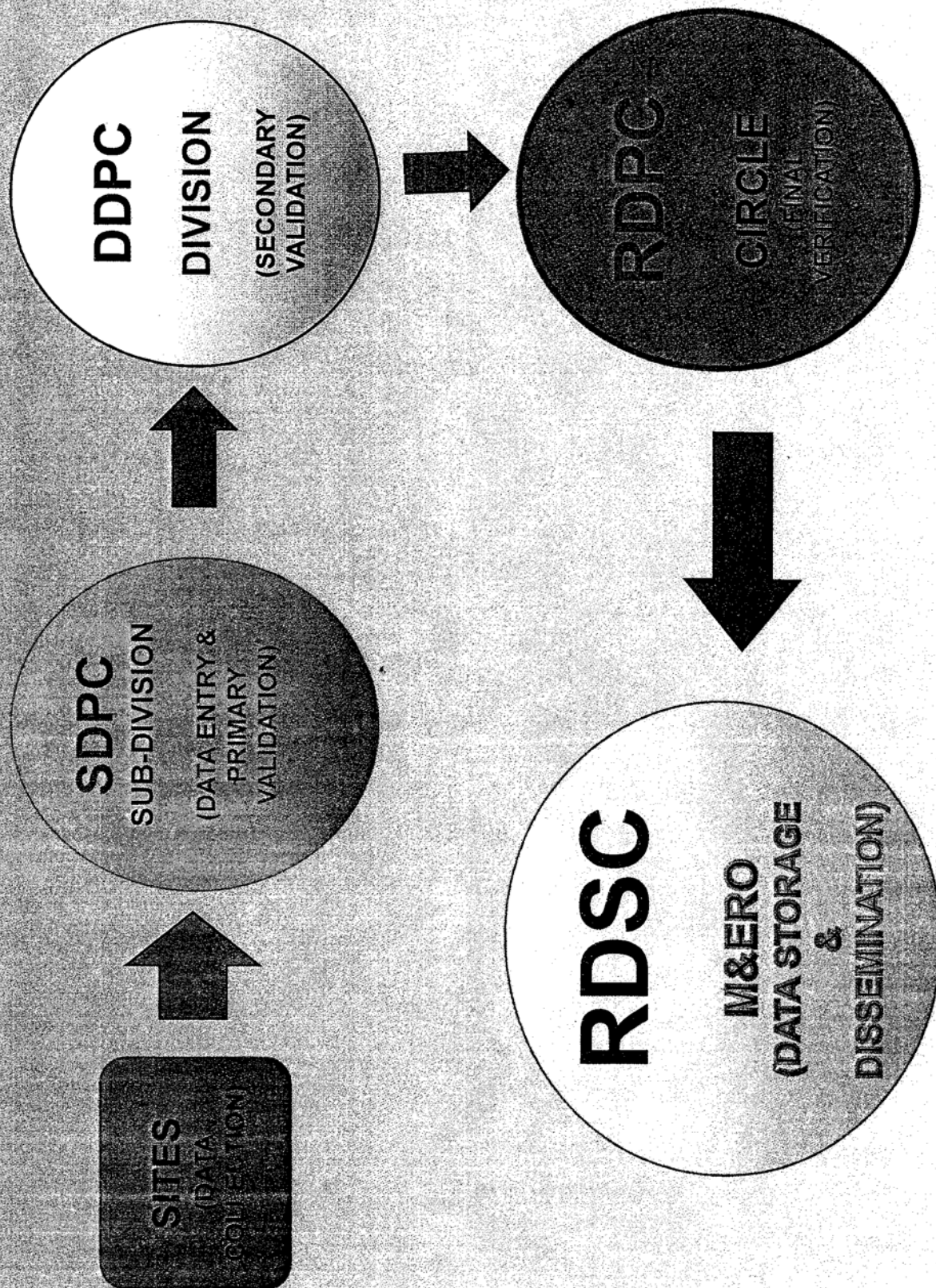
- Flood Forecasting .
- Collection and Compilation of Hydrological data.
- Appraisal of Medium Irrigation Projects and also projects to be funded under central schemes.
- Monitoring of projects under Accelerated Irrigation Benefit Program (AIBP), FMP, CADWM, etc. of Odisha
- Coordination with the State Government of Odisha

SITES UNDER M&ERO

	RF	G(S)	G	GD	GQ	GDQ	GDSQ	TOTAL
MAHANADI DIVISION	06	03	17	01	-	01	19	47
EASTERN RIVERS DIVISION	01	02	14	03	01	01	17	39
TOTAL	07	05	31	04	01	02	36	86

RF : RAINFALL
 G(S) : GAUGE (SEASONAL)
 G : GAUGE
 GD : GAUGE & DISCHARGE
 GQ : GAUGE & WATER QUALITY
 GDQ : GAUGE, DISCHARGE & WATER QUALITY
 GDSQ : GAUGE, DISCHARGE, SILT & WATER QUALITY

DATA FLOW PATTERN



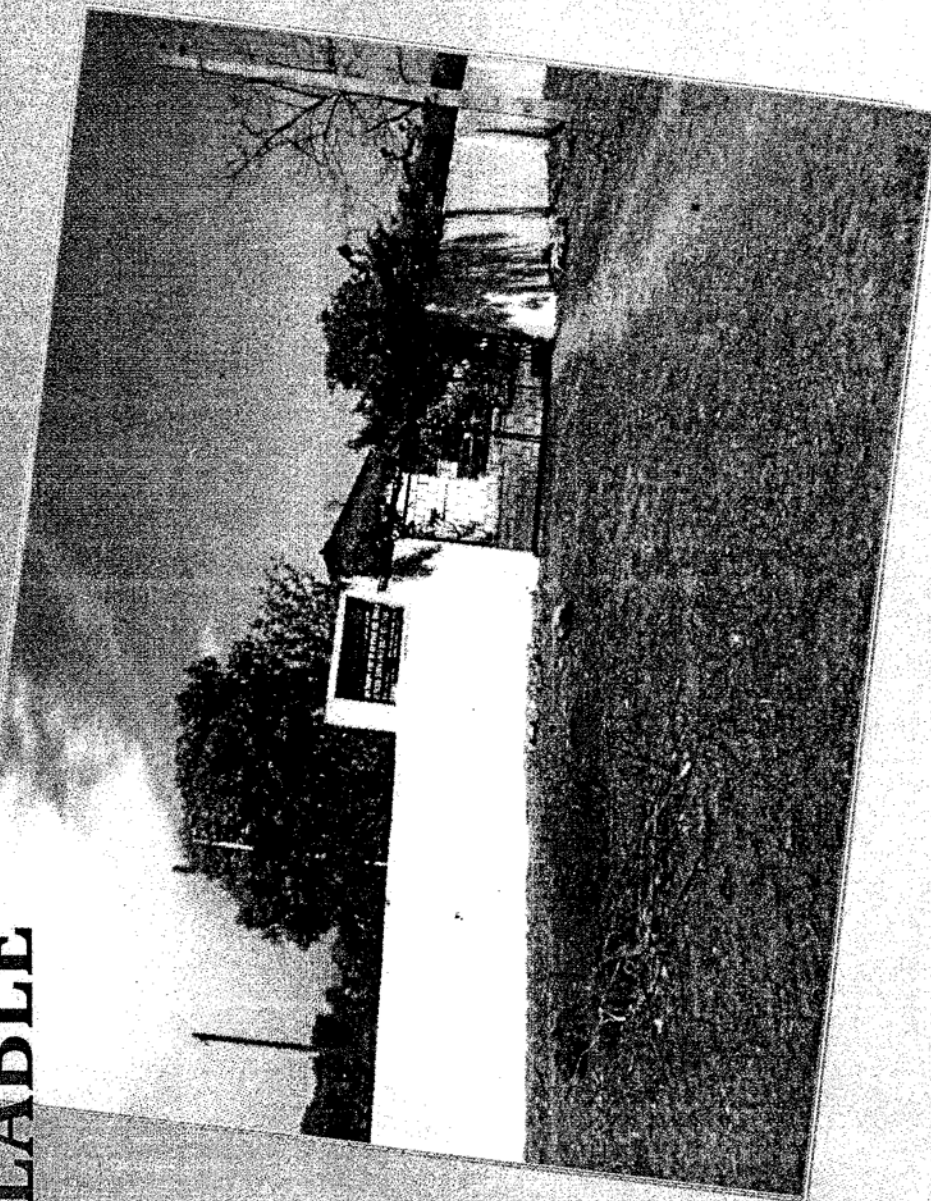
DATA AVAILABLE

HYDROLOGICAL

- GAUGE
- DISCHARGE
- SEDIMENT LOAD
- WATER QUALITY
- CROSS SECTIONS

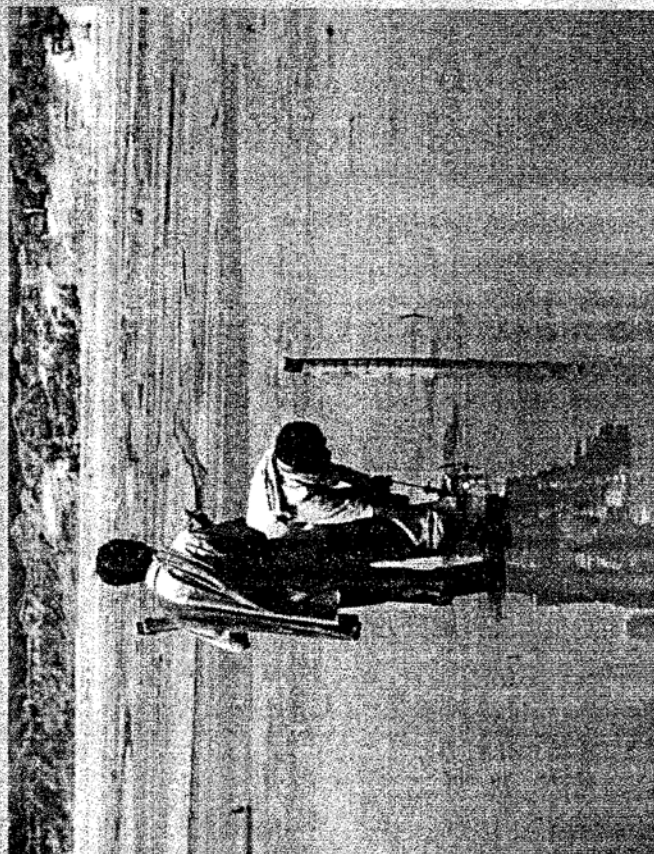
METEOROLOGICAL

- RAINFALL
- TEMPERATURE
- WIND SPEED & DIRECTION
- EVAPORATION

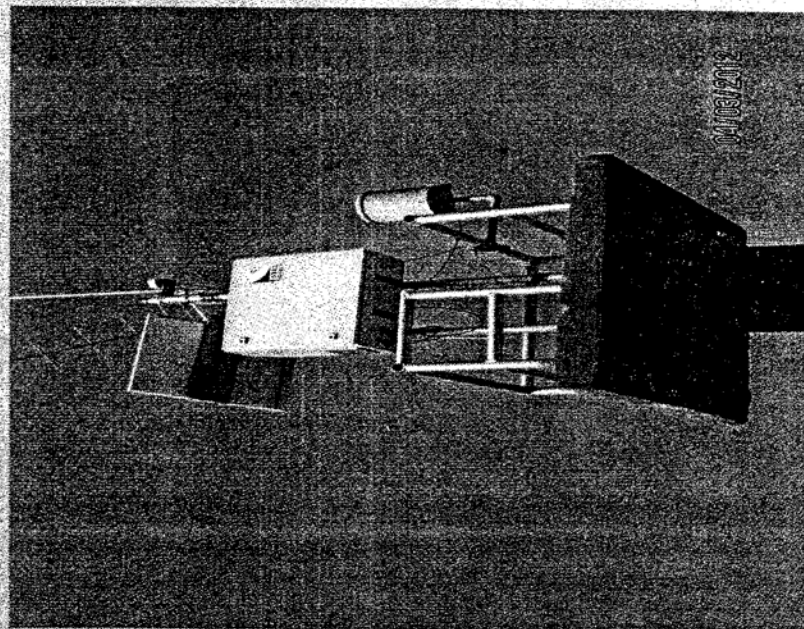


METHOD OF OBSERVATION

- MANUAL



- AUTOMATIC



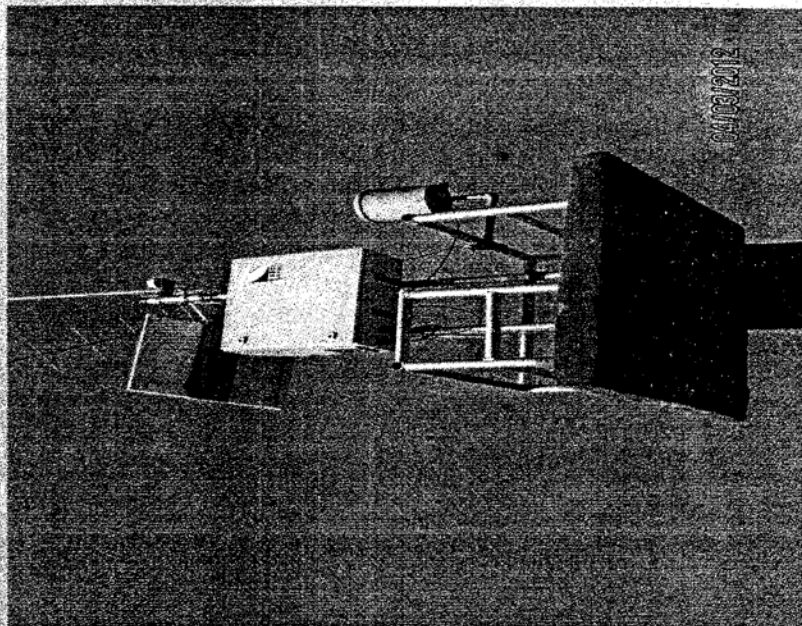
DATA AVAILABILITY

- **PUBLISHED DATA - YEAR BOOKS
(AVAILABLE UPTO 2011-12)**
- **STORED DATA - SWDES DATA BASE
(AVAILABLE UPTO 2012-13)**

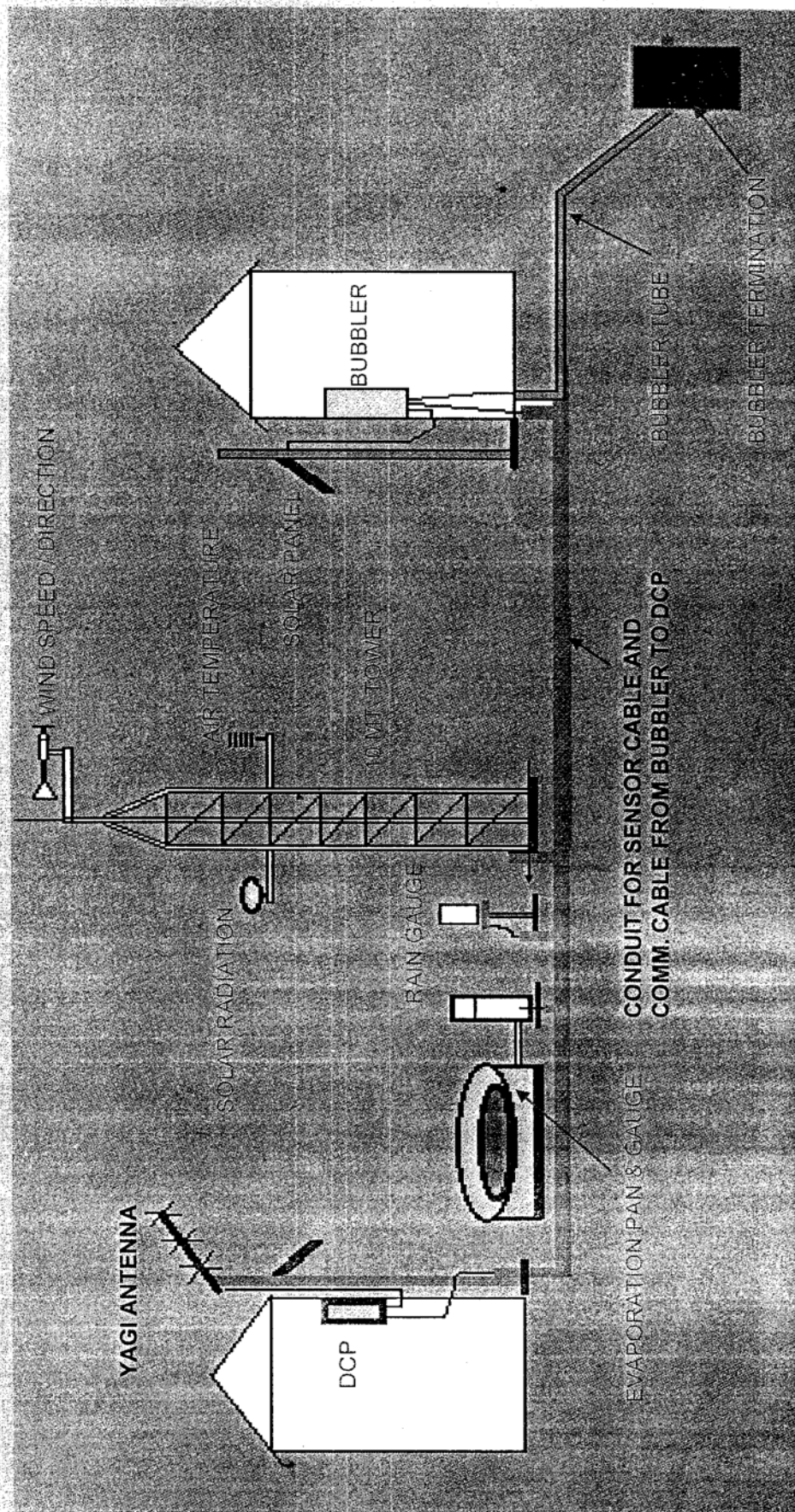
AUTOMATION OF COLLECTION OF DATA TELEMETRY

NO. OF TELEMETRY STATIONS INSTALLED:

ESTERN RIVERS DIVISION	
COMPLETED	- 34
UNDER PROGRESS	- 04
MAHANADI DIVISION	
COMPLETED	- 46
UNDER PROGRESS	- 01
TOTAL	- 85



TELEMETRY SYSTEM – SCHEMATIC LAYOUT



FLOOD FORECAST



• INFLOW FORECAST

• LEVEL FORECAST

FLOOD FORECAST IN 7 RIVER BASINS

- **Subarnarekha**
- **Burhabalang**
- **Baitarani**
- **Brahmani**
- **Mahanadi**
- **Rushikulya**
- **Vamsadhara**

FLOOD FORECAST

INFLOW FORECAST SITES

HIRAKUD RESERVOIR
GOTTA BARRAGE

LEVEL FORECAST SITES

NARAJ
NIMAPARA
ALIPINGAL
RAJGHAT
NH5 GOVINDPUR
AKHUAPADA
ANANDPUR
JENAPUR
KASHINAGAR
GUNUPUR
PURUSHOTTAMPUR



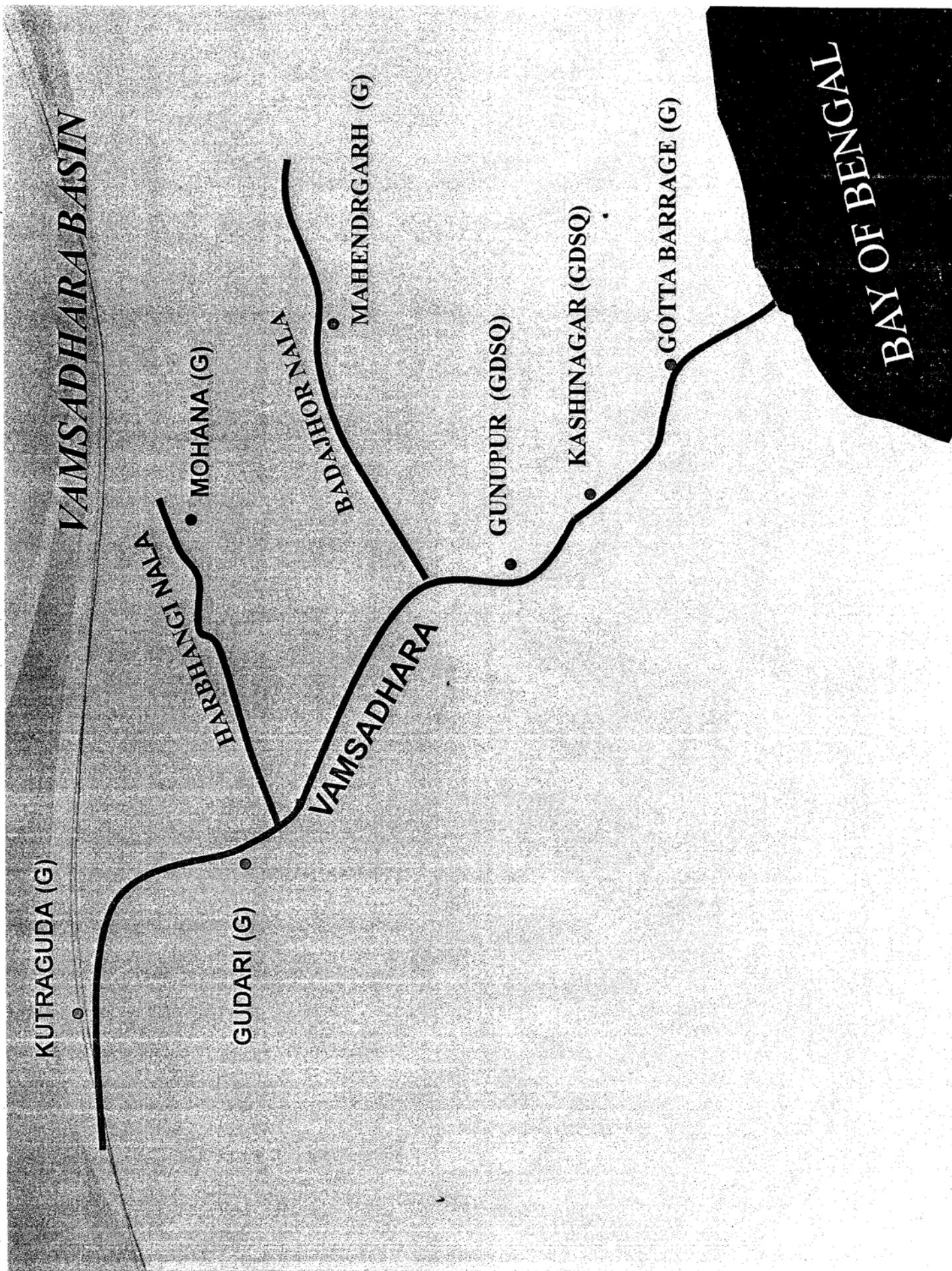
Details of Level Forecast Sites

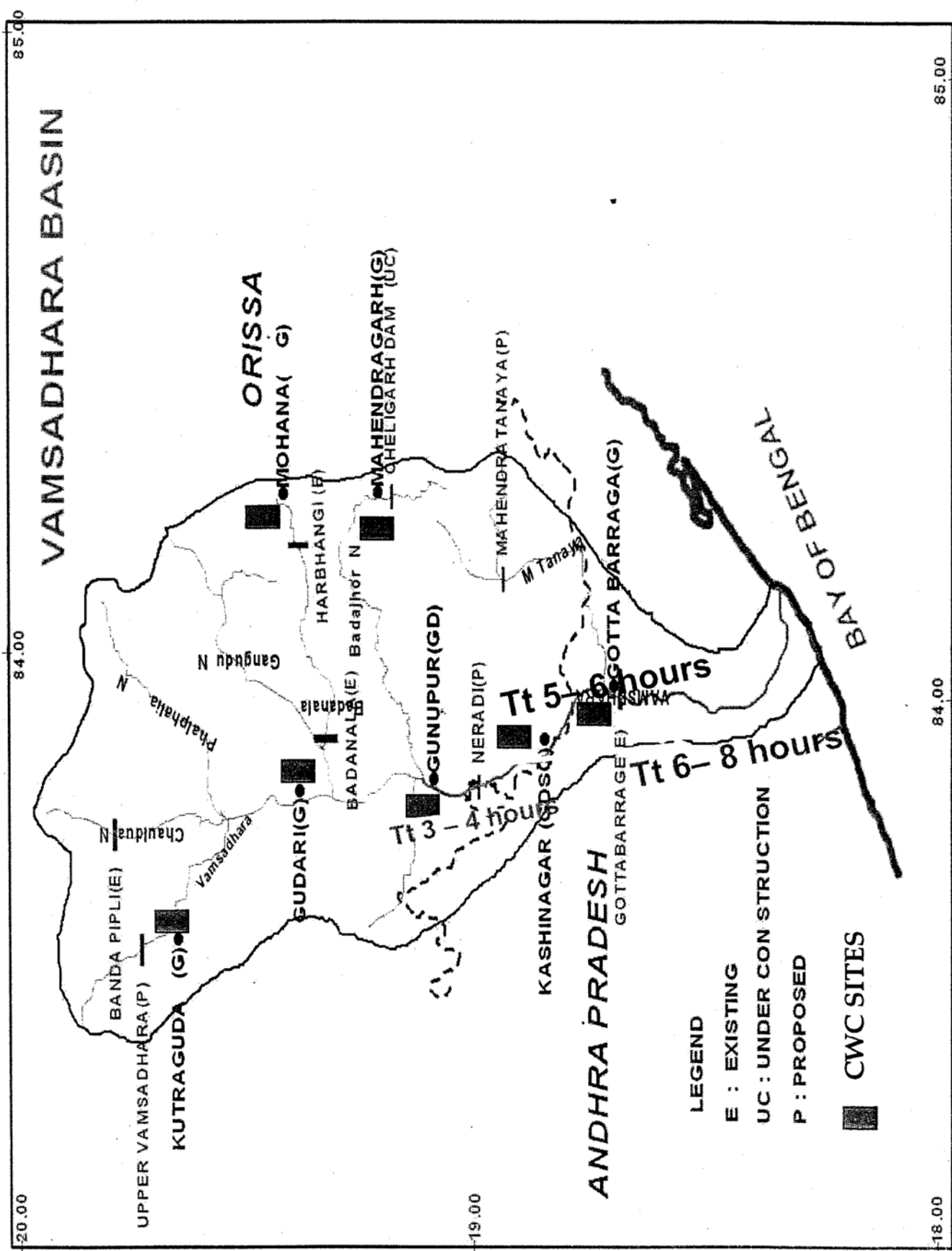
Sl. No.	Name of site	River/ Tributary	Forecast level (m)	Present level (m)	LEHL (m)	Date of Occurrence
1.	NH-5 Road Bridge	Burhabalang	07.21	08.13	09.50	12.10.73
2.	Rajghat	Subarnarekha	09.45	10.36	12.69	19.06.08
3.	Nimapara	Mahanadi/ Kushabhadra	09.85	10.76	11.60	31.08.82
4.	Alipingal	Mahanadi/ Devi	10.85	11.76	13.11	11.09.11
5.	Purushottampur	Rushikulya	15.835	16.835	19.655	04.11.90
6.	Akhuapada	Baitarani		17.83	21.95	16.08.60
7.	Jenapur Expressway	Brahmani	22.00	23.00	24.78	20.08.75
8.	Naraj	Mahanadi	25.41	26.41	27.61	31.08.82
9.	Anandpur	Baitarani	37.44	38.36	41.35	23.09.11
10.	Kashinagar	Vamshadhara	53.60	54.60	58.935	18.09.80
11.	Gunupur	Vamshadhara	83.00	84.00	88.75	17.09.80

Details of Inflow Forecast Sites

Sl. No.	Name of site	River	HFL (m)	Forecast starts after discharge (cumecs)
1.	Hirakud	Mahanadi	192.02	1133
2.	Gotta Barrage	Vamshadhara	39.87	1133

VAMSADHARA BASIN





TOTAL NO. OF SITES : 7

GDSQ - 2

G - 5

, Flood Forecasting Station : 3

BASIN DESCRIPTION

Sl. No.	Name of State	Catchment Area (sq. km)	Percentage of total catchment area
1.	Odisha	8,015	74
2.	Andhra Pradesh	2,815	26.
	Total	10,830	100

DETAILS OF SITES IN OPERATION UNDER VAMSADHARA BASIN

Sl. No.	Station Name	River/ Tributary	Code No.	Type	Latitude	Longitude
1.	Gottabarrage	Vamsadhara		G	18 42' 00"	83 57' 00"
2.	Gudari	Vamsadhara		G	19 23' 00"	83 48' 00"
3.	Gunupur	Vamsadhara	AV000K9	GDSQ	19 05' 00"	83 49' 00"
4.	Kashinagar	Vamsadhara	AV000J4	GDSQ	18° 50' 49"	83° 57' 04"
5.	Kutragada	Vamsadhara		G	19° 36' 48"	83° 33' 33"
6.	Mahendragarh	Badajore		G	19° 13' 19"	84° 15' 55"
7.	Mohana	Harbhangi		G	19° 26' 40"	84° 16' 21"

DETAILED HISTORY OF SITES IN VAMSADHARA BASIN

Sl. No.	Name of Site (River/ Catchment area in Sq. Km.)	Type of Site	Date of Establishment
1	Kutragada (Vamsadhara / 663)	G W/L	G : 02-07-78 W/L : 24-07-79
2	Gudari (Vamsadhara / 3,172)	G W/L	G : 08-06-87 W/L : 28-06-87
3	Mohana (Harbangi / 147)	G W/L	G : 26-05-87 W/L : 16-07-87
4	Mahendragarh (Badajora / 185)	G W/L	G : 01-06-87 W/L : 25-06-87
5	Gunupur (Vamsadhara / 6,740)	GDSQ W/L (Boat with O.B.Eng.)	G : 19-04-78 D : 01-06-89 W/L : 18-08-78
6	Kashinagar (Vamsadhara / 7,820)	GDSQ W/L (Boat with O.B. Eng.)	G : 20-03-71 D : 28-04-71 S : 13-10-72 Q : 01-09-72 W/L : 18-07-85
7	Gotta Barrage (Vamsadhara / 9,300)	G W/L	G : 01-06-77 W/L : 16-07-87

GDSQ DATA AVAILABILITY

Sl. No.	Station Code No.	Station Name	Type	Data Available From
1.	AV000K9	Gunupur	G&D	G -19.04.78 D -01.06.89
2.	AV000J4	Kashinagar	GDSQ	G -20.03.71 D -28.04.71 S - 13.10.72 Q -01.09.72

THANK YOU

Annexure - VI

LIST OF PARTICIPANTS DURING THE SITE VISIT ON 21.03.2014

I V.W.D.T. TEAM

1. Justice Dr. Mukandakam Sharma, Hon'ble Chairman.
2. Justice B.N. Chaturvedi, Hon'ble Member
3. Justice Ghulam Mohammed, Hon'ble Member
4. Shri A.D. Bhardwaj, Assessor
5. Shri S.K. Sinha, Assessor
6. Shri B.V. Sharma, Registrar

II ANDHRA PRADESH

A TECHNICAL TEAM

1. Sri M. Venkateshwar Rao, Engineer-in-Chief
2. Sri K. Jalandhar, Chief Engineer
3. Sri A. Ramakrishna Rao, Chief Engineer
4. Sri B. Nagendra Rao, Superintending Engineer
5. Sri B. Rambabu, Superintending Engineer
6. Sri L.V. Ramana Murthy, Executive Engineer, IS&WR

B LEGAL TEAM

1. Sri C.S. Vaidyanathan, Sr. Advocate
2. Sri A. Satya Prasad, Sr. Advocate
3. Sri S. Satya Narayana Prasad, Sr. Advocate
4. Sri B. Bhaskar Rao, AGG
5. Sri M. Vishnu Vardhan Reddy, Advocate
6. Sri Y. Rajagopala Rao, AOR

III ODISHA

TECHNICAL TEAM

1. Sri R.N. Swain, Chief Engineer
2. Sri Dhiresh Chandra Das, Executive Engineer

Annexure- VII

**LIST OF THE PARTICIPANTS IN THE TECHNICAL PRESENTATION HELD AT
HYDERABAD ON 24.03.2014**

I V.W.D.T. TEAM

1. Justice Dr. Mukandakam Sharma, Hon'ble Chairman.
2. Justice B.N. Chaturvedi, Hon'ble Member
3. Justice Ghulam Mohammed, Hon'ble Member
4. Shri A.D. Bhardwaj, Assessor
5. Shri S.K. Sinha, Assessor
6. Shri B.V. Sharma, Registrar

II ANDHRA PRADESH

A TECHNICAL TEAM

1. Sri V. Nagi Reddy, Principal Secretary (Projects)
2. Sri M. Venkateswara Rao, Engineer-in Chief
3. Sri A. Ramakrishna Rao, Chief Engineer, IS&WR
4. Sri K. Jalandhar, Chief Engineer, North Coast Project
5. Sri B. Rosaiah, Chairman (TAC)
6. Sri Routhu Satynarayana, Member (TAC)
7. Sri V.V.S. Rama Murthy, Member (TAC)
8. Sri B. Negendra Rao, Superintending Engineer, IS&WR
9. Sri P. Ramakrishna Murthy, Superintending Engineer, Hydrology

10. Sri L.V. Ramana Murthy, Deputy Director (Geo)
11. Sri K Prasad, Deputy Director (KT)
12. Sri G.V. Subramanyam, Executive Engineer (Hydrology)
13. Sri H.S. Suresh, Dy. Executive Engineer (Geo)
14. Smt. L. Gayatri Devi, Dy. Executive Engineer (Geo)
15. Smt. M. Revathi, Dy. Executive Engineer

B LEGAL TEAM

1. Sri S.S. Prasad, Sr. Advocate
2. Sri A. Satya Prasad, Sr. Advocate
3. Sri Badana Bhaskar Rao, Addl. Advocate General
4. Sri M. Vishnu Vardhan Reddy, Advocate
5. Sri Y. Rajagopal Rao, A.O.R.

II ODISHA

A TECHNICAL TEAM

1. Dr. G.N. Yoganarasimhan, Expert
2. Sri C.V. Prasad, Consultant Advisor, Deptt. of Water Resources, Odisha
3. Dr. A.S. Rao, Dy. Director, Project Planning

B LEGAL TEAM

1. Sri S. Das, Advocate

WELCOME

THE HON'BLE CHAIRMAN

AND

THE MEMBERS

OF

THE VAMSADHARA WATER DISPUTES

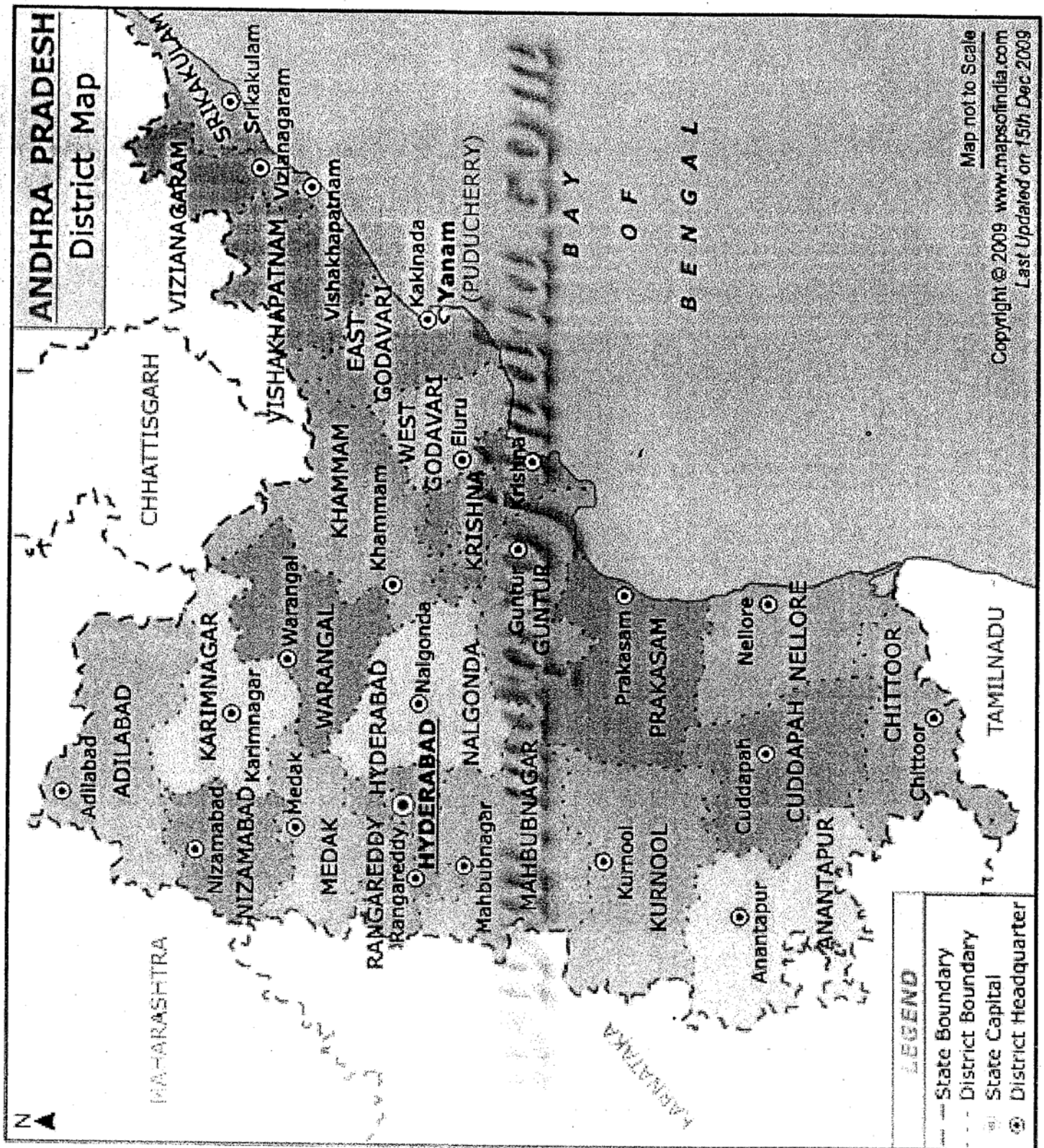
TRIBUNAL

NERADI BARRAGE

PRESENTATION

BY

GOVERNMENT OF ANDHRA PRADESH

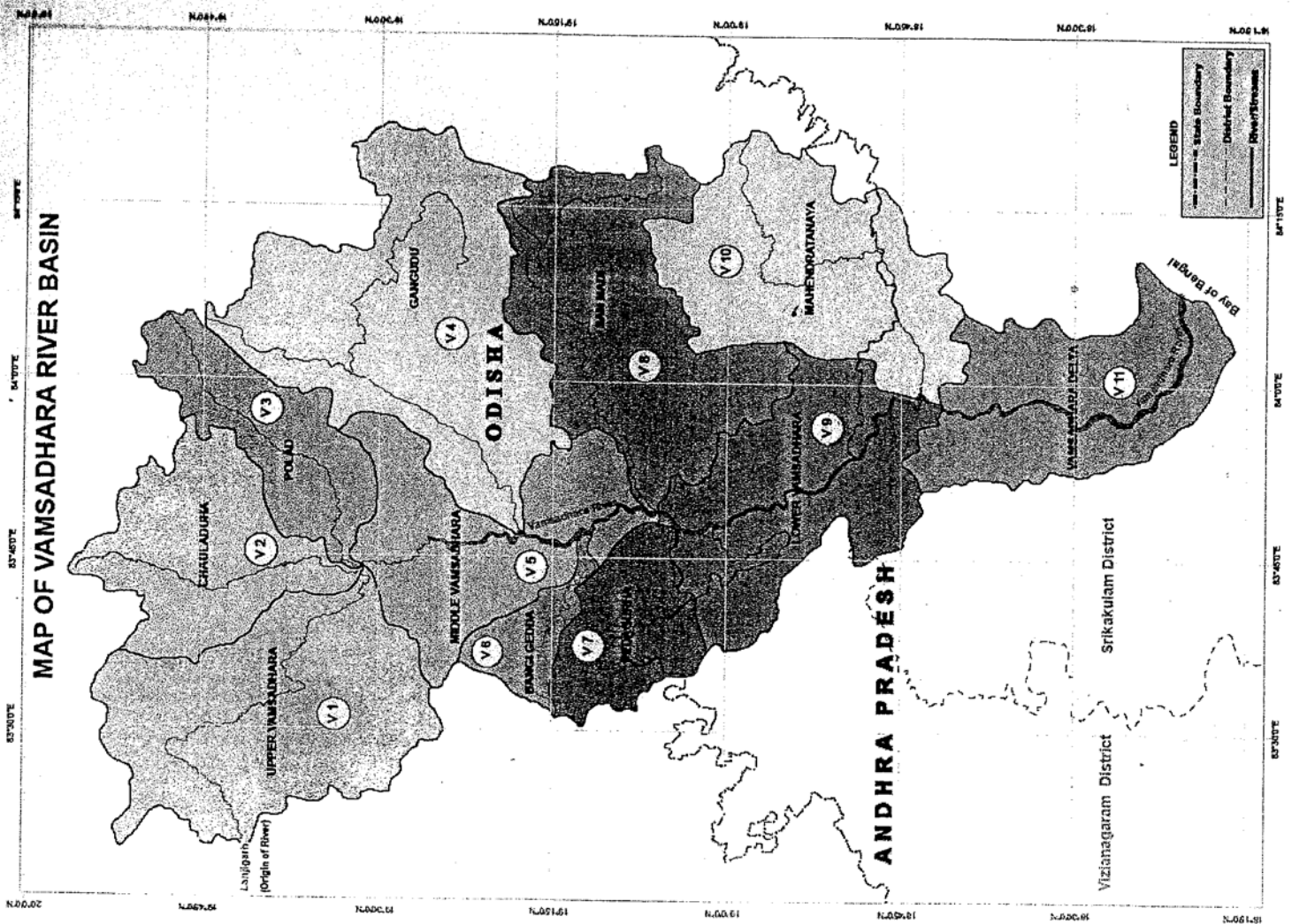


SRIKAKULAM DISTRICT

S No	Description	Area in Acres
1	Geographical area	14,42,300
2	Culturable Area	8,99,000
3	Irrigated Area	5,43,000
4	Forest Area	1,70,000
5	Population	25,37,600 (No' s)
• Most of the population depend on Agriculture. • Srikakulam is one of the most backward districts in AP.		

VAMSADHARA RIVER BASIN

- Vamsadhara River originates in the Eastern Ghats near Lanjigarh of Kalahandi District in Odisha at an elevation of about 1500 m.
- Length of the river in Odisha is 154 km.
- Further it flows as a common boundary of Odisha and A.P. for a length of 29 km. (Km 154 to km 183)
- Remaining length of the river in A.P. is 82 km.



Map Details:

- Bay of Bengal:** Located at the top of the map.
- Vansadhara River:** The main river shown, flowing from the Bay of Bengal towards the south.
- Odisha-Andhra Pradesh Border:** Indicated by a dashed line.
- Key Locations and Distances:**
 - 265.00 km (from Bay of Bengal)
 - 240.00 km
 - 210.00 km (BL + 110 ft)
 - 205.00 km (Mahanadi Barrage)
 - 183.00 km (BL + 157 ft)
 - 159.00 km (BL + 220 ft)
 - 157.00 km (Sala Weir)
 - 154.00 km (BL + 238 ft)
 - 150.00 km (Pongda)
 - 145.00 km (Samsal)
 - 140.00 km (BL + 270 ft)
 - 110.00 km (Hambhalingi)
 - 80.00 km (Pondaka Falls)
 - 77.50 km (Chakras Nalla)
- Other Features:**
 - Right Main Canal
 - Left Main Canal
 - Inter State Border
 - NOT TO SCALE

Sl. No.	Project Name	Location	Length (km)	Width (m)	Height (m)
1	Pongda Dam	150.00 km	1.60	12.00	22.00
2	Samsal Dam	145.00 km	1.60	12.00	22.00
3	Chakras Nalla	77.50 km	1.60	12.00	22.00
4	Pondaka Falls	80.00 km	1.60	12.00	22.00
5	Hambhalingi	110.00 km	1.60	12.00	22.00
6	Mahanadi Barrage	205.00 km	1.60	12.00	22.00
7	Sala Weir	157.00 km	1.60	12.00	22.00

[illegible]

VAMSADHARA IRRIGATION PROJECT

In 1961 Odisha agreed for a barrage at Neradi to irrigate about 1,07,280 **Acres** of land in backward mandals of Bhamini, Kothuru, Heeramandalam, **LN** Peta, Burja, Amudalavalasa, Gara and Srikakulam.

It agreed to provide 106 Acres of land on its side.

The utilisation and requirements of AP were assessed at 54.5 TMC.

The yield in the river was agreed as 115 TMC in 1962.

The yield in the river is agreed to be shared on 50:50 basis.

A sluice on left side was provided at the request of Odisha.

Thus Neradi is a joint project.

CM of Odisha expressed his pleasure that all submersions at Gotta reservoir were avoided. (Vide Annexure 10 to 13)

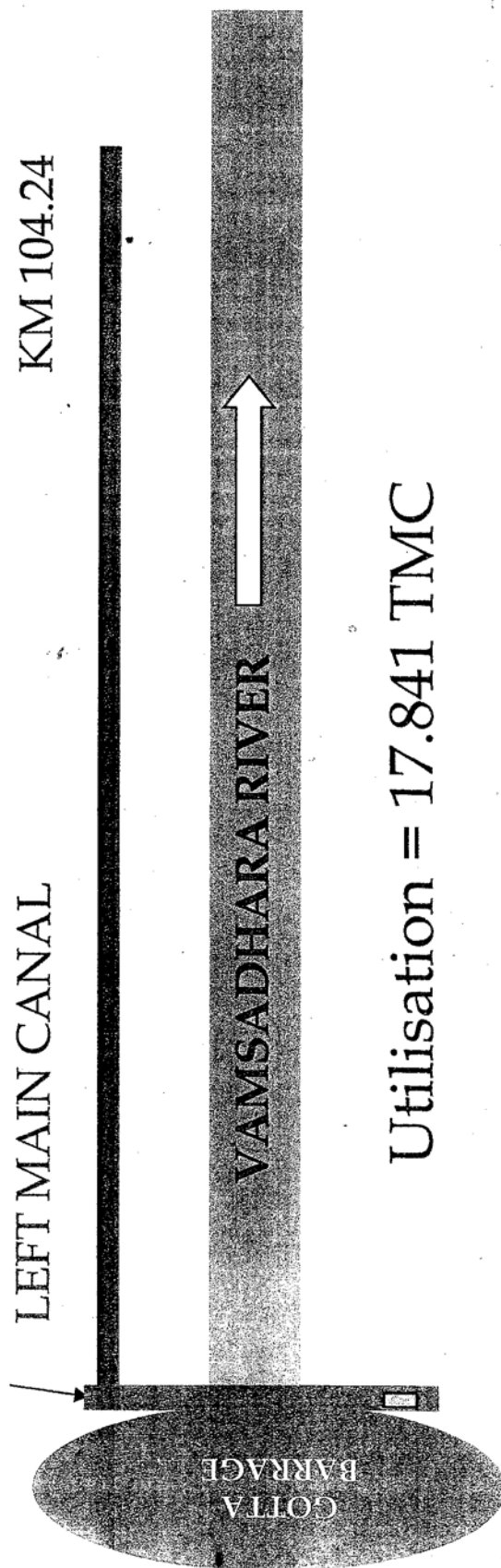
VAMSADHARA PROJECT of 1969

In 1969 On the suggestion of MoWR-Gol, Andhra Pradesh had split its Vamsadhara irrigation Project in two stages.

Barrage at Gotta with an FRL of +125 feet will irrigate 1,48,230 acres on left side.

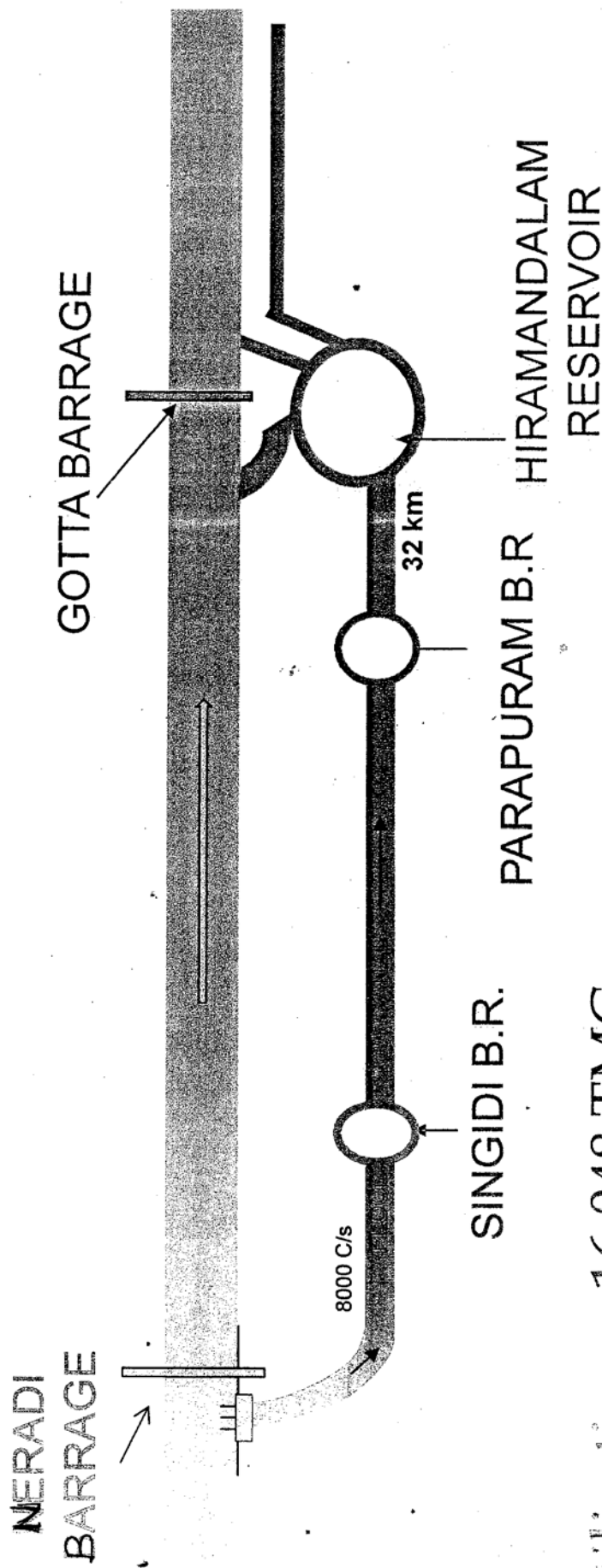
This project is completed and has been in operation since 1978.

This will irrigate 1,48,230 acres on left side of Gotta.



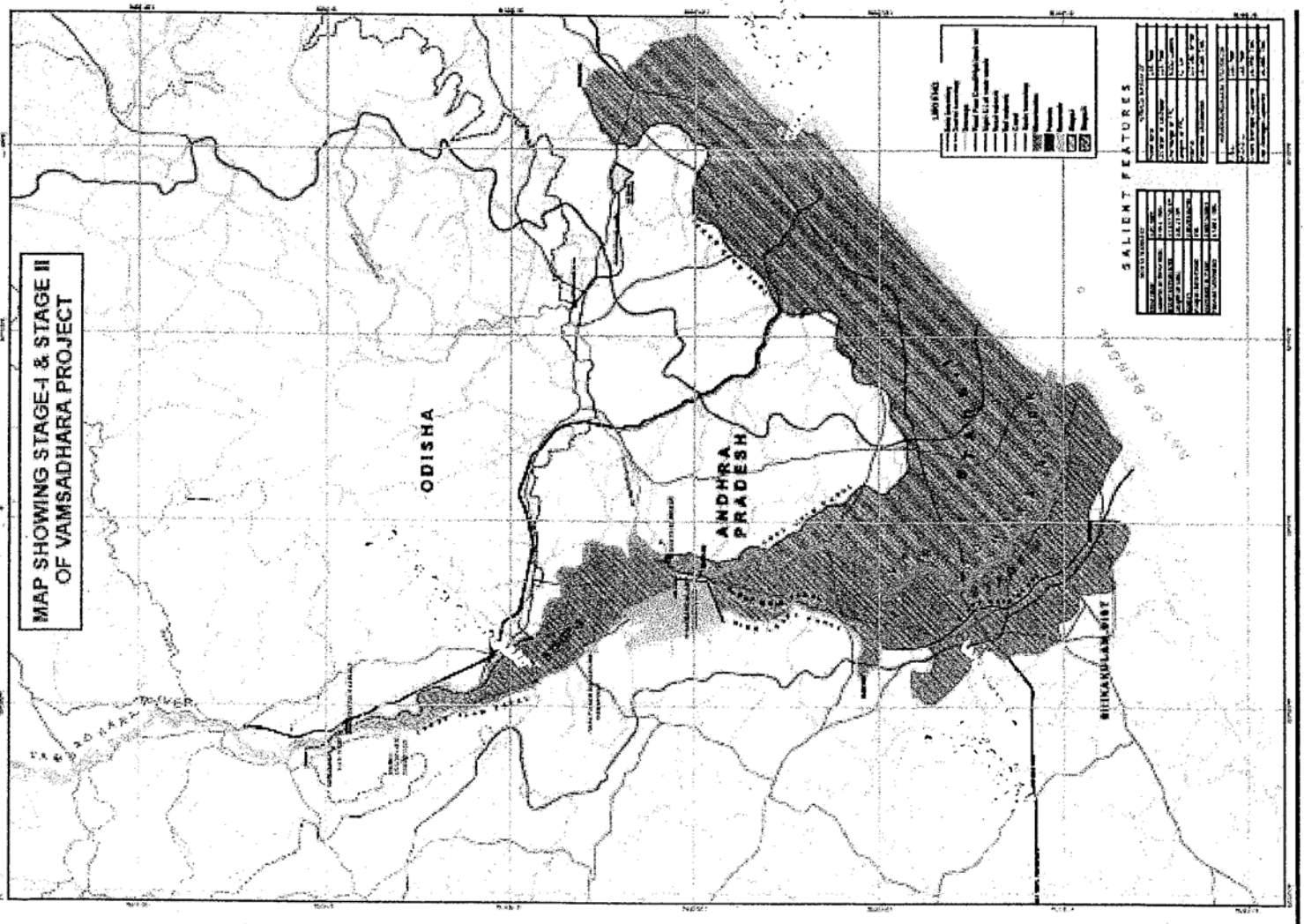
Stage-II:

A Barrage at Neradi with a pond level of +235 feet having a capacity of 0.60 TMC to irrigate 1,07,280 acres besides stabilising the ayacut under the Gotta Barrage.



Utilisation = 16.048 TMC

(Including Drinking needs of about 1 TMC)



SEPTEMBER, 1980 FLOODS

In september 1980 Un-precedented floods occurred to Vamsadhara river.

AP assessed Maximum Flood Discharge as 4.31 lakh cusecs, to which CWC agreed in the Inter-State meeting Dt:-10-01-1984.

Odisha requested that the Neradi barrage has to be redesigned keeping in view 1980 floods.

Neradi Barrage was redesigned to 5 lakh cusecs in consultation with CWC.

However, at the insistence of Odisha, AP had agreed to re-design the barrage for a discharge of 6 lakh cusecs.

Odisha requested for additional protection on its side by constructing/strengthening the embankments on its side.

State of Andhra Pradesh had informed that 1326 acres of land is required for providing additional protection with embankments upto 10.5 Km against 6.0 lakhs cusecs flood.

But Odisha insisted unreasonably to limit land requirement on its side to 106 acres only.

protection Wall proposed to limit Land Acquisition

In 1987-88 AP had proposed a flood protection wall 3.8 km long on the left side of the River to limit the land acquisition on Odisha side to 106 Acres.

S.No	Item	Extent in Acres
1	For catch drain	16
2	For inspection path	03
3	For walk way	01
4	For Masonry protection wall (as shown in the cross section)	4.5
5	River Margin	67
6	For barrage, guide bunds and approach road.	11.5
	Total	103 acres

Protection Wall proposed to limit Land Acquisition

Odisha accepted the plan of flood protection wall, catch drain, outfall structure. (vide annexure 22, Pg 40 of Vol. 3J of SOC of AP)

'Neradi Barrage (Vamsadhara Project Stage-II) was accepted by the TAC of CWC on 04-12-1991. (vide annexure 26)

AGREEMENT ON PROTECTION WALL - LAND REQUIREMENT

In the inter-state meetings held in 1988 and thereafter Odisha agreed that the proposals of the protection wall and design flood calculations are acceptable to it.

Odisha agreed for 3.8Km long protection wall from the Barrage.

Odisha also agreed that, the afflux beyond 3 Km of the protection wall Upstream of the barrage is within permissible limits.

An option was given by CWC to Odisha either to choose 10.5 Km long embankments which require additional land or the protection wall to limit the land acquisition to 106 Acres, Odisha preferred and chose the Protection Wall. (Vide Annexures 22,27,28 and 29)

Mathematical Model Studies

The inspection team of CWC which studied the necessity and purpose of the model studies observed that there is no necessity for taking up Physical Model Studies for studying the behavior of the river to take appropriate decisions for necessary flood protection works in Odisha territory under post-barrage condition.

CWC observed that as regard the possibility of aggradations of the river bed on the back water zone, mathematical model studies can be carried out. (minutes of joint inspection and discussions on Vamsadhara Project Stage-II held on 22-12-1991)

CWPRS Model Studies Report 2013

- This Hon'ble Tribunal during its visit to CWPRS, Pune in May, 2013 ordered for fresh study taking in to consideration, fresh cross sections.
- Fresh cross sections were taken jointly by Andhra Pradesh and Odisha under the guidance of the Officials of CWC.
- CWPRS in consultation with both the states took up fresh model study and compared the Results with the earlier model studies.

Conclusions of CWPRS - 2013 Report

- Back water length after construction of Neradi Barrage would be of the order of 6km upstream of barrage for a discharge of 6 Lakhs cusecs, **which is the same as the results obtained from the earlier Physical Model Studies.**
- As per 2005 CWPRS Study the rise in water level at 6th Km was 16 cm and was nil at 7th km U/s, where as, as per this report it is only 1 cm at 6th km and nil at 7th km.
- It is understood that the river profile has not undergone any significant or adverse changes during the last three decades.

Observations of Andhra Pradesh

- Fresh Studies by CWPRS indicate rise in water level after 1 Km from Barrage which is insignificant.
- Flood of the Order of 6 lakh cusecs may occur once in more than 500 Years. The next highest flood observed was only 2.6 lakh cusecs.
- The backwater effect due to this 2.6 lakh cusecs flood is expected to be insignificant since the Barrage is designed to discharge 6 lakh cusecs flood.
- AP has designed protection wall for an afflux of 45 cm which is more than the afflux assessed in any of the Model Studies.

Observations of Andhra Pradesh

- After the 1980 floods, Odisha has strengthened the flood bank on its side. It has been constructing Protection Wall over the existing embankments and has been taking protective measures on its side by strengthening the embankments, dumping huge boulders etc. into the river on the left side.
- The inundation due to 6 lakh cusecs flood in 1980 lasted for couple of hours. Latest guidelines issued by MoWR suggests that land is to be acquired between FRL and MWL, if duration of submergence exceeds 15 days

Observations of Andhra Pradesh cont...

The latest guidelines of MoWR regarding land acquisition says:

" Generally acquisition may be done up to FRL only. The area between FRL and MWL may be acquired only if the submerged land is fertile and the duration of submergence beyond FRL upto MWL is long enough to cause damage to crops i.e., over 15 days duration (for acquisition of land the effect of backwater need not be taken into consideration)"

Page:108 of Guidelines for preparation of Detailed Project Report of Irrigation & Multipurpose Projects, MoWR,

Contentions of Andhra Pradesh

As per the Agreement dated on 15.01.1987, Chief Ministers of both the states had agreed for taking up the Neradi barrage with acquisition of 106 acres of land in Odisha territory. This agreement was reached consequent of 1980 flood.

With a view to limit the land acquisition as desired by Odisha to 106 acres AP has proposed 3.8 Km long flood protection wall upstream of the Neradi Barrage which was agreed by Odisha in the meeting held on 8th April - 1988. (Annexure 22)

During the meeting on 8.3.1991, AP renewed its offer to extend the embankment up to 10.5 Km in the upstream to prevent any flooding of U/s areas, which unavoidably involve more land acquisition. (Annexure 24)

Contentions of Andhra Pradesh Cont.....

- Secretary (W.R), MoWR asked Odisha to immediately indicate their preference.
- During the next meeting on 22.11.1991, Odisha Government indicated that as per Inter State Agreement, the acquisition of land for works in Odisha should be restricted to 106 acres. (Annexure 25)
- Keeping this in view, Odisha agreed that the proposal for the construction of masonry wall of 3.8 km long was acceptable to it.
- This clearly shows that Odisha had preferred to limit the land acquisition rather than preventing flooding the upstream areas with embankments.

Contentions of Andhra Pradesh Cont.....

- Odisha knows the general norm that the flood of such a huge magnitude of 6 lakh cusecs is of above 500 years return frequency. The improvements it has been making to the existing flood banks on its side after the 1980 flood would adequately protect all the upstream areas on the Odisha side against all probable floods.
- Odisha had not pleaded any damage to their territory by reason of Barrage or its back waters which is evident by the insistence of Odisha to acquire 106 acres land though AP was willing to provide embankments up to 10.5 Km U/s of Barrage.

ADMITTED/EVIDENT FACTS RELATING TO NERADI BARRAGE

The yield in the River is 105 TMC.

Both the States to share the yield on 50:50 basis.

Utilisations/Requirements of AP is 54.5 TMC.

The location of the barrage was agreed.

The ayacut of the barrage was agreed.

The utilisation of river waters through Neradi barrage was agreed.

Since the Barrage is across the River, Odisha had agreed to provide 106 Acres of land after acquiring the same.

The protection wall for 3.8 Km long from the barrage was agreed.

The afflux due to Neradi barrage beyond 3kms from the 3.8Km long protection Wall was agreed to be within permissible limit.

The drawls through Neradi Barrage was agreed to be during the first crop period and all flows thereafter or beyond first December is let down in the river for use by both the States.

ADMITTED/EVIDENT FACTS RELATING TO NERADI BARRAGE – Cont.....

- The contention that Neradi barrage was given up by Andhra Pradesh has no basis and is contrary to the record before the Tribunal.
- The contention that there may be drawls for 2nd crop has no basis and is incorrect as long as Andhra Pradesh is within its share of its water.
- While objecting to this legitimate utilisation of AP, Odisha has been making trans-basin diversions of the river in the upstream.
- While insisting drawls by Andhra Pradesh only for 1st crop, Odisha is claiming (falsely) that on its side it is raising 3 Crops.
- The storage at Neradi is about 0.6 TMC which will not cause any adverse submersion of any area on Odisha side since flood banks are constructed near river margin.
- There will not be any water logging by reason of the storage.

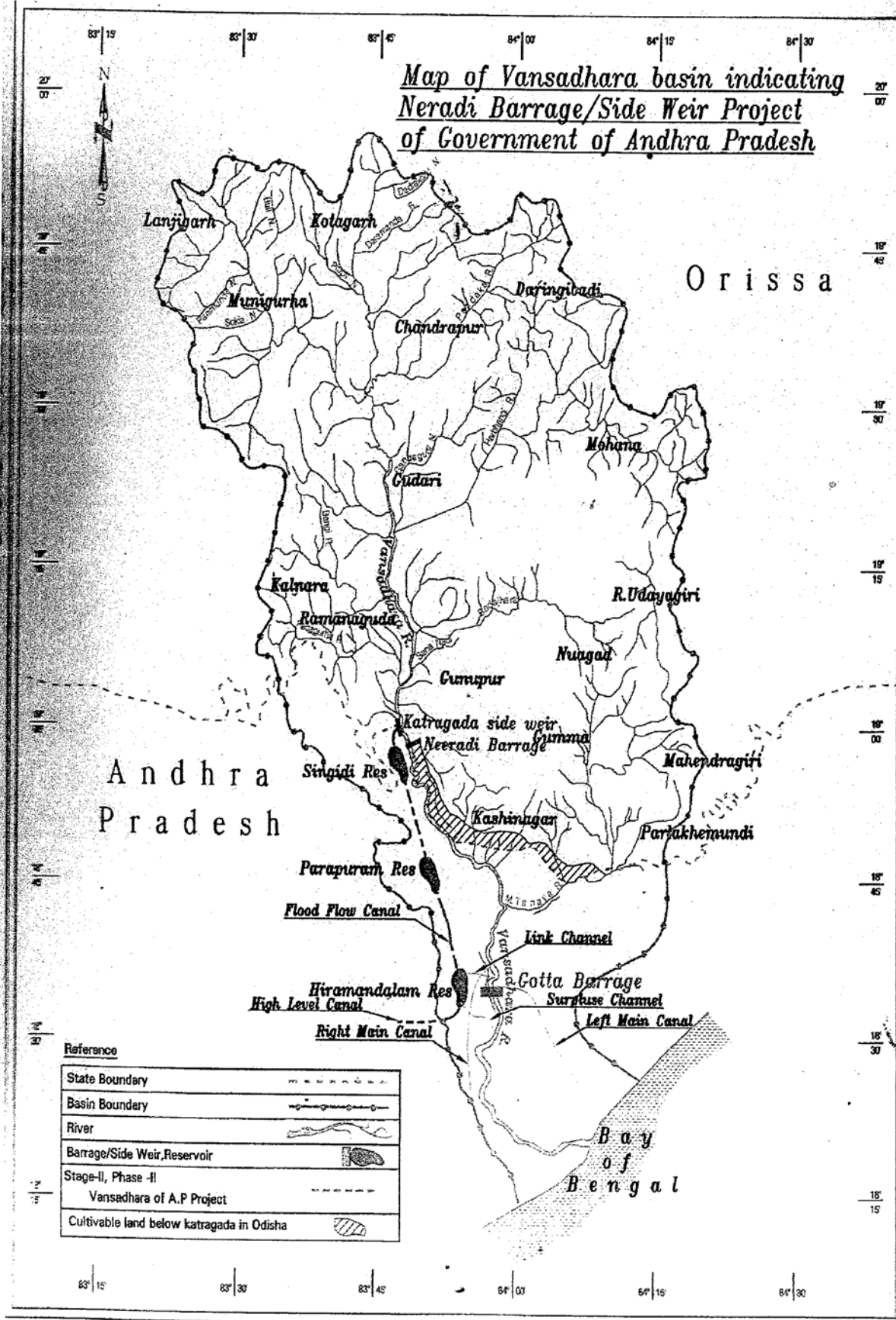
Prayers of AP

- AP should be allowed to construct the barrage at Neradi on Vamsadhara river.
- The present utilisations by AP and Odisha are only 25 TMC and 8 TMC respectively and about 82 TMC annually is going un-utilised into the Sea.
- AP already has spent huge public money of about Rs.630 crores on Vamsadhara Project Stage-II (Neradi Barrage) for Flood flow Canal, Hiramandalam Reservoir and for other Balancing Reservoirs including R&R packages provided to the land losers.
- Construction of Neradi Barrage is an imminent requirement to the State of AP for utilising its legitimate share of water in the River and to serve the backward regions in the State.

THANK YOU ALL

Fig-1 : Index Plan

Fig-2







Vansadhara Water Disputes Tribunal

Ministry of Water Resources
Government of India



REPORT ON THE VISIT OF VANSADHARA WATER DISPUTES TRIBUNAL

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REPORT ON THE VISIT OF
VANSADHARA WATER DISPUTES TRIBUNAL TO
CENTRAL WATER & POWER RESEARCH STATION, PUNE
FROM 3rd -5Th DECEMBER 2014

- (A) TECHNICAL PRESENTATION AND DISCUSSIONS HELD ON 04.12.2014
- (B) INSPECTION OF PHYSICAL MODEL OF PROPOSED KATRAGADDA SIDE WEIR AND PROPOSED NERADI BARRAGE AND DISCUSSIONS HELD ON 05.12.2014
- (C) TECHNICAL PRESENTATION MADE BY ODISHA

**REPORT ON THE VISIT OF VANSADHARA WATER DISPUTES TRIBUNAL DURING
3rd – 5th DECEMBER, 2014**

THE INSPECTION OF PHYSICAL MODEL OF PROPOSED KATRAGADDA SIDE WEIR AND PROPOSED NERADI BARRAGE AND DISCUSSIONS WITH THE CONCERNED OFFICERS AND PARTIES AT CENTRAL WATER AND POWER RESEARCH STATION, PUNE.

Background

The Vansadhara Water Disputes Tribunal (VWDT) in its sitting on 22nd January, 2014 passed an Order (copy enclosed as Annexure-I), relevant extract of which is as follows:

“The Tribunal proposes to visit the site of proposed Neradi Barrage as also Pune to see the Model prepared by the CWPRS and also allow the State officials to make their presentations, if any and for that purpose an Itinerary has been prepared, which is circulated.”

The matter was again discussed during the sitting of VWDT on 6th March, 2014. The relevant extract of the Order is as follows. (copy of the Order is enclosed as Annexure -II).

“There is yet another application i.e. I.A No. 12 of 2014 filed by the applicant, seeking modification in the programme of hearing technical presentation by both the States and also postponement of the dates fixed for inspection of Model and the Site. After hearing the counsel appearing for the parties, we find no reason to change the dates for initial programme i.e. from 18.3.2014 to 25.3.2014 as it is agreed to go ahead with the programme as it is.

So far as the request of the counsel appearing for the applicant regarding the visit to the Odisha side of the Barrage is concerned, the same would be decided at a later stage, when we meet next.

So far as the visit to CWPRS at Pune for inspection of the Model of the Neradi Barrage is concerned, the same stands now cancelled in view of the difficulties expressed by the counsel appearing for the parties and the dates for the postponed visit to the said site would be decided on the next date."

Subsequently the Itinerary was finalised by the representatives of both the Governments in consultation with the Registrar of the Tribunal. It was decided to visit CWPRS, Pune from 8th to 10th October, 2014. This matter came up for hearing during the sitting on 25th September, 2014. The relevant extract of the Order is as follows: (copy of the Order is enclosed as Annexure- III).

"An intimation has been received from the office of the Central Water and Power Research Station, Pune indicating some difficulty with regard to the availability of their Officers during the proposed visit of the Tribunal in the month of October, 2014. It is stated in the letter that due to the declaration of the election in the State of Maharashtra, the majority of the CWPRS staff would be on election duty and, therefore, there is request for deferment of the date of the visit of the Tribunal. With the consent of the counsel appearing for the parties we cancel our schedule for 8th to 10th October, 2014 and now we propose to go on 3rd to 5th December, 2014 with proposed discussions with the concerned Officers and parties on 5th December, 2014. The counsel for the parties shall also make themselves available during the time of discussion on 5th December, 2014."

In terms of the aforesaid order passed, the Tribunal along with its officials visited the Central Water and Power Research Station, Pune from 3rd to 5th December, 2014 to inspect the physical model of the proposed Katragadda side weir and proposed Neradi Barrage.

INSPECTION OF PHYSICAL MODEL OF PROPOSED KATRAGADDA SIDE WEIR AND PROPOSED NERADI BARRAGE AND DISCUSSION WITH THE CONCERNED OFFICERS AND PARTIES AT CENTRAL WATER AND POWER RESEARCH STATION, (CWPRS), PUNE.

(A) Technical Presentation made by CWPRS and discussions held on 4.12.2014

The Chairman and the Members of the Hon'ble Tribunal were welcomed by Shri T. Nagendra, Jt. Director and other senior Officers of CWPRS, Pune. The Counsel and Technical Officers representing the Governments of Andhra Pradesh and Odisha were also present during this inspection. The list of the participants is annexed as Annexure – IV.

Shri R.G. Patil, Chief Research Officer made an informative power point presentation (copy enclosed as Annexure – V) regarding the studies related to Neradi Barrage by CWPRS, Pune. He stated that so far CWPRS has carried out three studies.

1. Physical Model studies for Neradi Barrage (2005)

The Hon'ble Tribunal was informed that the proposal of construction of Neradi Barrage was under discussion between the two States since 1962. An unprecedented, flood occurred in 1980 which was estimated and agreed to be about 16990 cumecs (about 6 lakhs cusecs). Odisha and Andhra Pradesh agreed to design the Barrage using this discharge rather than the earlier discharge. Govt. of Odisha insisted to verify the backwater effect on physical Model which was earlier studied by CWC using one dimension mathematical model. CWPRS was approached for the model studies for assessing backwater effect.

The scope of the studies was to assess mainly back water effect and examination of sufficiency of upstream protection arrangement. The Report of the Studies was submitted in 2005. The report concluded that the back water effect for 16990 cumecs floods extended upto 6-7 km. Shri Patil informed the Tribunal that the back water effect beyond this was not possible as the flow is super critical around 6.5 km upstream of the barrage.

2. Physical Model Studies for Katragadda Side Weir (2008)

CWPRS was requested by Andhra Pradesh to study the Side weir near Katragadda on the existing barrage model. The report for the Katragadda Side weir Model was submitted in 2008. The main finding of this study was that for $150 \text{ m}^3/\text{s}$ flow in the river, there was negligible flow over the side weir and with discharge of $200 \text{ m}^3/\text{s}$ and $400 \text{ m}^3/\text{s}$ in the river, discharge passing over Katragadda side weir was $29 \text{ m}^3/\text{s}$ and $145 \text{ m}^3/\text{s}$ respectively.

3. Studies for assessing changes in RiverVansadhara near proposed Neradi Barrage (2013)

VWDT visited CWPRS on 3rd May 2013 and felt that studies conducted earlier were based on an old data. VWDT wanted to know the differences that may have occurred in river over this period that may possibly affect the results of the earlier studies. Accordingly, VWDT directed the States to resurvey the river and submit fresh data to CWPRS for verification.

The mathematical studies conducted by CWPRS showed that the results are practically similar to the results obtained earlier indicating no major change in the river configuration and hence there is no need to again conduct any physical model studies.

The Chairman of the Tribunal asked both the party- States if they have any query regarding this presentation. The engineers/experts of Odisha raised number of queries regarding the provision of flood protection wall in the model, not using the agreed 'n' value, not including the sediment in the studies and variation in the values of the afflux. The Chairman desired that CWPRS may provide the clarification to these queries in writing to the Tribunal for its reference.

The Tribunal also desired to know the impact of removal of shoal upstream of barrage on the back water. The Chairman brought out that in their letter dated 28.3.2005, CWPRS in a reference dated 15.03.2005 from State of Andhra Pradesh

has informed them that widening the river by removing constriction might have a negligible effect on reduction in back water length of 6 km upstream of the barrage. It was clarified by CWPRS officer that it may have marginal impact on the back water effect, but however, the removal of such shoal by deepening the channel is morphologically not a recommended solution.

The representative of State of Odisha pointed out that a study is required to be done by the CWPRS taking into consideration the proposed protection wall on the left bank upstream of Neradi Barrage. Tribunal was of the view that the State of Odisha should provide cross sections and alignment of the proposed protection wall to CWPRS for such study. The Tribunal passed an order (copy enclosed as Annexure- VI) regarding this aspect under section 9(1) of the ISRWD Act, 1956.

(B) Inspection of Physical model of Proposed Katragadda Side Weir and Proposed Neradi Barrage and discussions held on 5.12.2014.

The Tribunal alongwith the representatives of both the party- States inspected the physical model of proposed Neradi barrage (The list of the participants is enclosed as Annexure- VII). The Tribunal was informed that model has been made on the scale of 1:200 horizontal and 1:40 vertical. The model covers the river 14 Km upstream to 10 Km downstream of Neradi barrage. At the time of the inspection of the Tribunal, the quantum of flow in the model was about 1 lakh cusecs. CWPRS officers pointed out to the Tribunal that the rapids (turbulent flow) were occurring between 6-7 km upstream of the Neradi Barrage. The flow in the model was then gradually increased in stages up to about 6 lakhs cusecs and the back water of this increasing flow was observed by the Tribunal.

The officers of CWPRS explained all the flow conditions. It was pointed out at the spot that the back water effect is not extending beyond 6-7 Km upstream of the Neradi barrage. The Tribunal noticed the said fact. To a query of the Tribunal that the bed of model was rigid and not mobile, CWPRS officer explained that mobile bed was not representing the actual river conditions having grit and sand. The actual river conditions are generated in the model by hit and trial method and for that rigid bed was found more appropriate. The Tribunal desired to have an idea regarding the period for siltation process to take place behind Neradi barrage. CWPRS officers explained that siltation process varies from river to river as also the silt load but as per their experience it usually takes 20-25 years before any appreciable siltdeposits behind the barrages. It further clarified that the silt behind barrage is usually managed by operation of under sluices and also by regulation of gates as is being done in case of Farakka barrage. Subsequently the Tribunal held discussions with the representatives of both the parties.

(C) **Technical Presentation made by Odisha**

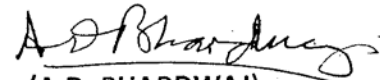
The Consultant of State of Odisha, Shri C.V. Prasad desired to give power point presentation regarding the views of Odisha. The Tribunal agreed to this request and Shri Prasad made the technical power point presentation (Copy enclosed as Annexure- VIII).

The Counsel of Andhra Pradesh pointed out that a particular study carried out by Govt. of Odisha mentioned in the power point presentation is not available with the Tribunal. Joint Director, CWPRS informed the Tribunal that the comments pertaining to queries to the report of CWPRS raised during the technical presentations by CWPRS and the discussions held on 4th & 5th December 2014

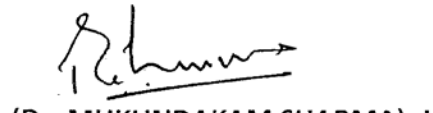
would be provided in writing to the Tribunal. Same have been submitted now by CWPRS. (copy enclosed as Annexure- IX).

On the conclusion of this inspection, the Hon'ble Tribunal thanked the Joint Director and other officers of CWPRS, Pune.


(S.K. SINHA)
ASSESSOR


(A.D. BHARDWAJ)
ASSESSOR


(GHULAM MOHAMMED) J
MEMBER


(Dr. MUKUNDAKAM SHARMA) J
CHAIRMAN


(B.N. CHATURVEDI) J
MEMBER

Dated 19.12.2014

**BEFORE THE VANSADHARA WATER DISPUTES TRIBUNAL
NEW DELHI**

IN THE MATTER OF:

Water disputes between the State of Odisha and Andhra Pradesh
regarding the Inter-State river Vansadhara and the river valley
thereof.

State of Odisha vs State of Andhra Pradesh

22.1.2014: This matter was called on for hearing before the Tribunal today.

CORAM: **HON'BLE DR. JUSTICE MUKUNDAKAM SHARMA, CHAIRMAN**
 HON'BLE MR.JUSTICE B.N. CHATURVEDI, MEMBER
 HON'BLE MR.JUSTICE GHULAM MOHAMMED, MEMBER

FOR GOVERNMENT OF ODISHA .

1. Shri Mohan V.Katarki, Advocate
2. Shri R.S. Jena, Advocate-on-Record
3. Shri SidharthPanda, Advocate
4. Shri Sanjeev Das, Advocate

FOR GOVERNMENT OF ANDHRA PRADESH

1. Shri C.S.Vaidyanathan, Senior Advocate
2. Shri S.S.Prasad, Senior Advocate
3. Shri BadanaBhaskar Rao, Additional Advocate General
4. Shri A Satya Prasad, Senior Advocate
5. Shri Y. Rajagopala Rao, Advocate-on-Record
6. Shri M.VishnuVardhan Reddy, Advocate

ORDER

In terms of the directions issued earlier, both the parties have filed their list of witnesses. The State of Odisha has given the list with the names of 4 witnesses to be examined on behalf of the State of Odisha, whereas, the State of Andhra Pradesh has submitted a list of witnesses with 3 names. Both the lists of witnesses are taken on record. Now both the States shall file the Affidavits of these witnesses by way of Examination-in-Chief, in terms of the earlier order.

The Tribunal proposes to visit the site of proposed Neradi Barrage as also Pune to see the Model prepared by the CWPRS and also allow the State officials to make their presentations, if any and for that purpose an Itinerary has been prepared, which is circulated.

It is also proposed to have the issues already framed, recast and a proposed draft thereof is circulated amongst the parties, to which response shall be made on the next date.

Re-notify on 6.3.2014 at 11.00 A.M for further directions, if any.

.....sd/-..... J
(DR.MUKUNDAKAM SHARMA)
CHAIRMAN

.....sd/-..... J
(B.N. CHATURVEDI)
MEMBER

.....sd/-.....J
(GHULAM MOHAMMED)
MEMBER

**BEFORE THE VANSADHARA WATER DISPUTES TRIBUNAL
NEW DELHI**

IN THE MATTER OF :

Water disputes between the State of Odisha and Andhra Pradesh
regarding the Inter-State river Vansadhara and the river valley
thereof.

I.A.No.11/ 2014	State of Odisha	vs	State of Andhra Pradesh
I.A.No.12/2014	State of Odisha	vs	State of Andhra Pradesh

6.3.2014: This matter was called on for hearing before the Tribunal today.

CORAM:	HON'BLE DR. JUSTICE MUKUNDAKAM SHARMA,	CHAIRMAN
	HON'BLE MR.JUSTICE B.N. CHATURVEDI,	MEMBER
	HON'BLE MR.JUSTICE GHULAM MOHAMMED,	MEMBER

FOR GOVERNMENT OF ODISHA

1. Shri Raju Ramachandran, Sr. Advocate
2. Shri Mohan V.Katarki, Advocate
3. Shri R.S. Jena, Advocate-on-Record
4. Shri Sidharth Panda, Advocate
5. Shri Sanjeev Das, Advocate

FOR GOVERNMENT OF ANDHRA PRADESH

1. Shri C.S.Vaidyanathan, Senior Advocate
2. Shri S.S.Prasad, Senior Advocate
3. Shri Y. Rajagopala Rao, Advocate-on-Record

ORDER

The matter is listed today for directions, in view of the earlier order passed directing the applicant to file their Affidavits by way of evidence. However, when the matter is called out, a request is made by Mr. Raju Ramachandran, Senior Advocate appearing for the applicant seeking for further time to enable them to file the same. There is a strong opposition by Mr. C.S. Vaidyanathan, Senior Advocate appearing on behalf of the State of Andhra Pradesh against the aforesaid prayer. However, considering the nature of the request, two weeks further time from today is granted as one last opportunity, making it clear that no further prayer for extension will be entertained under any circumstances. The Affidavits shall now be filed on or before 21st of March, 2014.

In view of the delay in filing the aforesaid Affidavits by the applicant, the time for filing the Affidavits by the respondents is also enlarged. They are given time for filing their Affidavits on or before 30.4.2014.

There is yet another application i.e. I.A.No.12 of 2014 filed by the applicant, seeking modification in the programme of hearing technical presentation by both the States and also postponement of the dates fixed for inspection of Model and the Site. After hearing the counsel appearing for the parties, we find no reason to change the dates for initial programme i.e. from 18.3.2014 to 25.3.2014 as it is agreed to go ahead with the programme as it is.

So far as the request of the counsel appearing for the applicant regarding the visit to the Odisha side of the Barrage is concerned, the same would be decided at a later stage, when we meet next.

So far as the visit to CWPRS at Pune for inspection of the Model of the Neradi Barrage is concerned, the same stands now cancelled in view of the

difficulties expressed by the counsel appearing for the parties and the dates for the postponed visit to the said site would be decided on the next date.

The issues which were framed on 21.8.2013 would now be re-framed as suggested by all concerned, as follows:

1. Whether, the reference dated 19.03.2010 of the Union of India, under Section 5(1) of the Inter State River Water Disputes Act, 1956 with regard to the water disputes emerging from the complaint dated 28.07.2009 filed by the State of Andhra Pradesh is not maintainable?

[1(No change)]

2. Whether the State of Odisha is justified in objecting to or delaying the Neradi Barrage by not honouring the binding Inter-State Agreements and not allowing the construction of Neradi Barrage.

[3&4 clubbed]

3. Whether the State of Odisha is not obliged to make available the agreed extent of 106 acres of land to the State of Andhra Pradesh for the construction of the Neradi Barrage having agreed to do so as far back as in 1961?

[5 (No change)]

4. Whether the State of Odisha is justified in stating that the land required for acquisition should be confined to 106 acres, on account of the Neradi Barrage, as initially agreed, when they insist on additional protective measures like embankments etc., on its side on account of the 1980 flash floods?

[6(No change)]

5. Whether the construction of Neradi barrage by the State of Andhra Pradesh across Inter State River Vansadhara is subjected to any agreed conditions? If so, whether the agreed conditions are the following:

- (i) That the submergence in the territory of Odisha shall be limited to 106 acres excluding the river bed in the State of Odisha; and
- (ii) That the back water effect shall be limited to 3 km upstream of the barrage both in non-silted and silted conditions.

[2&9 clubbed]

6. Whether the back water effect of the Neradi barrage as planned by the State of Andhra Pradesh goes beyond 3 km from the barrage upto Gunupur and whether the State of Andhra Pradesh has no legal right to cause submergence or back water effect in the territory of the State of Odisha without its consent?

[8&10 clubbed]

7. Whether the State of Odisha is not barred from undertaking projects under which it has been proposed/proposing to unilaterally divert the waters of Inter State River Vamsadhara to another basin jeopardizing the basin requirements of river Vamsadhara?

[7 (No change)]

8. Whether the State of Odisha is justified in objecting to the drawal of waters by the State of Andhra Pradesh through Side Weir especially when the proposed drawal is within its territory and share and whether the State of Andhra Pradesh is bound to take the consent of the State of Odisha before execution of the Side Weir Project on the right bank?

[12&14 clubbed]

9. Whether the Side Weir as proposed by the State of Andhra Pradesh would in any way adversely affect any interests of the State of Odisha in the downstream of Katragadda?

[11 (N0 change)]

10. Whether the drawal of waters through Side Weir as proposed by the State of Andhra Pradesh would in any way diminish the share of waters of the State of Odisha?

[13(No change)]

11. Whether, the Side Weir at Katragada planned by the State of Andhra Pradesh to divert water from the right bank of the Inter-State river Vansadhara is likely to change or alter the Inter-State border in the common reach of the river below Katragada and If so, is the above material issue for consideration by this Tribunal in the context of the present dispute?

[15&16 clubbed]

12. Whether the Side Weir at Katragada planned by the State of Andhra Pradesh to divert water from the Inter-State river Vansadhara is likely to affect the morphology of the river Vansadhara in the downstream reach of Katragada due to aggradation of the river bed caused by siltation and If so, whether the above is a material issue for consideration by the Tribunal in the context of the present dispute?

[18&19 clubbed]

13. After the construction of the Side Weir at Katragada by the State of Andhra Pradesh, will there be any material change in volume or pattern of flows on the left bank of the river falling in the territory of the State of Odisha? If so, will it adversely affect the existing water requirement of the inhabitants in the State of Odisha?

[17 (No change)]

14. Whether an Inter-State regulatory body is necessary for implementation of the decision to be given by this Hon'ble Tribunal?

[20 (No change)]

15. To what relief?

[21 (No change)]

The reframed issues shall now be given to the parties. I.A.Nos. 11 and 12 of 2014 stand disposed of in terms of the aforesaid order.

The matter shall now be listed for directions on 13th May, 2014 at 11.00 A.M.

.....sd/-..... J
(DR.MUKUNDAKAM SHARMA)
CHAIRMAN

.....sd/-..... J
(B.N. CHATURVEDI)
MEMBER

.....sd/-..... J
(GHULAM MOHAMMED)
MEMBER

**BEFORE THE VANSADHARA WATER DISPUTES TRIBUNAL
NEW DELHI**

IN THE MATTER OF :

Water disputes between the State of Odisha and Andhra Pradesh
regarding the Inter-State river Vansadhara and the river valley
thereof.

State of Odisha vs State of Andhra Pradesh

25.9.2014: This matter was called on for hearing before the Tribunal today.

**CORAM: HON'BLE DR. JUSTICE MUKUNDAKAM SHARMA, CHAIRMAN
 HON'BLE MR.JUSTICE B.N. CHATURVEDI, MEMBER
 HON'BLE MR.JUSTICE GHULAM MOHAMMED, MEMBER**

FOR GOVERNMENT OF ODISHA

1. Shri Mohan V.Katarki, Advocate
2. Shri R.S. Jena, Advocate-on-Record

FOR GOVERNMENT OF ANDHRA PRADESH

1. Shri C.S.Vaidyanathan, Senior Advocate
2. Shri D.Srinivas, Addl.Adv.General,
3. Shri G.Umapathy, Advocate,
4. Shri Guntur Prabhakar, Advocate.

ORDER

In terms of the last order, the sitting of the Tribunal was held today. On perusal of the records, it is found that the State of Odisha has filed Affidavits by way of evidence of four witnesses. They have also filed all the documents which they seek to rely upon.

The State of Andhra Pradesh has now filed Affidavits of the first two witnesses mentioned in their list of witnesses filed on 22.1.2014. It is stated by the counsel appearing for the State of Andhra Pradesh that they want to drop the third witness named in that list, with a liberty to file affidavits of additional witnesses, if any, on or before the next date. The State of Andhra Pradesh is permitted to file Affidavits by way of evidence of additional witness, if any, one week before the next date, with advance copy to the counsel appearing for the State of Odisha.

We accordingly fix for cross-examination of witnesses of the State of Odisha on 25th and 26th of November, 2014 at 11.00 A.M. and also on 9th and 10th December, 2014 at 11.00 A.M. The witnesses mentioned in the list of witnesses, whose affidavits have been filed, shall be present for the State of Odisha. The name of the witness to be examined initially as a first witness shall be intimated to the Tribunal as also to the counsel appearing for the State of Andhra Pradesh, within a week from today.

An intimation has been received from the office of the Central Water and Power Research Station, Pune indicating some difficulty with regard to the availability of their Officers during the proposed visit of the Tribunal in the month of October, 2014. It is stated in the letter that due to the declaration of the election in the State of Maharashtra, the majority of the CWPRS staff would be on election duty and, therefore, there is request for deferment of the date of the

visit of the Tribunal. With the consent of the counsel appearing for the parties, we cancel our schedule for 8th to 10th October,2014 and now we propose to go on 3rd to 5th December,2014 with proposed discussions with the concerned Officers and parties on 5th December,2014. The counsel for the parties shall also make themselves available during the time of discussion on 5th December,2014.

.....sd/-..... J
(DR.MUKUNDAKAM SHARMA)
CHAIRMAN

.....sd/-..... J
(B.N. CHATURVEDI)
MEMBER

.....sd/-..... J
(GHULAM MOHAMMED)
MEMBER

Annexure- IV

LIST OF PARTICIPANTS DURING TECHNICAL PRESENTATION AND DISCUSSIONS HELDON 04.12.2014.

VWDT Members

1. Justice Dr. Mukandakam Sharma, Hon'ble Chairman.
2. Justice B.N. Chaturvedi, Hon'ble Member
3. Justice Ghulam Mohammed, Hon'ble Member
4. Sri A.D. Bhardwaj, Assessor
5. Sri S.K. Sinha, Assessor
6. Sri B.V. Sharma, Registrar, VWDT

CWPRS OFFICIALS

1. Dr. T. Nagendra, Joint Director
2. Dr. R.G. Patil, Chief Research Officer
3. Sri Arun Kumar, Research Officer

ANDHRA PRADESH

Legal Team

1. Sri G. Umapathy, Advocate
2. Sri G. Prabhakar, Advocate

Technical Team

1. Sri D. Rama Krishna, Chief Engineer, IS&WR
2. Sri A. Siva Prasad, Chief Engineer, North Coast
3. Sri R. Satyanarayana, Witness/TAC member
4. Sri V.V.S Rama Murty, Witness/ TAC member
5. Sri P. Rama Raju, TAC Member
6. Sri P. Rama Krishna Murthy, Superintending Engineer, IS&WR
7. Sri B. Rambabu, Superintending Engineer, Vamsadhara
8. Sri G.V. Subrahmanyam, Executive Engineer, Hydrology
9. Sri T. Giridhara Rao, Deputy Director, V.W.D.T
10. Smt. L. Gayatri Devi, D.E.E., Vamsadhara
11. Sri P. Nageswara Rao, D.E.E., Vamsadhara, Project
12. Sri M. Venkata Krishna, D.E.E., Vamsadhara Project
13. Sri J.V. Rama Rao, A.E.E, Vamsadhara
14. Sri A.G. Vara Prasad, A.E.E, VWDT
15. Sri M. Suresh Kumar, A.E.E, Hydrology.

ODISHA

Legal Team

1. Sri R.S. Jena, Advocate on record

Technical Team

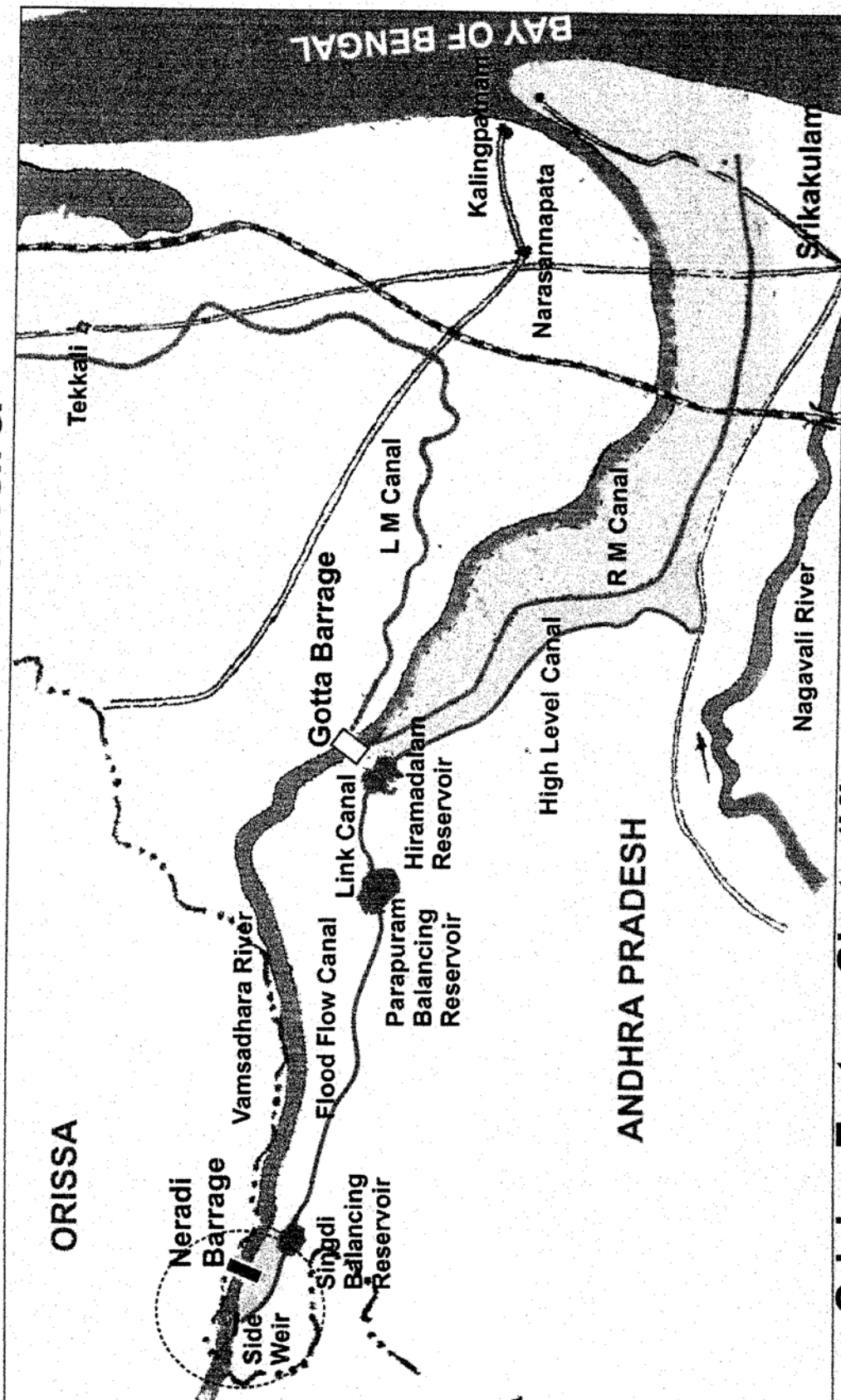
1. Prof. G. N. Yoganarasimhan, Expert
2. Sri C.V. Prasad, Consultant
3. Sri F.M. Das, Chief Engineer
4. Sri Upendra Sethy, D.D
5. Sri Dhimesh Das, A.D
6. Sri Hari Hara Mohanty, A.D.

Studies Related to Neradi Barrage

By

Central Water & Power Research Station, Pune

River Vamshadhara



- **Origin - Eastern Ghats (Khoraput District, Orissa)**
- **Flows 154 km in Orissa**
- **Flows 29 Km along the border of AP and Orissa**
- **Flows 89 Km in Andhra Pradesh**
- **Finally empties into Bay of Bengal near Kalingapatnam**

BRIEF BACK GROUND OF NERADI BARRAGE

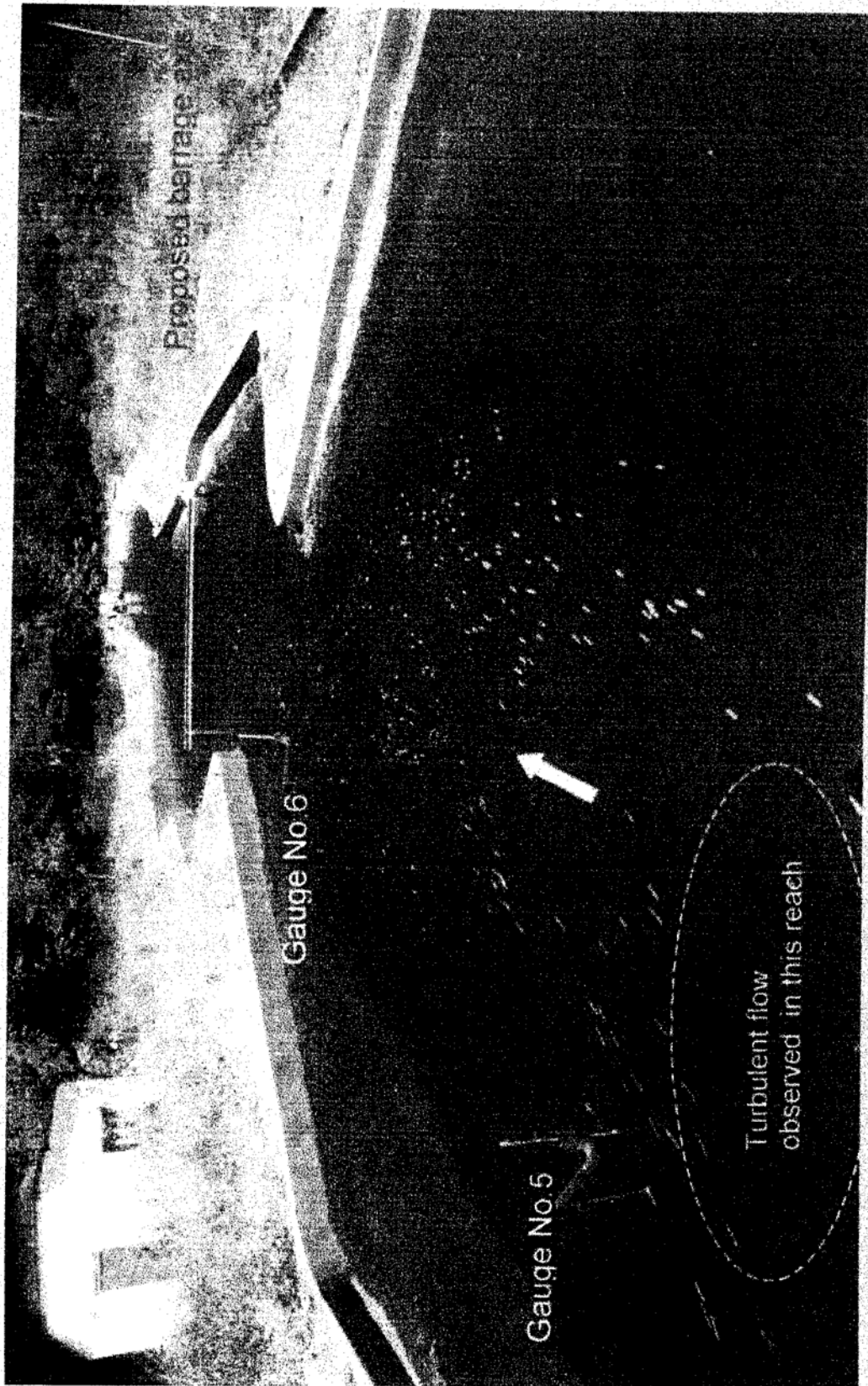
- 1962 - AP & Odisha agreed and constructed a barrage near Gotta under Vamsadhara Project Stage – I.
- To augment the irrigation, both states agreed to construct another barrage at Neradi (35 km u/s) under the scheme Vamshadhara Project Stage – II
- Unprecedented flood occurred in 1980, which was estimated and agreed to be about 16990 cumecs.
- Odisha & AP agreed to design the barrage using this discharge rather than the earlier discharge.
- Odisha expressed inadequacies in flood banks due to increase in design discharge.
- Odisha insisted to verify the back water effect on a physical model which were earlier studied using 1-D Mathematical model (Conducted by CWC).
- CWPRS was approached for the model studies for assessing the back water effect.

Physical Model Studies for Barrage (2005)

Scope of studies: To assess mainly the back water effect and examination of sufficiency of u/s protection arrangements

Scale 1: 200 (H) and 1: 40 (V)

View of Model



Without barrage - Discharge 16990 m³/s

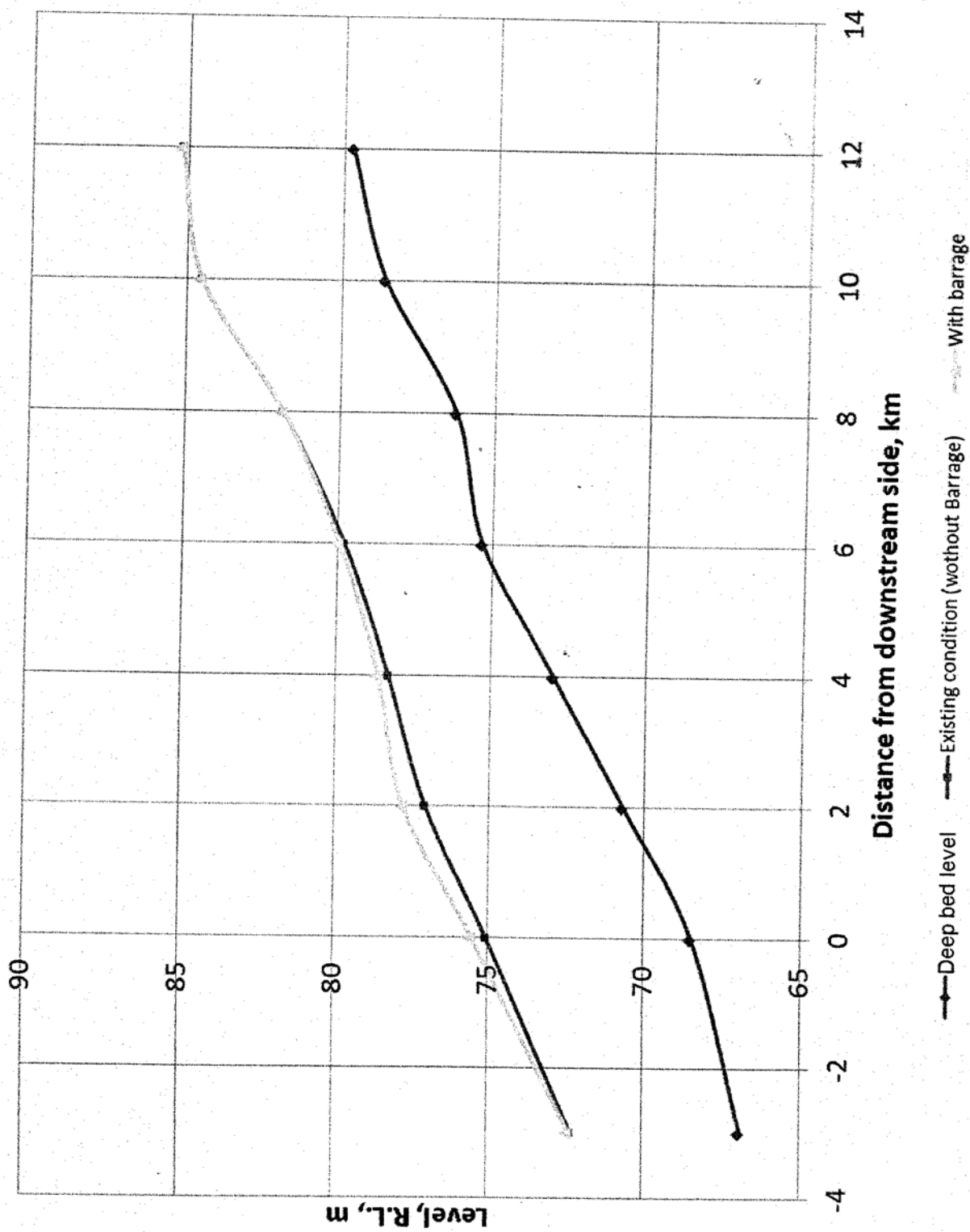
30 bays of 18.29 m (clear) + 4 left under sluice + 2 right under sluices of 12.19 m ww

View of Model

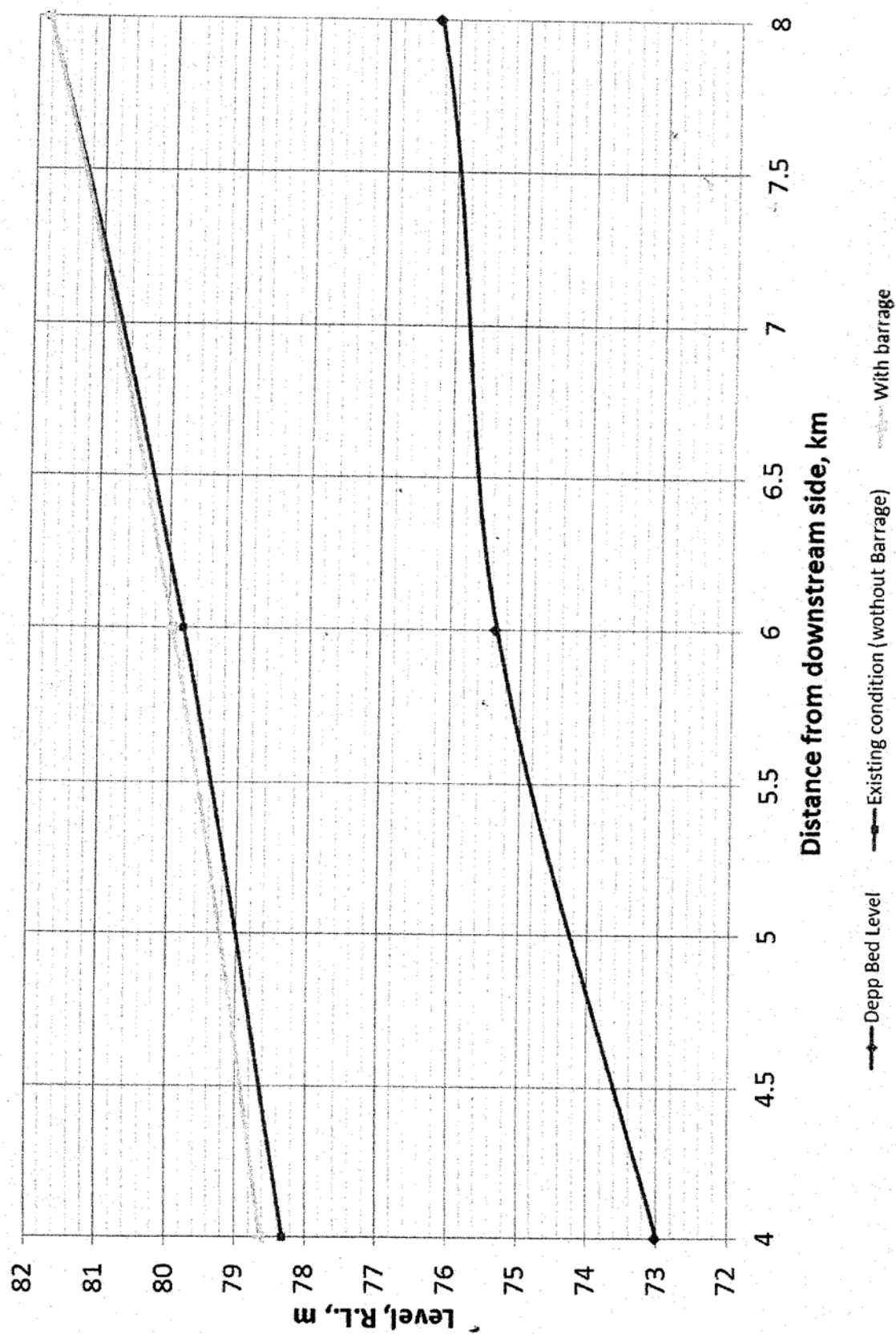


With barrage (Discharge 5663 m³/s)

30 bays of 18.29 m (clear) + 4 left under sluice + 2 right under sluices of 12.19 m ww



Back water effect – Discharge 16990 m³/s

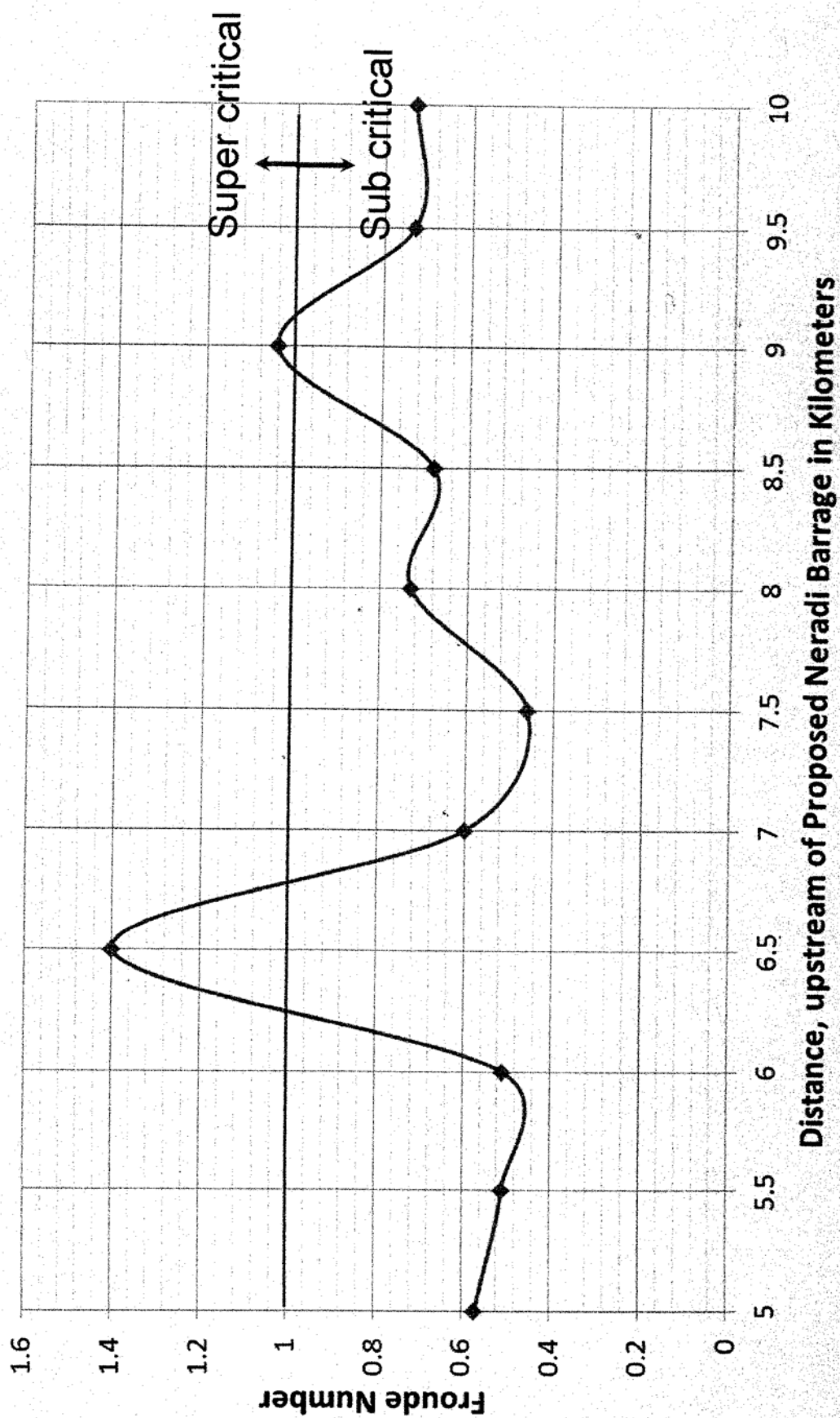


Back water effect (closer view) – Discharge 16990 m³/s.

Measured water levels in model and back water computations for discharge of 16990 cumec

Cross section +ve u/s; -ve d/s	Water level without barrage (m)	Water level with barrage (m)	Back water effect (m)
12	85.18	85.18	Nil
10	84.52	84.52	Nil
8	81.84	81.84	Nil
6	79.80	79.96	0.16
4	78.32	78.64	0.32
2	77.08	77.80	0.72
0 (barrage axis)	75.09	75.55	0.46
-3	72.32	72.38	0.06

Froude Number along the Thalweg line



Conclusions:

- Back water length would extend up to about 6 km u/s of barrage for a discharge $16,990 \text{ m}^3/\text{s}$.
- For a discharge $16,990 \text{ m}^3/\text{s}$, increase in water level at C/S No. 2 (2 km upstream of barrage) was 0.72 m.
- Rise in water level for a discharge $16,990 \text{ m}^3/\text{s}$ at cross section No. 6 was of the order of 0.16 m. This diminished rapidly after cross section No. 6 and was negligible at cross section No. 7.

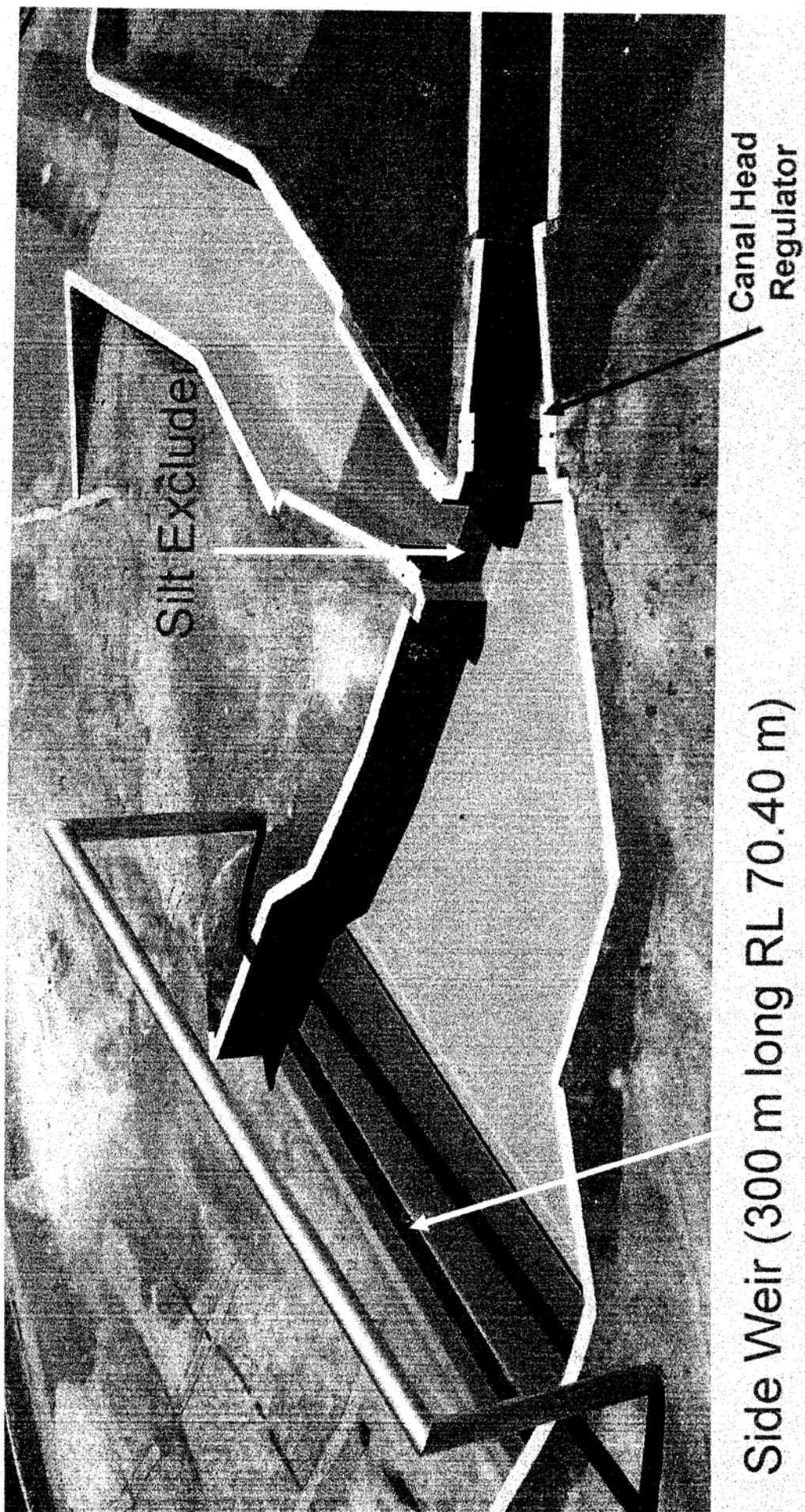
Katragada Side weir Model (2008)

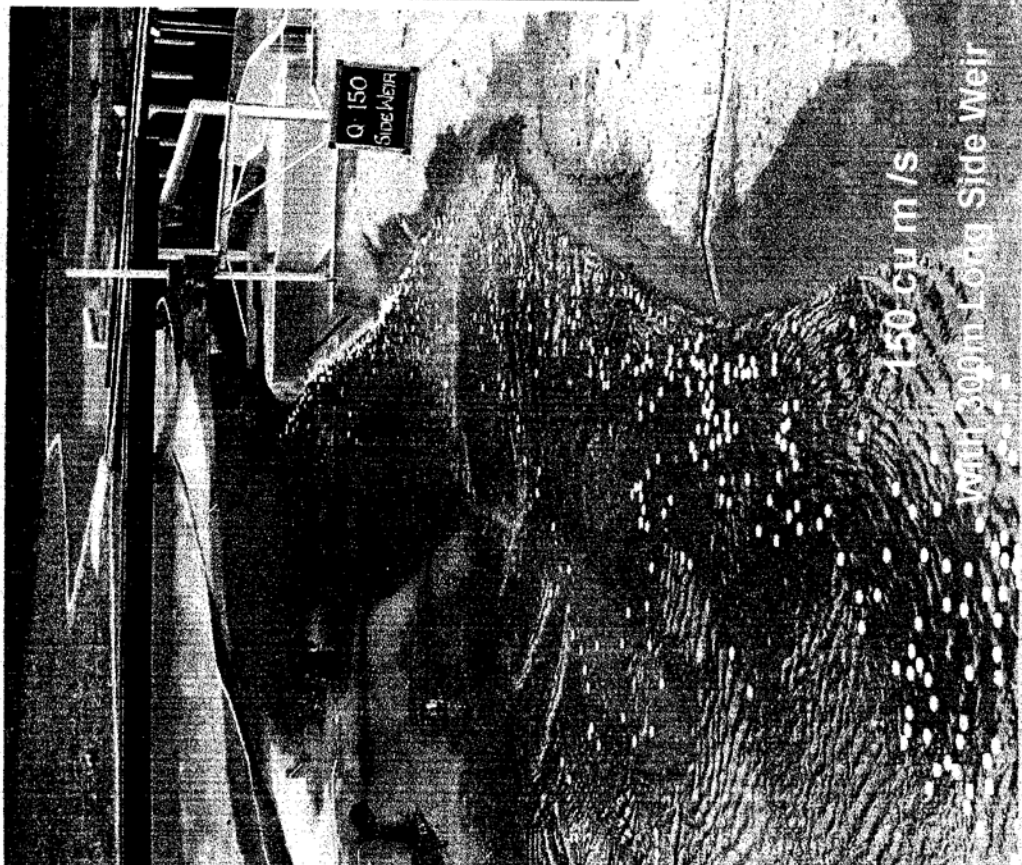
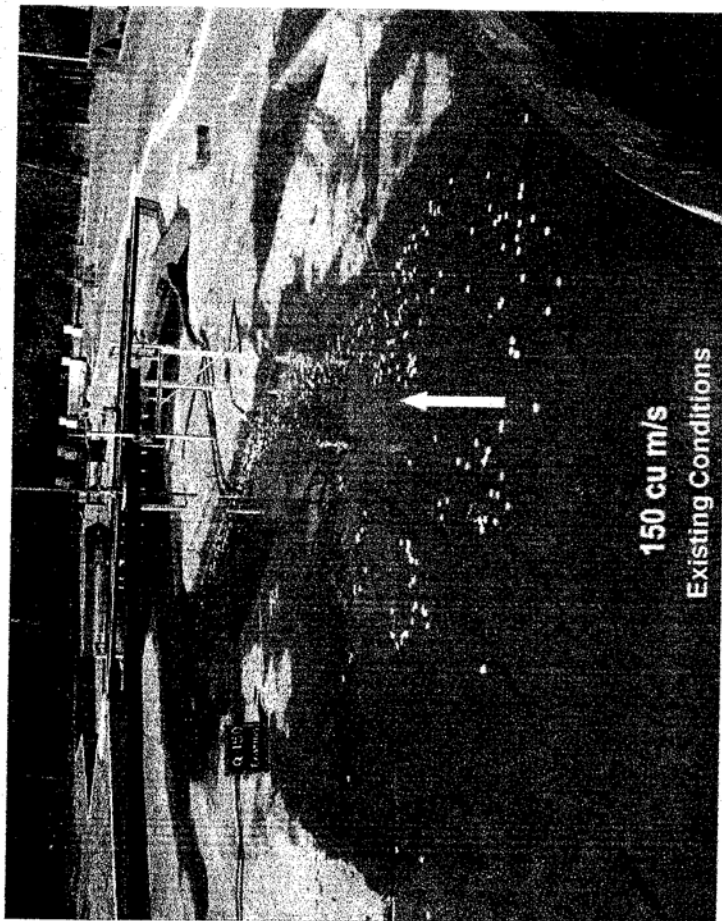
Later, because of delay in construction of barrage for various reasons, AP requested CWPERS to study the side weir on the existing barrage model.

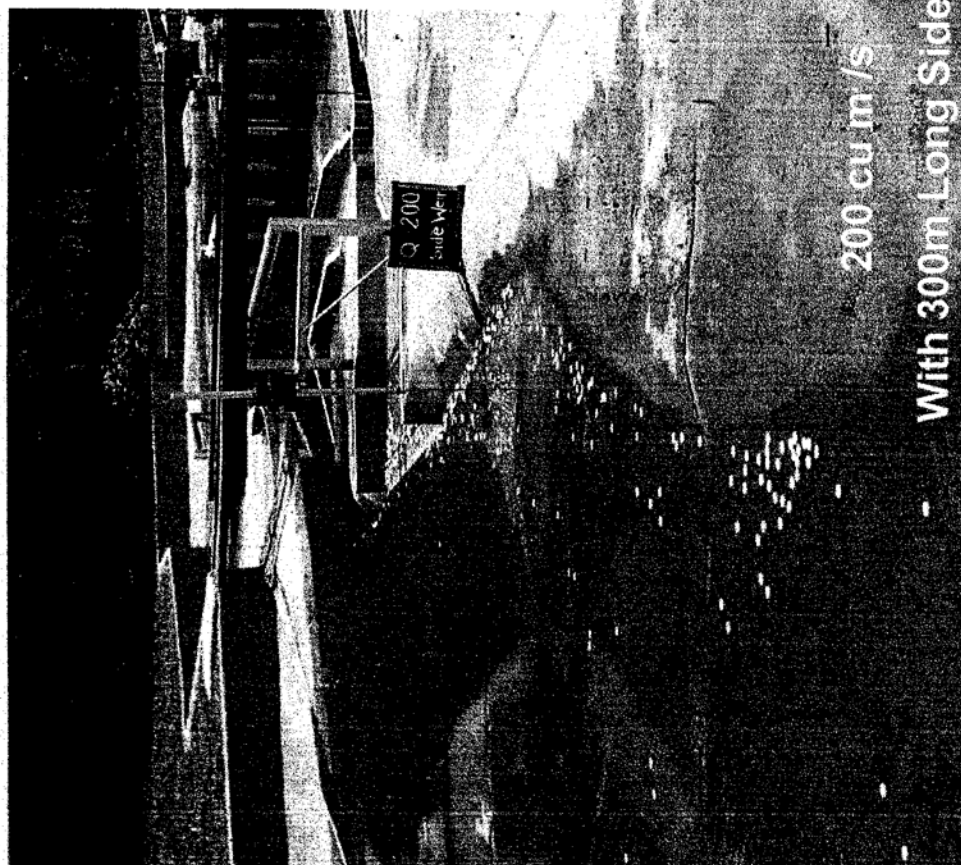
Scope of studies:

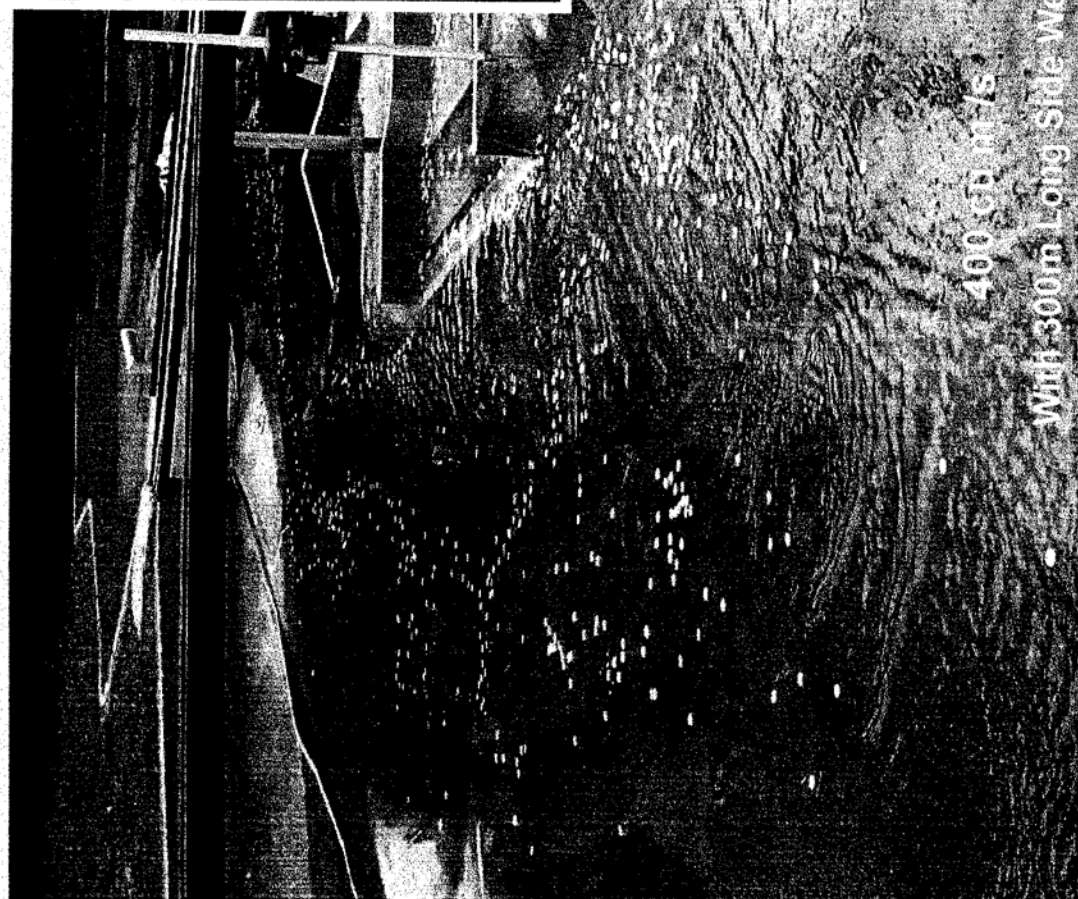
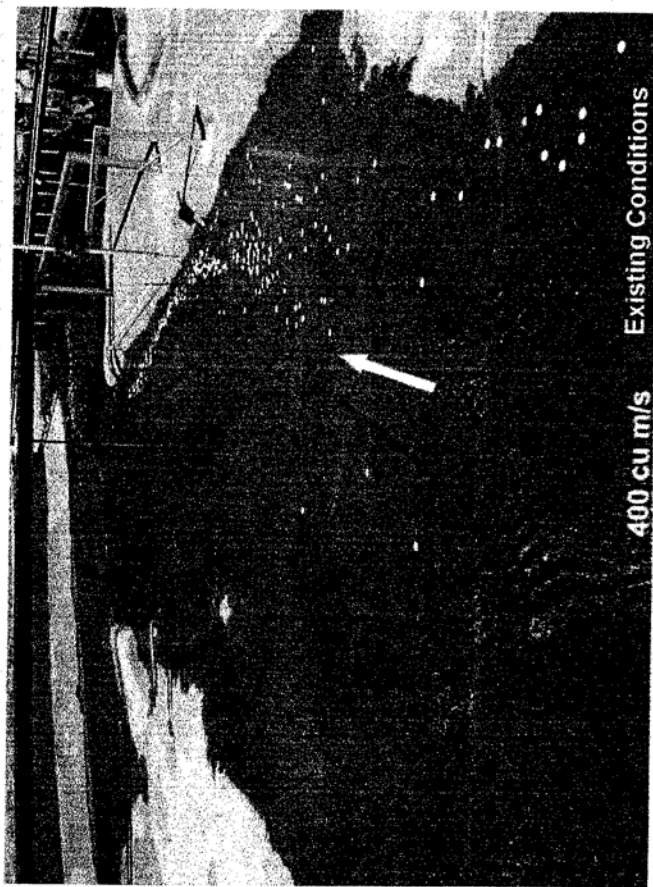
- Flow pattern for 150, 200, 400 m³/s discharge in river.
- Flow conditions for 8495 and 16990 m³/s.
- Discharge passing over 300 m long weir under low flows.
- Water levels u/s and d/s of weir.

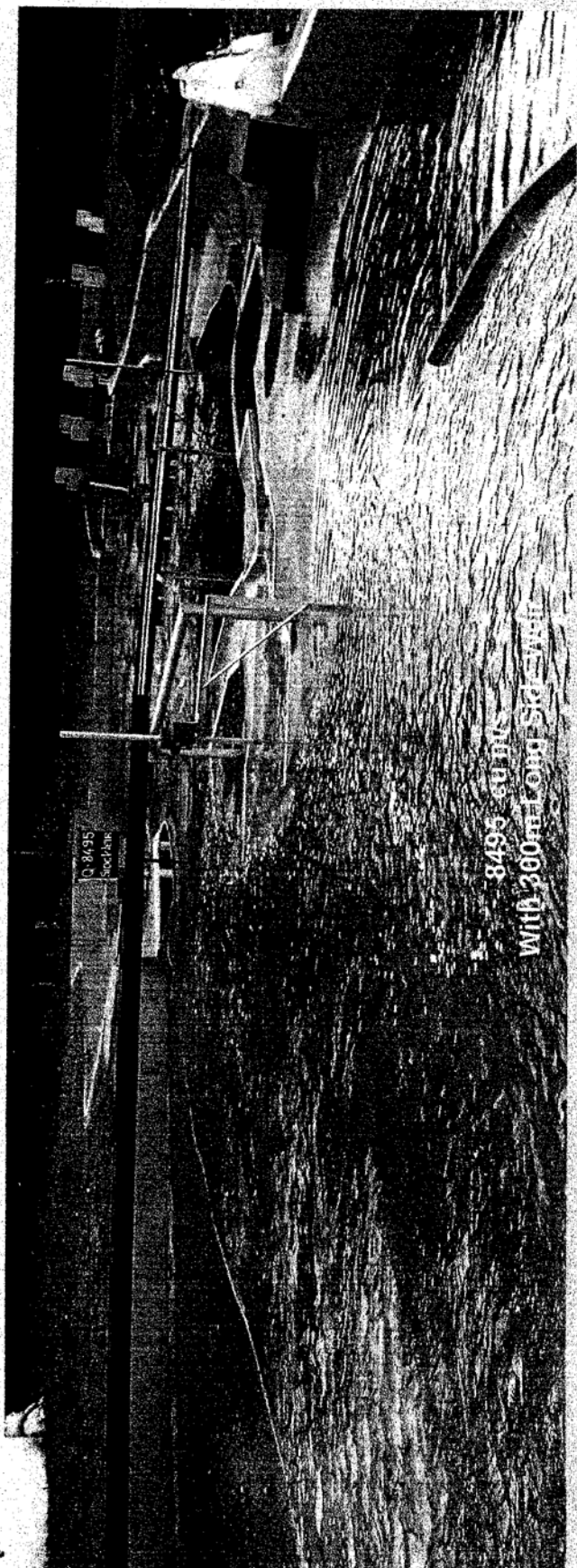
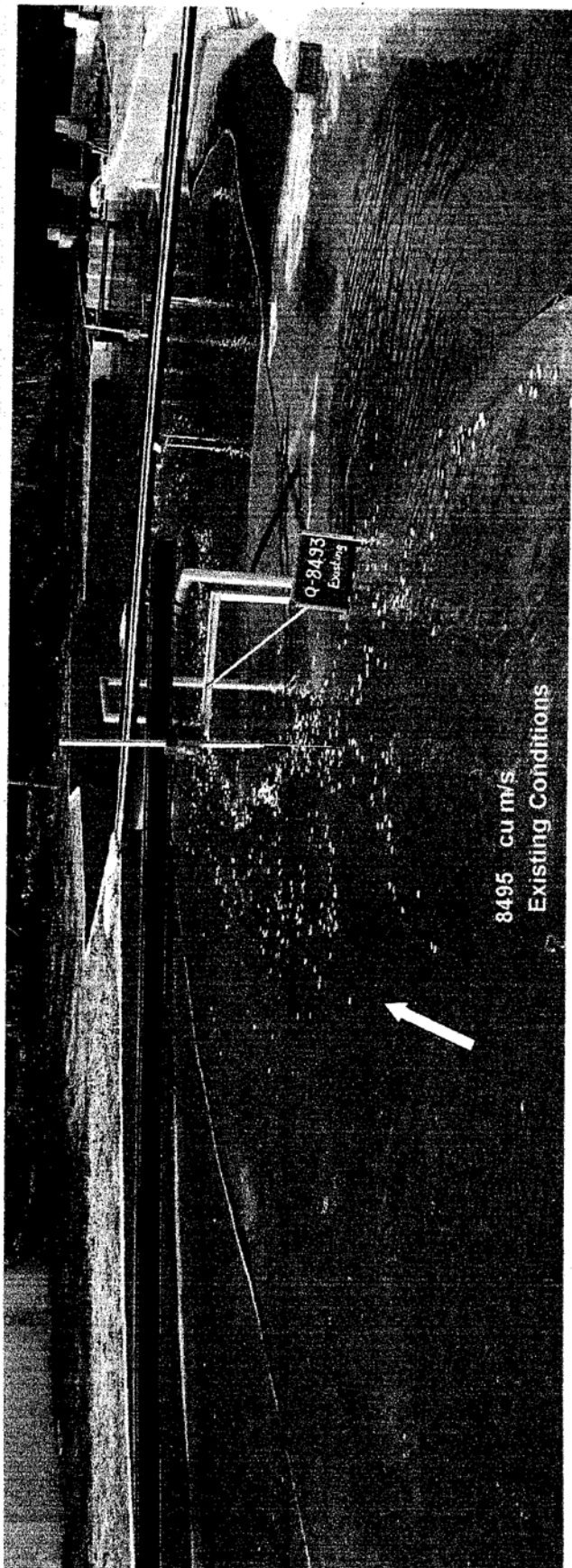
View of Side weir

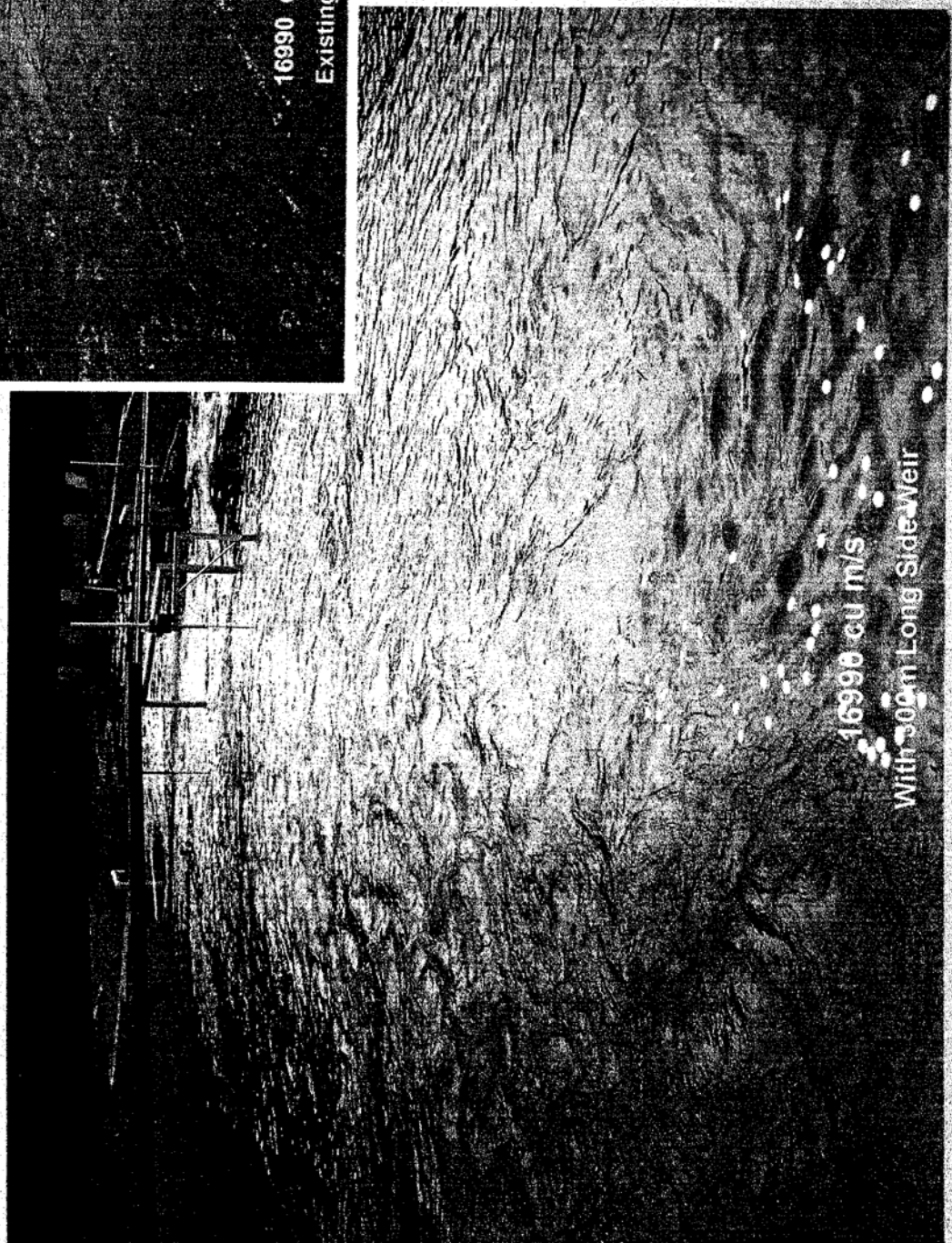
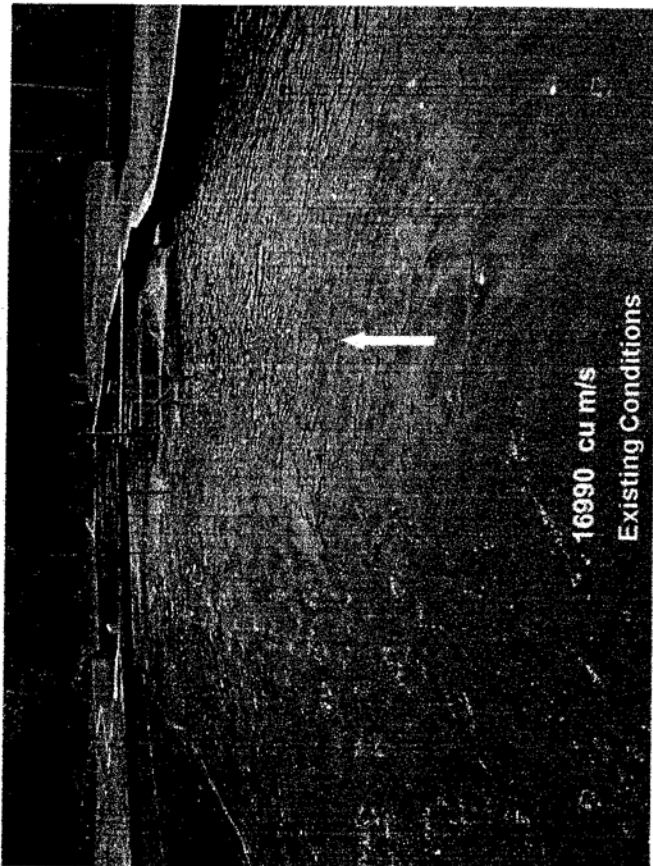












The studies were conducted and results were communicated with the following conclusions:

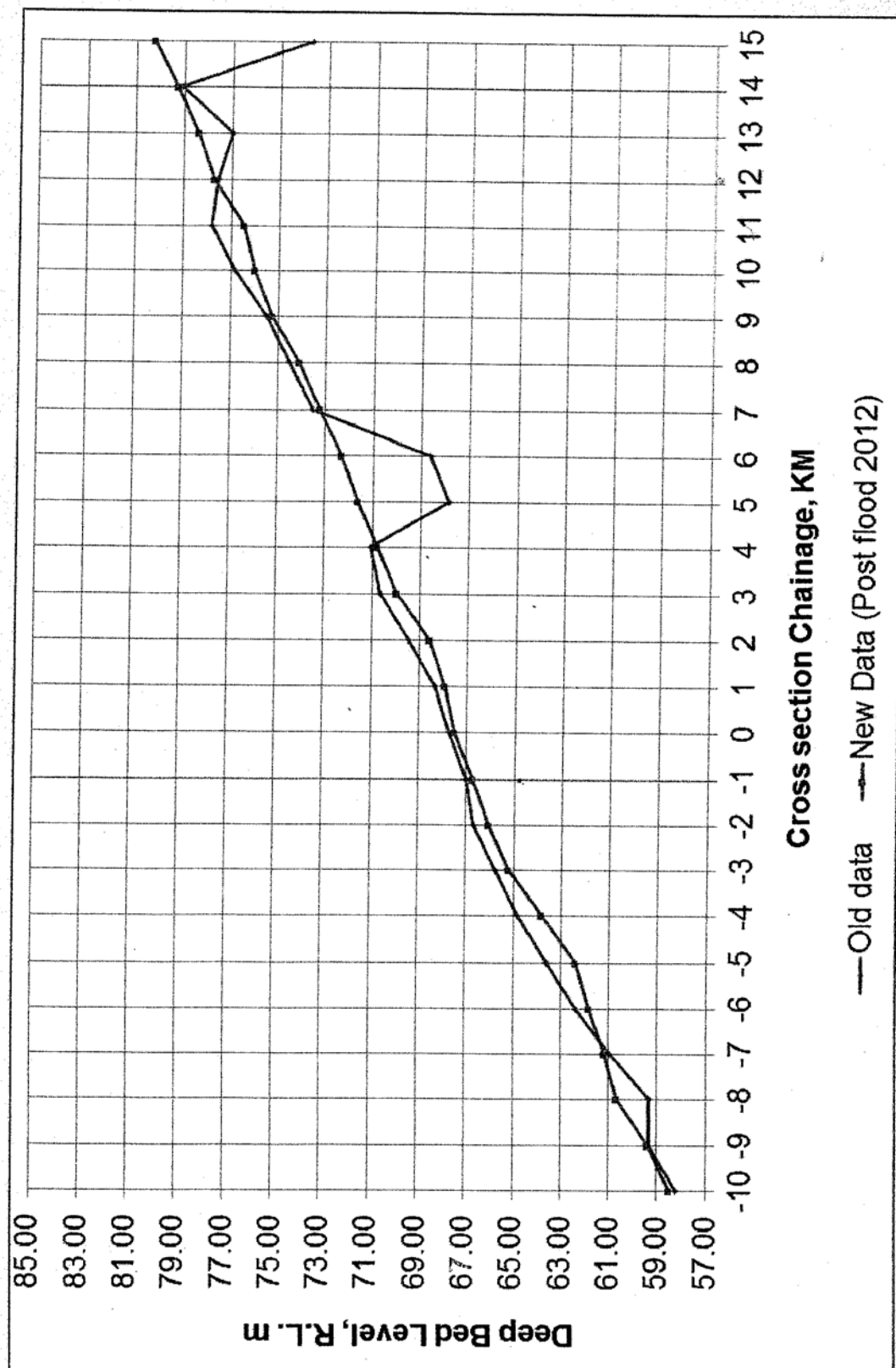
- The flow conditions with and without side weir were almost similar.
- For 150 cumec in river, negligible flow passed in to the side weir, while for 200 and 400 cumec, 29 and 145 cumec respectively passed over the weir.
- Water levels on u/s of side weir varied from 70.48 to 71 m for discharge of 150 to 400 m³/s.
- Drop in water level 2 km d/s was about 0.2 to 0.25 m.
- Alignment of side weir needs to be twisted by 3°.

Studies for assessing changes in River Vamshadhara near proposed Neradi Barrage (2013)

- VWDT visited CWPRS last year on 3-5-2013.
- VWDT felt studies conducted earlier were based on old data.
- VWDT wanted to know the differences that may have occurred in river, over this period, that may possibly affect the results of the earlier studies.
- VWDT directed the states to re-survey (c/s) the river and submit data to CWPRS for verification.
- Joint survey was conducted and data was submitted to CWPRS for verification on 5th July 2013.
- Alignment of newly surveyed data and zero of the cross sections was different from the old data and both the data were incomparable.

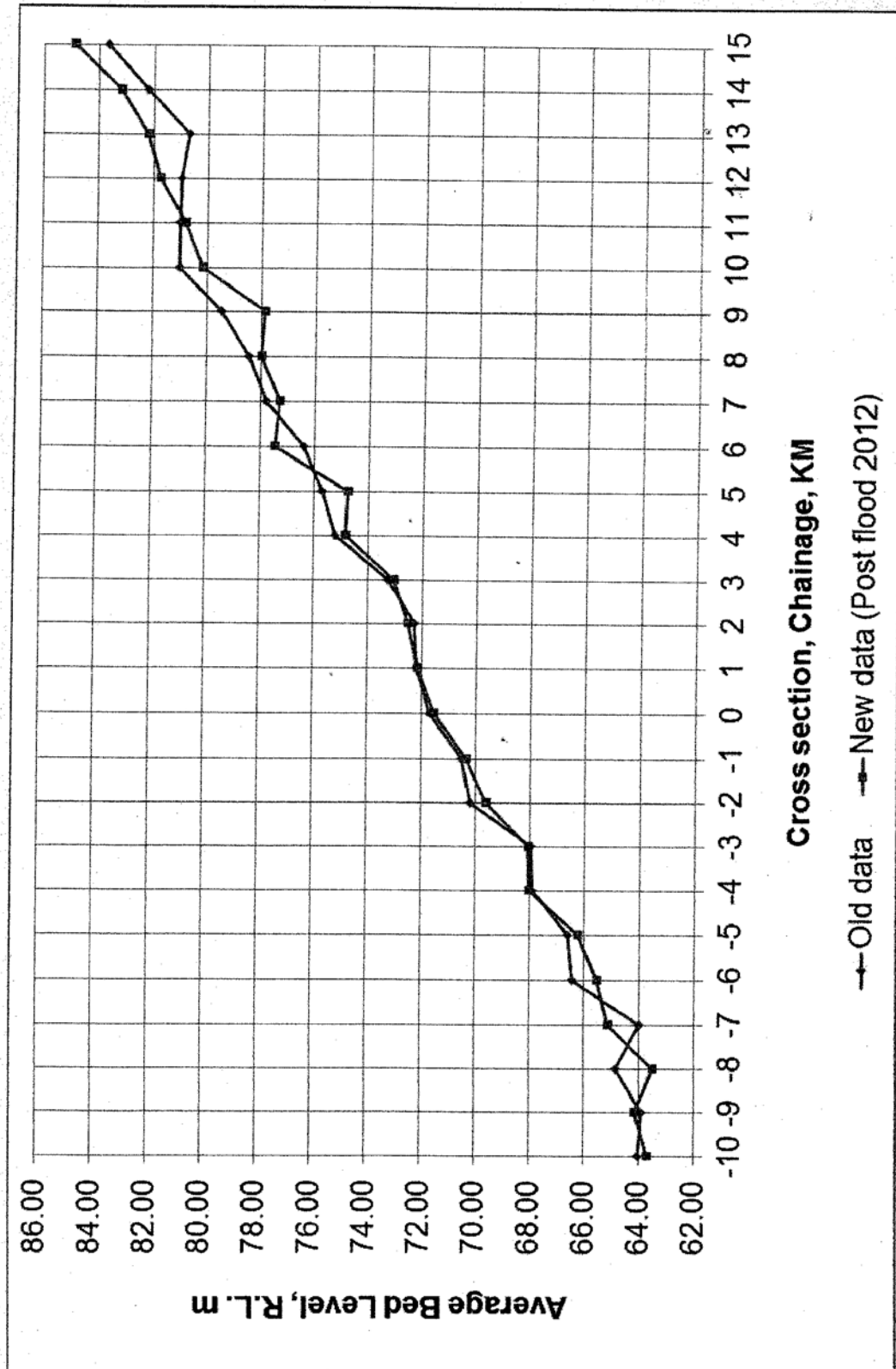
- During the meeting of concerned engineers on 5-6 August 2013 at CWPRS, Pune, it was agreed that reconciliation of data was not possible by either state representatives or CWPRS.
- Hence, CWPRS opined to conduct MMS with the newly surveyed data for assessing the extent of backwater and the result may be compared with the past model study results to get an idea about the changes, if any.
- This is indirect method of comparison.
- Agreeing to the above, VWDT desired that CWPRS may take the needful action in the matter and the studies were initiated.

Thalweg line



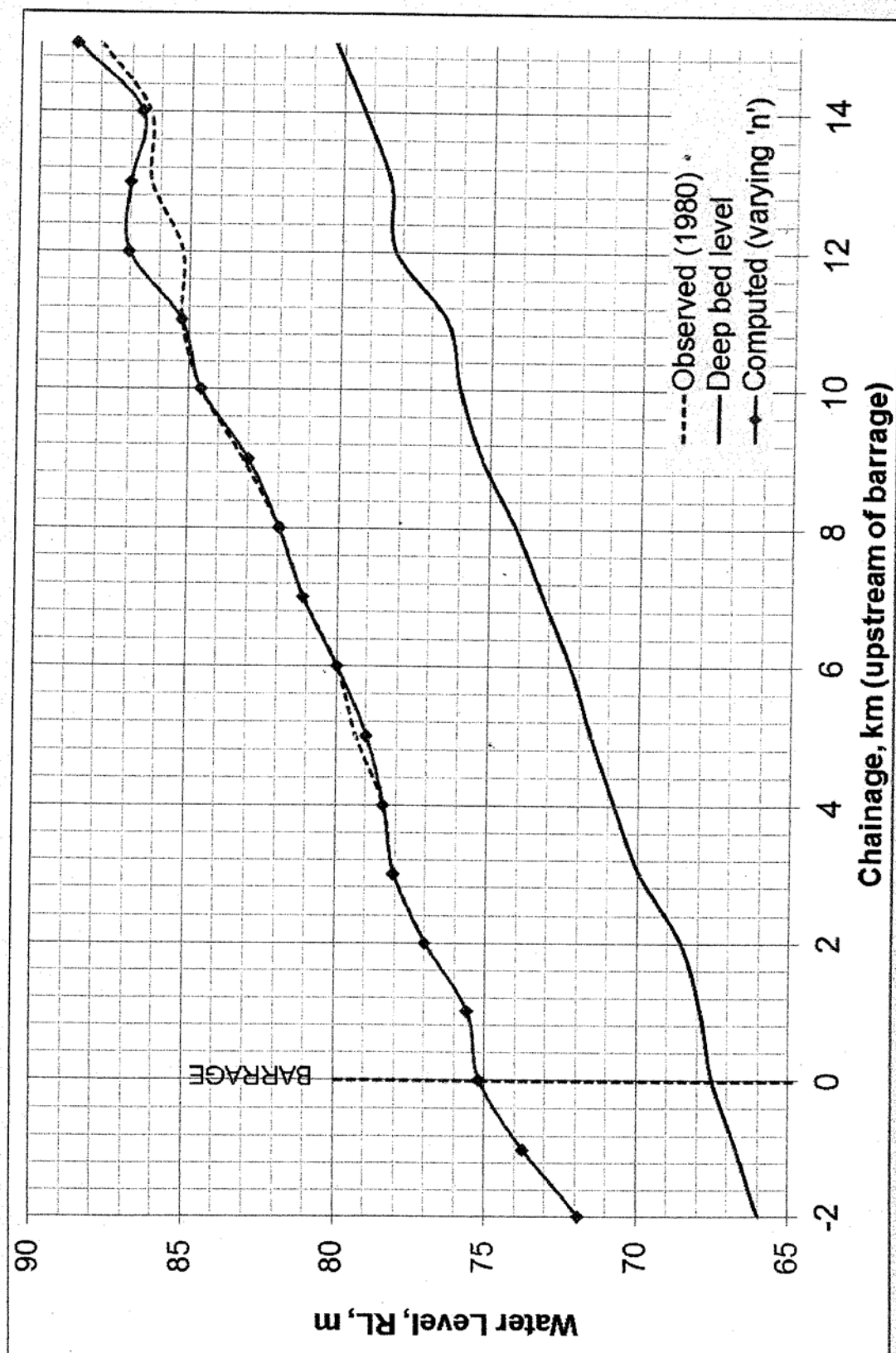
Comparison of thalweg line along cross sections of old and new (Pre-monsoon 2013) survey.

Average bed levels

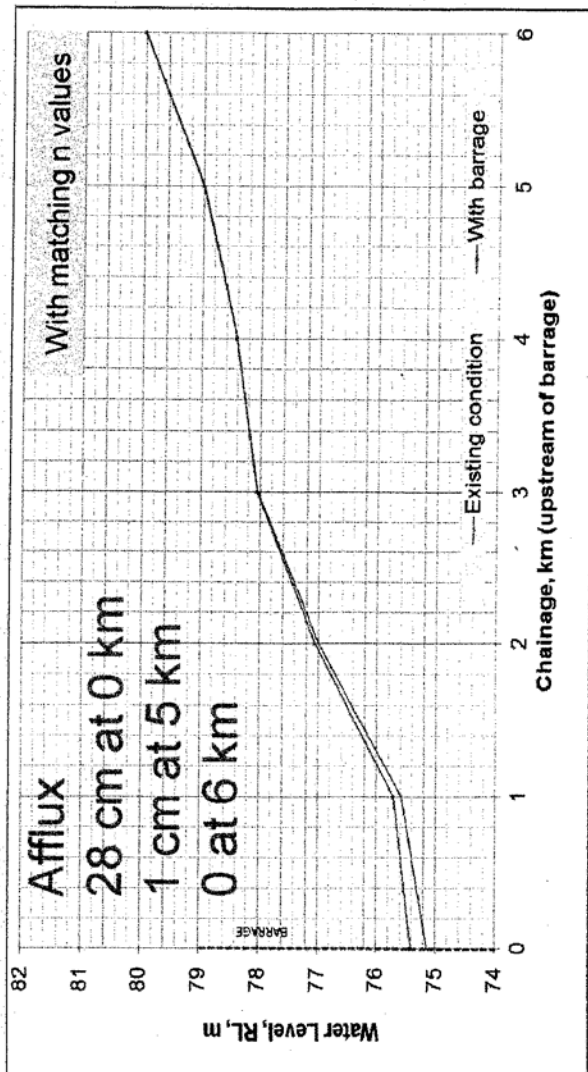


Comparison of average bed levels along cross sections of old and new (Pre-monsoon 2013) survey

Proving Studies

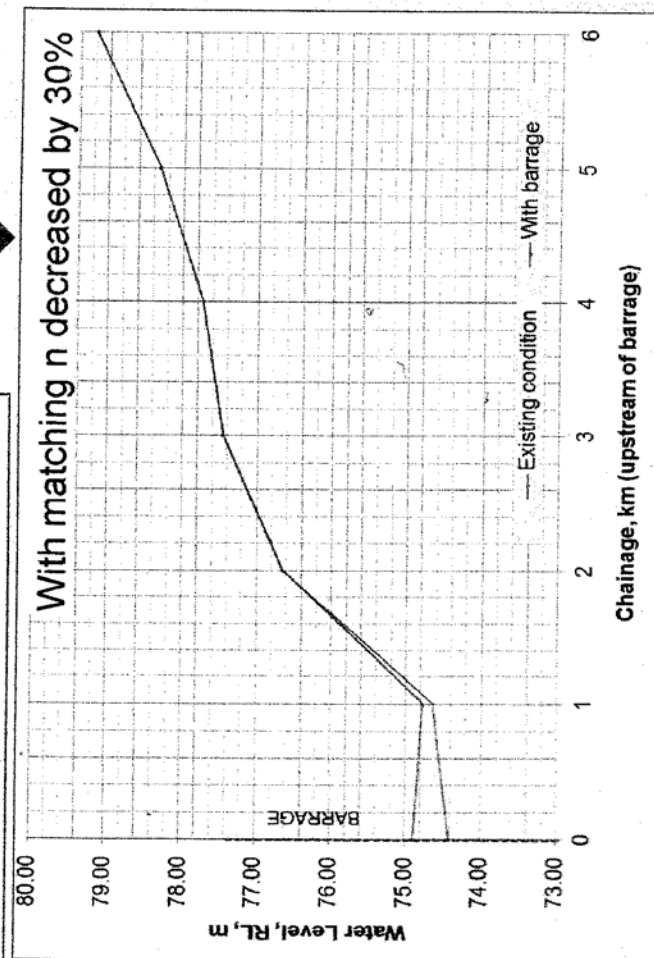
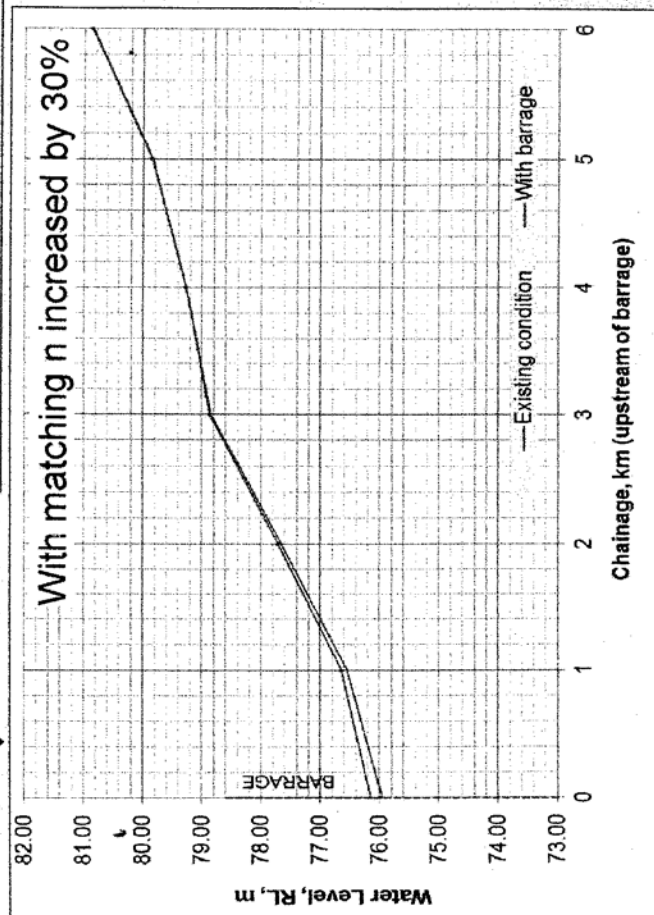


Observed and computed water levels under existing condition for 16990 m³/s with matching 'n' values in each cross section. (0.012 to 0.2)

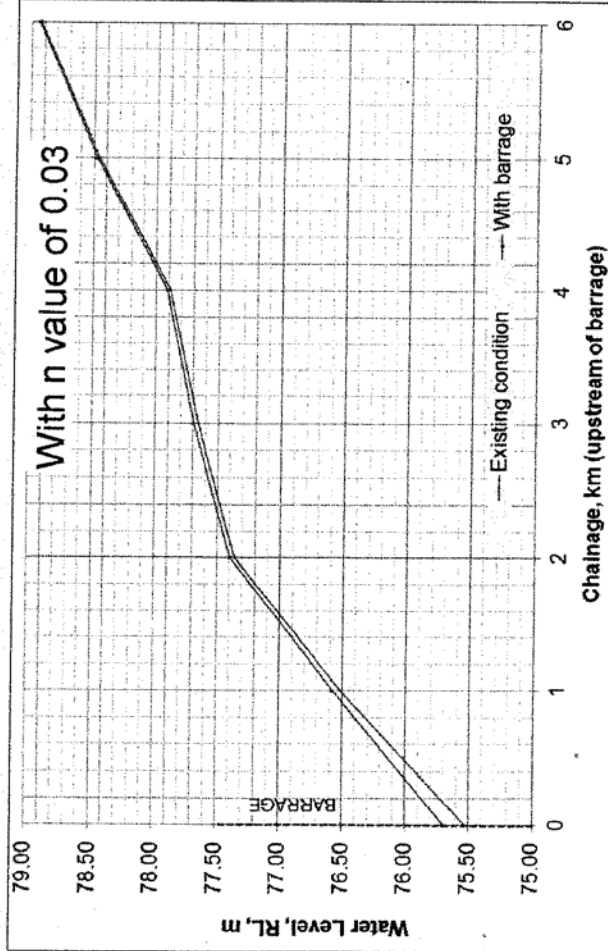
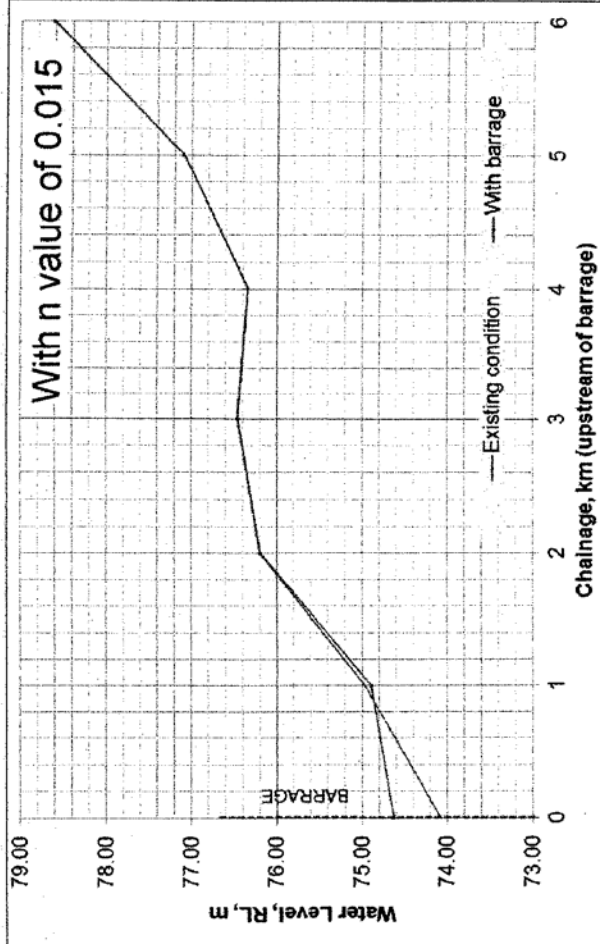


Afflux
19 cm at 0 km
1 cm at 6 km
0 at 7 km

Afflux
48 cm at 0 km
13 cm at 1 km
0 at 2 km



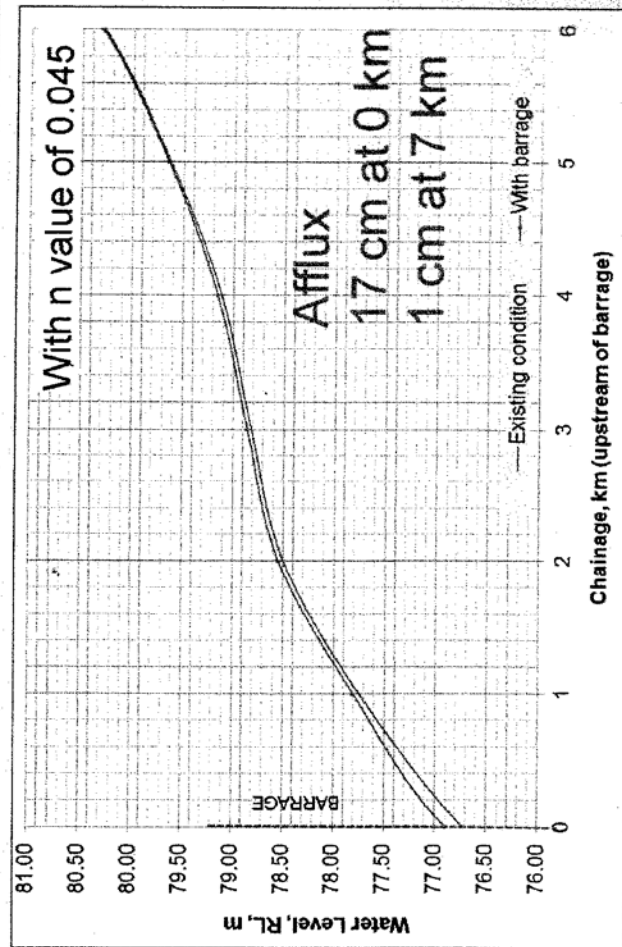
Extent of back water with matching 'n' values at each C/S due to proposed barrage. Maximum extension is 6 km only. "n" varied from (0.012 to 0.2)



Afflux
55 cm at 0 km
1 cm at 1 km



Afflux
17 cm at 0 km
1 cm at 6 km



Afflux
17 cm at 0 km
1 cm at 7 km

Extent of back water with fixed 'n' values of 0.015, 0.03 and 0.045.

Conclusions

- Back water length expected is of the order of 6 km upstream of barrage for a discharge $16,990 \text{ m}^3/\text{s}$.
- These results are practically similar to the results obtained earlier – indicating no major change in the river configuration.
- Hence there is no need to again conduct any physical model studies.

Thank you

BEFORE THE VANSADHARA WATER DISPUTES TRIBUNAL

CAMP OFFICE: KDK,PUNE

IN THE MATTER OF:

WATER DISPUTES BETWEEN THE STATE OF ODISHA AND ANDHRA PRADESH REGARDING THE
INTER-STATE RIVER VANSADHARA AND THE RIVER VALLEY THERE OF.

State of Odisha

.....Complainant

Vs

State of Andhra Pradesh

.....Respondent

Dated:4.12.2014

CORAM:

HON'BLE DR.JUSTICE MUKUNDKAM SHARMA

CHAIRMAN

HON'BLE MR. JUSTICE B.N. CHATURVEDI

MEMBER

HON'BLE MR. JUSTICE GHULAM MOHAMMED

MEMBER

FOR GOVERNMENT OF ODISHA

1. Shri R.S. Jena, Advocate,
2. Shri F.M.Das, Chief Engineer
3. Shri U.Sethi, Deputy Director and Team

FOR GOVERNMENT OF ANDHRA PRADESH

- 1.Shri G.Umapathy, Advocate
- 2.Shri G.Prabhakar, Advocate
- 3.Shri D.Ramakrishna, Chief Engineer
- 4.Shri P.Ramakrishna Murthy, S.E. and Team

O R D E R

During the presentation in the office of the Central Water and Power Research Station (CWPRS) at Pune, it is pointed out that a study is required to be done by the CWPRS taking into consideration the proposed protection wall on the left bank upstream of Neeradi Barrage. In order to make such a study cross sections and alignment of the proposed protection wall have to be given by the State Government of Odisha. It is assured to us that the same shall be submitted to the CWPRS within 15 days with a copy thereof to the State of Andhra Pradesh within the same period of time. The State of Andhra Pradesh will give their comments within 15 days to CWPRS and a copy thereof shall be given to the State of Odisha. On receipt of the communication from both the States, CWPRS will carry out their study and give a report within a month thereafter to the Tribunal and a copy thereof to both the States. The expenses incurred for the study will be borne equally by both the States

No fresh notice would be sent to the counsel/parties and this order itself shall be treated as the notice as it is passed in the presence of the counsel/parties of both the States. Both the States will extend their full coöperation in executing this order, passed under Section 9(1) of the Inter-State River Water Disputes Act, 1956.

Sd/-

.....
(DR. MUKUNDAKAM SHARMA)
CHAIRMAN

Sd/-

.....
(B.N. CHATURVEDI)
MEMBER

Sd/-

.....
(GHULAM MOHAMMED)
MEMBER

Annexure- VII

LIST OF PARTICIPANTS DURING INSPECTION AND DISCUSSIONS HELD ON 05.12.2014

VWDT Members

1. Justice Dr. Mukandakam Sharma, Hon'ble Chairman.
2. Justice B.N. Chaturvedi, Hon'ble Member
3. Justice Ghulam Mohammed, Hon'ble Member
4. Sri A.D. Bhardwaj, Assessor
5. Sri S.K. Sinha, Assessor
6. Sri B.V. Sharma, Registrar, VWDT

CWPRS OFFICIALS

1. Dr. T. Nagendra, Joint Director
2. Dr. R.G. Patil, Chief Research Officer
3. Sri Arun Kumar, Research Officer

ANDHRA PRADESH

Legal Team

1. Sri C.S. Vaidyanathan, Sr. Advocate,
2. Sri G. Umapathi, Advocate
3. Sri G. Prabhakar, Advocate
4. Sri Y. Rajagopala Rao, Advocate on Record

Technical Team

1. Sri D. Rama Krishna, Chief Engineer, IS&WR
2. Sri A. Siva Prasad, Chief Engineer, North Coast
3. Sri R. Satyanarayana, Witness/TAC member

4. Sri V.V.S Rama Murty, Witness/ TAC member
5. Sri P. Rama Raju, TAC Member
6. Sri P. Rama Krishna Murthy, Superintending Engineer, IS&WR
7. Sri B. Rambabu, Superintending Engineer, Vamsadhara
8. Sri G.V. Subrahmanyam, Executive Engineer, IS&WR
9. Sri T. Giridhara Rao, Deputy Diector, V.W.D.T
10. Smt. L. Gayatri Devi, D.E.E., IS&WR
11. Sri Siva Sanker, D.E.E, IS&WR
12. Sri P. Nageswara Rao, D.E.E., Vamsadhara, Project
13. Sri M. Venkata Krishna, D.E.E., Vamsadhara Project
14. Sri A.G. Vara Prasad, A.E.E, IS&WR
15. Sri J.V. Rama Rao, A.E.E, IS&WR
16. Sri M. Suresh Kumar, A.E.E, IS&WR

ODISHA

Legal Team

1. Sri Mohan V. Katarki, Advocate
2. Sri R.S. Jena, Advocate on record

Technical Team

1. Sri F.M. Das, Chief Engineer
2. Prof G. N. Yoganarasimhan, Expert
3. Sri C.V. Prasad, Consultant
4. Sri Upendra Sethy, D.D.
5. Sri Hari Hara Mohanty, A.D.

GOVERNMENT OF ODISHA



DEPARTMENT OF WATER RESOURCES

TECHNICAL PRESENTATION

PRESENTING THE VIEWS OF ODISHA

DURING

VISIT OF HON'BLE TRIBUNAL TO CWPRS, PUNE

FOR

INSPECTION OF MODEL OF NERADI BARRAGE

1

Technical Presentation to Hon'ble VWDT

- **Vansadhara Water Dispute Tribunal** vide its Order dated 3rd May 2013 directed to provide fresh data to CWPRS for it to decide, if any changes are required in the Model studies done so far.
- Also directed that the decision shall be taken by CWPRS within 10 days of the receipt of data and if it is decided that a fresh study is to be made, the same should be completed within three months thereafter.

2

Contd.

- The Joint Surveys were conducted under the overall Guidance of CWC during the period 15th-22nd May,2013.The Joint field survey data handed over to CWPRS. **A joint meeting was held** between Officials of Govt. of Odisha, Andhra Pradesh and CWPRS.

3

Contd

- While comparing the old and new sections, Engineers of both the states expressed that the alignment, bench marks (for elevation) and zero of the cross sections were different for both the surveys. The same views are conveyed by CWPRS to Andhra Pradesh on dated 11th July 2013 (Ref. page 31 of Technical Report).

4

Contd.

- And reconciliation of new cross section with old cross section of Vansadhara river can not be done without proper expertise, **neither** CWPRS is having such expertise.
- In view of the above, CWPRS was of the opinion that mathematical model studies may be carried out expeditiously using new cross section data and the results could be compared with the past model study results.

5

Contd.

- At the time of referring model studies to CWPRS, Andhra Pradesh was well aware of the requirements of embankments/Flood protection walls and the need to reduce the extent of back water. These were the problems for which model studies should have addressed. Instead, CWPRS only carried out conventional type of studies without looking to alternatives to solve the problem on hand.
- Instead of this, the **best option** for comparison purpose, a new physical mobile bed model studies with fresh cross sections should have been carried out and compared with mathematical study with new cross sections.

6

Mathematical Model Study of Neradi Barrage by CWPRS (2013)

➤ CWPRS conducted the Mathematical Model Study to assess qualitative changes in River Vansadhara near proposed Neradi Barrage & submitted its Technical Report No. 5098 during August 2013. **with the Objectives:**

1. To assess the extent of back water due to proposed Neradi Barrage with newly surveyed data.
2. The result of model study can be compared with the result of past model study to decide on the extent of changes in river if any qualitatively.

7

Important Shortcomings of Model Study

- This study has many short comings **in fulfilling the above objectives** .
- The results of Mathematical model studies done can not be compared with the earlier Physical model studies as the new cross sections are not comparable with the Old cross sections.

8

Contd.

- Average/deepest bed levels of new cross sections of old and new surveys are compared and concluded that there is no morphological change in the River Vansadhara in the said reach
- This statement is contradictory to earlier one.

9

Contd

- Besides this, Model was run **without incorporating embankments or flood protection wall upstream of barrage** for estimating the back water extent with the new cross sections which is not in tune with the Inter state Agreement regarding providing the Flood protection wall of 3.8 km to limit back water extent within 3.0 km.

10

Contd.

- In the Inter State Agreement dated 09.02.1985, it was agreed that “ After dividing the channels into main channel and over bank, the values of ‘n’ already decided that is **0.04 for over bank and 0.03 for main channel** will be adopted.”
- However, the Model was run with **single ‘n’ value for both bed and bank.**

11

Contd

- Model was run **without considering the sediment load movement.**

The sediment flow in River Vansadhara is significant (**about 40 % of** coarse and medium load flows with respect to total annual load) **which can not be ignored.**

12

Contd.

- The new cross sections while carrying the joint surveys have not been taken up to the highest flood levels observed.
- However, the **Calibration of the Model** was done with water levels observed in 1980 flood with the recent cross sections. **This is not acceptable.**

13

Contd.

- **CWPRS in its Conclusion** in Technical Report No. 5098 has mentioned that "For a discharge of 16990 m³/s, increase in water level at cross section No. 2 (2 Km upstream of barrage) over the existing condition (pre-barrage condition) was 5 cm. **With the studies conducted during 2005, the increase in water level was 72 cm over the existing condition.**"

14

Contd.

- While comparing the new and old cross sections , it is observed that there is change (more than 0.50m) in **deepest bed level** in **14 nos** of cross sections and change (more than 0.50m) in **average bed level** in **12 nos** of cross sections out of 26 no of cross sections surveyed. (Extract from Technical Report can be seen).
- It can be said the results are not matching with earlier studies.

15

Comparison of Deepest Bed Levels,R.L.,m

	Cross Sections	Old Data	New Data	Difference (New-Old)
Upstream	15	73.71	80.28	6.57
Upstream	14	79.11	79.31	0.2
Upstream	13	76.97	78.42	1.45
Upstream	12	77.59	77.73	0.14
Upstream	11	77.84	76.5	-1.34
Upstream	10	76.85	76.04	-0.81
Upstream	9	75.49	75.29	-0.2
Upstream	8	74.56	74.14	-0.42
Upstream	7	73.52	73.23	-0.29
Upstream	6	68.63	72.3	3.67
Upstream	5	67.86	71.61	3.75
Upstream	4	71.07	70.81	-0.26
Upstream	3	70.66	69.96	-0.7
Upstream	2	69.46	68.58	-0.88
Upstream	1	68.36	67.92	-0.44
Barrage Axis	0	67.77	67.53	-0.24
Downstream	-1	67.02	66.72	-0.3
Downstream	-2	66.68	66.02	-0.66
Downstream	-3	65.75	65.23	-0.52
Downstream	-4	64.85	63.84	-1.01
Downstream	-5	63.58	62.38	-1.2
Downstream	-6	62.38	61.83	-0.55
Downstream	-7	60.98	61.17	0.19
Downstream	-8	59.32	60.68	1.36
Downstream	-9	59.32	59.41	0.09
Downstream	-10	58.23	58.53	0.3

16

Comparison of Average Bed Levels, R.L., m

	Cross Sections	Old Data	New Data	Difference (New-Old)
Upstream	15	83.66	84.89	1.23
Upstream	14	82.18	83.19	1.01
Upstream	13	80.68	82.2	1.52
Upstream	12	80.99	81.76	0.77
Upstream	11	81	80.82	-0.18
Upstream	10	81.01	80.15	-0.86
Upstream	9	79.47	77.89	-1.58
Upstream	8	78.46	78	-0.46
Upstream	7	77.8	77.32	-0.48
Upstream	6	76.4	77.45	1.05
Upstream	5	75.73	74.78	-0.95
Upstream	4	75.24	74.85	-0.39
Upstream	3	73.28	73.04	-0.24
Upstream	2	72.3	72.53	0.23
Upstream	1	72.2	72.16	-0.04
Barrage Axis	0	71.73	71.55	-0.18
Downstream	-1	70.54	70.36	-0.18
Downstream	-2	70.21	69.63	-0.58
Downstream	-3	67.96	68.09	0.13
Downstream	-4	67.93	68.04	0.11
Downstream	-5	66.62	66.25	-0.37
Downstream	-6	66.44	65.56	-0.88
Downstream	-7	64.02	65.16	1.14
Downstream	-8	64.85	63.52	-1.33
Downstream	-9	63.93	64.15	0.22
Downstream	-10	64.04	63.7	-0.34

OBSERVATIONS REGARDING MATHEMATICAL MODEL STUDY :

- Mathematical model should be run **with** flood protection wall **with** consideration of 'n' as agreed in the inter state agreement dated 09.02.1985 at Bhubaneswar and **with** incorporating sediment transport in the river **with** all the gates open and with 10 % inoperative gate condition.

Contd.

- Mathematical Model study for back water computation have been carried out by Deptt. of Water Resources, Govt. of Odisha, using HEC-RAS model with same data used by CWPRS, Pune for the condition of 10 % gates inoperative with flood protection wall of length 3.5 km upstream of barrage. The back water extends up to 9.0 km. If sediment input is considered, the back water stretch may further increase.

19

Deficiencies of Earlier Physical Model studies of Neradi barrage conducted by CWPRS, Pune(2005)

- The purpose of the Model Study is to
 - (i) Estimate the backwater extent,
 - (ii) Examine the upstream protection arrangements for the barrage
- This is a distorted model(5:1) with different horizontal and vertical scales. (vertical Scale: 1:40 & Horizontal Scale 1:200)
- The sediment scale is not mentioned. The sediment size is decided by trial and error for minimising local scour.

Contd.

- The model has not included either embankments/ flood Protection wall but considered only protection works for the barrage.
- Development of backwater with continuous aggradations of river bed due to sediment inflow has not been considered.
- **The back water observed in such model can not correctly estimate the back water extent due to above deficiencies.**

21

COMPARISON OF AFFLUX JUST U/S OF BARRAGE

Year of Study	Organization	Type of Model Study	Software Used	Afflux just u/s of the Barrage (cm)	Remarks
2000	CWC	Mathematical	MIKE- 11	36.0	Using Old cross-section
2005	CWPRS	Physical	-	46.0	-do-
2005	CWPRS	Mathematical	HEC-6	44.0	-do-
2013	CWPRS	Mathematical	HEC-RAS	28.0	Using New cross-section

With no change in Barrage design, the different magnitude of afflux computed by different method in different years indicate the river as Morphologically active.

22

LOCAL VISIT-I OF VWDT

- During Field visit, it is observed at the Gotta Barrage site that the sediment had accumulated right up to the crest of barrage bays and the same may likely to happen at Neradi Barrage too, resulting in flatter river bed slope in up stream of Neradi Barrage and higher water levels.
- The Tribunal advised the Odisha officials in the report on Local visit-I during the period 23rd to 24th April 2013 to submit their various options to Andhra Pradesh Government which could be responded to by them for reaching an amicable solution, if possible, to these contentious issues.

23

SUGGESTIONS OF ODISHA ON DIFFERENT OPTIONS:

- It is not understood why GOAP has not taken any action regarding Neradi construction till the year 1978, though agreements were drawn between the two states as early as during 1962 instead of blaming Odisha for its lapses.
- It appears AP had some public opposition for taking up Neradi project for which AP could not initiate any action till 1978. Now Odisha has similar resistance after 1980 floods from the villagers affected due to Neradi barrage.

24

Contd.

- If AP is serious for accruing irrigation benefits, it would have thought of to lift water from Gotta barrage to Hiramandalam to draw only 8 TMC of water if it is temporary arrangement in stead of proposing controversial Side Weir project. This would have saved water from going to Sea and produced irrigation benefits for last 40 years.

25

Contd.

- Neradi agreement and the stipulations are to be adhered to, for which AP could have explored by reformulating the Neradi Barrage with :

Keeping the crest level of all the bays of barrage at river bed level which may reduce the afflux and back water with in 3 km and submergence may be kept with in agreed 106 Acres by providing a flood protection wall.

The feasibility of this proposal is to be thoroughly examined by Andhra Pradesh.

26

THANK YOU

27

भारत सरकार
जल संसाधन, नदी विकास और
गंगा संरक्षण मंत्रालय
केन्द्रीय जल और विद्युत अनुसंधान शाला
पुणे - 411 024



Annexure - IX
Government of India
Ministry of Water Resources,
River Development and Ganga Rejuvenation
CENTRAL WATER AND POWER RESEARCH STATION
Pune - 411 024

No. RH/TN /2014 /4666

Date: 15th December 2014

✓ Shri B V Sharma,
Registrar (VWDT), 5th floor,
Mohan Singh Place,
New Delhi - 110 001.
Tele fax 011-23368327

For signature

By speed post

Sub: Answer to the queries on subject related to the model studies carried out by
CWPRS Pune during the visit of VWDT on 4-5 December 2014.

Sir,

Please find enclosed herewith, the replies to the queries on subject related to the model
studies carried out by CWPRS, Pune during the visit of VWDT on 4-5 December 2014 along
with the colored copy of presentation.

Thanking you,

Yours faithfully,

Encl : As above.

(T. Nagendra)
Scientist-E



दूरभाष / Telephone : +91-20-24103444; फ़ैक्स / Fax : +91-20-24381004; ई-मेल / Email : rsrgp@rediffmail.com
वेब / Website : www.mowr.gov.in, www.cwprs.gov.in

Clarifications on the queries raised by Odisha Engineers/Experts during VWDT meeting on 04-12-2014 after CWPRS presentation

1. Whether Flood protection works were considered in the 2013 mathematical model studies?

Ans: The mathematical model studies conducted in 2013 reported vide CWPRS Technical Report No. 5098 of August 2013 titled "Mathematical model studies to assess qualitative changes in river Vamsadhara near proposed Neradi barrage" were undertaken with specific objective to establish whether there has been any major change in the river configuration (bathymetry) when compared with the old river data of 2003. The 1-Dimensional mathematical model simulations were carried out utilising the data furnished through the joint survey carried out by Odisha and A.P. The river cross-sections submitted did not include the proposed embankment or flood protection. It may be mentioned that this aspect is not included in the predefined aim of the studies and no query in this regard was raised before the conduct of the studies. The physical model studies reported vide Technical Report No. 4212 of February 2005 were also conducted without the proposed embankment or flood protection wall upstream of the proposed barrage. In view of this, the results of earlier physical model and present mathematical model are based on the similarly placed model input data and boundary conditions. The only difference between the two model simulations is the model input for the river bathymetry in the form of cross sections corresponding to old survey and survey conducted in 2013. The mathematical model study was done to assess the effect of the natural changes that might have occurred over the period between collection of both the data.

2. If Comparison of the Cross sections of 2013 was not possible then how the results are comparable?

Ans: The comparison of the river cross sections of 2003 and 2013 was not possible as the cross section alignments and zero (starting point) were different in the two surveys. Engineers of both the states accepted this flaw in the conduct of the survey and expressed that the reconciliation of new cross sections in relation to the old cross sections (2003) of Vamshadhara river could not be done without proper expertise and neither CWPRS was having such expertise. In view of this, CWPRS suggested an indirect method of comparing the results by undertaking 1-Dimensional mathematical model studies utilising the river cross section survey data of 2013 and with proper calibration of the model. Thus instead of establishing the physical changes in the bathymetry the changes in the hydrodynamics, that may be major or minor, could be decided based on the variations in the results. The representatives of both the states agreed to the above facts vide the minutes of meeting held at CWPRS during 5-6 Aug. 2013. These minutes of meeting are included in the CWPRS Technical Report No. 5098 of August 2013.

The 1-Dimensional model HEC-RAS does not require the zero and the alignment of the cross sections. It creates topography of the river based on the consecutive given cross sections and the computations proceed from one cross-section to the next one using standard step method of back water computation.

3. Why agreed n values not used (Agreed values were 0.03 for deep channel and 0.04 for flood plain)?

Ans: Manning's n is a calibration parameter in a 1-D model. While calibrating the model for the observed water levels this parameter will be adjusted in order to match computed water level with the observed values. Thus, the mathematical model was proved initially for the existing condition of the river i.e. by conducting studies using river cross-sections and not including the barrage. The agreed flood levels at individual cross-sections were matched, by changing the manning's 'n' values. These manning's 'n' values were used further for model simulations of the river including proposed barrage. The difference in water levels upstream of the barrage computed in these two cases is termed as the afflux at those cross-sections. These results are presented in the report.

Additional Notes:

- The manning's 'n' values are intrinsic property of the river. The values are to be generally derived by comparing the results as it is done in this particular case explained above and it is called "solving inverse problem".
- Similarly, to understand the sensitivity of the results for different manning's 'n' values, additional studies were conducted with fixed 'n' values of 0.015, 0.03 and 0.045. The results are enumerated under Section 6.0 of the CWPRS Technical Report No. 5098 of August 2013. One must accept that these are widest possible range of 'n' values in the river.
- CWPRS agrees that it has not adopted varying 'n' values of 0.03 and 0.04 across the cross section for the model study reported in CWPRS Technical Report 5098 of August 2013. It is, however, noticed from correspondence files that the model study with this setup of varying 'n' of 0.03 and 0.04 for overbank portion was also done by CWPRS subsequently. These results were communicated to Shri Manoj Kumar Misra, Engineer-in-Chief, Water Resources, Odisha, Bhubaneswar vide our letter No: RH/RGP/Neradi /2013/5075 dated 04th October 2013. The results for this setup indicated that the maximum afflux computed just upstream of barrage was 23 cm which diminished to 1 cm at cross section 6 km upstream of proposed Neradi barrage.
- In addition it may be mentioned that in the 1-Dimensional mathematical model specifying different 'n' values for main channel and flood banks is ultimately converted to a single value known as effective 'n' value. whatever may be the combination of river width and flood plain widths, with 0.03 and 0.04 as the n values for channel and overbanks respectively (as agreed), the effective n value is bound to lie between 0.03 to 0.04 as per the equation 1 (Open Channel Hydraulics by Ven Te Chow, 1981) given below. It is pertinent to note that in the report No. 5098 of August 2013 sensitivity analysis for a range of 'n' values was done and contains results encompassing these values starting from 0.015 to 0.045.

$$n = \frac{(P_1 n_1^2 + P_2 n_2^2)^{1/2}}{P^{1/2}} \quad \dots(1)$$

Where,

- P_1 and P_2 are the parts of total wetted perimeter length P of the cross-section having corresponding manning's n values.
- $P=P_1+P_2$ and P_1 is having n_1 and P_2 is having n_2 manning's coefficients

4. Is there necessity of lowering the crest of barrage?

The crest of the barrage is set at RL. 67.97 m. The cross section at the barrage axis is shown in Figure 1 below. It could be seen that the crest is already at the bed level and possibility of further lowering is difficult.

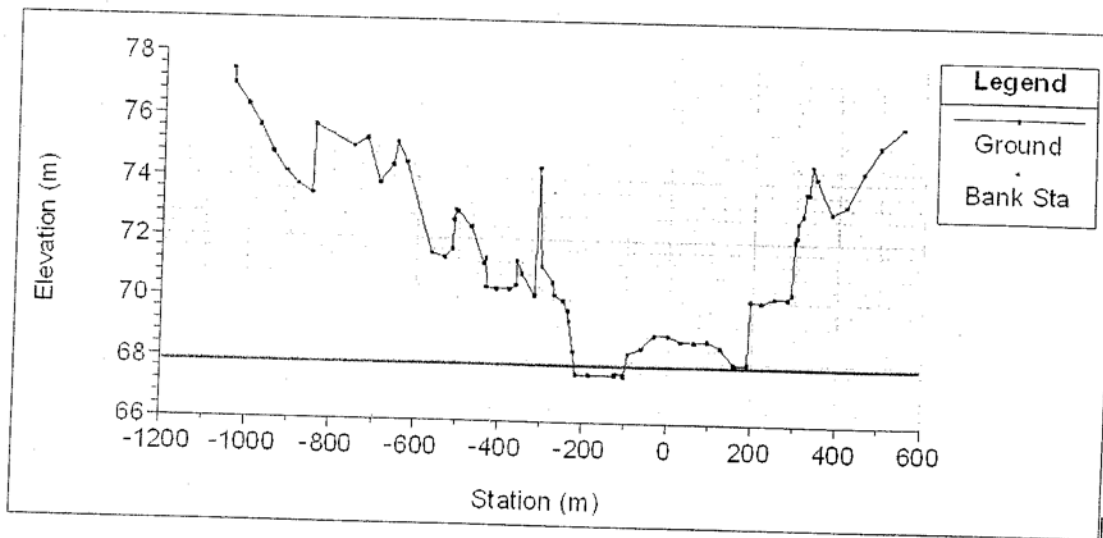


Figure 1: Cross section at proposed Neradi Barrage Axis

5. Why sediment is not considered in the study?

Ans: The 1-D mathematical model used for assessing the water levels does not include sediment transport simulations. The simulations have been carried out for the present scenario of the river cross sections, which is taken as representative of the river regime for the prevailing flood flow and sediment transport. The simulations for sediment transport and the shoaling pattern in the river would require highly sophisticated 2-Dimensional / 3-Dimensional mathematical models with elaborate data on suspended load inputs and river bed characteristics. Because of these limitations CWPRS is not inclined to study this effect.

6. Why there is variation in the afflux?

Ans: The variation in the afflux reported vide our technical reports is mainly attributable to the variation in cross section data supplied for the conduct of the studies. The limited cross section data submitted earlier was not extending on either side up to the high banks beyond the high flood levels. Due to the limited data the mathematical model considering a vertical

wall at the two side, there by restricting the area of cross section of the flow. This restriction will artificially amplify the afflux conditions in the model simulations. However, during the conduct of 2013 survey, at the insistence of CWPRS the data was acquired up to the high banks on both banks of river. Due to the inclusion of entire cross section for the flood flow, there is reduction in the afflux.

Additional Queries by the Hon'ble Chairman, VWDT

7. What will be the impact of removal of Shoal upstream of the barrage and its effect on the back water effect?

Ans: The removal of shoal upstream of barrage in order to increase the width of river or flow cross section would normally result in reduction in back water length. Quick model simulations undertaken on 4th Dec. 2014 using 2013 data revealed that the back water effects are bound to extend up to 4 to 5 km instead of 6 km. The afflux at the barrage, however, remains unchanged.

The removal of shoal by deepening the channel is morphologically not a recommended solution. This may lead to head cut and bank erosion on upstream. The shoal would always rebuild itself during subsequent flood events.

Clarifications on the queries raised during visit of VWDT to the model and meeting thereafter on 05-12-2014.

1. Concept of Gravity wave.

Ans: The effect of gravity upon the state of flow is represented by a ratio of inertial force to gravity forces. This ratio is given by the Froude number, defined as $F_r = \frac{V}{\sqrt{gL}}$, where 'V' is the mean velocity of flow, 'g' is acceleration of gravity and 'L' is characteristic length. In open channel flow the characteristic length is made equal to the hydraulic depth d, which is defined as the cross sectional area of water normal to the direction of flow in the channel divided by the width of the free surface. If 'F_r' is equal to unity, the flow is said to be in a critical state and in such a case $V = \sqrt{gd}$. If 'F_r' is less than unity, the flow is sub-critical. In this state the role played by gravity forces is more pronounced; so the flow has low velocity ($V < \sqrt{gd}$) and is often described as tranquil and streaming. If 'F_r' is greater than unity, the flow is super critical ($V > \sqrt{gd}$). In this state the inertial forces become dominant; so the flow has a high velocity and is usually described as rapid, shooting and torrential.

In the mechanics of water wave, the critical velocity $\sqrt{gd}$ is identified as the celerity of the small gravity wave that occur in shallow water in channels as a result of any momentary change in the local depth of water. Such a change may be developed by disturbances or obstacles in the channel that cause a displacement of water above and below the mean surface level and thus create waves that exert a weight or gravity force. It should be noted that a gravity wave can be propagated upstream in water of subcritical flow but not in water of supercritical flow, since the celerity is greater than the velocity of flow in the former case and less in the later. Therefore, the possibility or impossibility of propagating a gravity wave upstream can be used as a criteria for distinguishing between sub critical and super critical flow.

In case of Vamshadhara River, the flow velocities and in turn the Froude number at around 6 to 7 km is more than unity. The same was observed on the model to be supercritical (Rapids). In view of this, the effect of back water which travels upstream as a gravity wave is arrested by this kind of flow as explained above.

2. Siltation of barrages

Ans: The alluvial reaches of the rivers, under normal circumstances carry sediments/silts whose concentration depends on the flow velocities. Whenever the flow velocities reduce, the sediments/silt is deposited on the river bed. The shoal (island) formations are the examples of such phenomena. These shoals gets washed away when large floods with high velocity flows exert shearing stresses. The cohesive strength of shoal material along with the vegetation may oppose the flushing of shoal.

Formation of shoals/ siltation is generally observed to occur on upstream of most of the barrages. However, its size and shape are governed by the hydrology, slope, sediment concentration and plan form of the river. The size of such shoals, attain

equilibrium in a short period of 15 to 25 years. The size of such shoals does not increase infinitely and they attain equilibrium. The shoals that are formed in the vicinity of barrage upstream are required to be flushed/ managed by passing discharge using proper gate operation scheduling.

3. Barrage gate regulation/ operation.

Ans: The shoals that form in the vicinity of the barrage on upstream, as explained in 2 above are managed by inducing high velocity flows adjacent to them by operating the barrage gates. The shoals experience higher shearing stresses due to higher velocity of flow. For management of siltation the gates are accordingly operated during high floods to flush the siltation. The well managed barrages generally do this by studying the gate operation schedule on a physical model.

4. Odisha engineers in their presentation slide 9 have claimed "*Average/deepest bed levels of new cross sections of old and new surveys are compared and concluded that there is no morphological change in the river Vamshadhara in the said reach. This statement is contradictory to earlier one*".

Ans: CWPRS have not discussed anything about morphological issues in the Technical report No. 5098 of Aug. 2013. However, it is concluded (page No. 7) that "the changes in bed form of river Vamshadhara in the given river reach are minor which may not change the flow phenomena on a larger scale.

Replies to other queries are already submitted to VWDT on 05.12.2014 during the meeting held at CWPRS, Pune.

REPORT

ON

THE VISIT OF ASSESSORS OF

VANSADHARA WATER DISPUTES TRIBUNAL

TO

PROPOSED NERADI BARRAGE

AND

SIDE WEIR AT KATARAGADDA, ETC.

24-26 APRIL, 2017

**REPORT ON THE VISIT OF ASSESSORS OF VANSADHARA WATER
DISPUTES TRIBUNAL TOPROPOSED SITE OF NERADI BARRAGE, SIDE
WEIR AT KATARAGADDA,GOTTA BARRAGE, ETC.**

After the joining of the new Assessor, Shri M.S. Agrawal in the Vansadhara Water Disputes Tribunal (VWDT) on 31st March, 2017, it was decided that a team comprising of the two Assessors, namely, Shri A.D. Bhardwaj and Shri M.S. Agrawal and the Registrar of the Tribunal, Shri Harish Chander visit the proposed project sites at Neradi and Kataragadda from 24th to 26th April, 2017.

The team of officers from VWDT and the representatives of the State Governments of Andhra Pradesh and Odisha visited the sites of proposed Neradi Barrage, Side Weir at Kataragadda, Flood Flow Canal, Hiramandalam Reservoir, Gotta Barrage, Bhyri Open Head Channel Mouth, Gauging Site at Kashinagar, etc. on 24th & 25th April, 2017. List of the officials present during the visit is at Annexure-I.

(A) VISIT TO RIGHT BANK OF THE RIVER

On day one, a visit to the site of proposed Neradi Barrage and the Side Weir at Kataragadda (from the right bank i.e. Andhra Pradesh) and Flood Flow Canal and its ancillary structures, Singidi and Parapuram Balancing Reservoirs,

Hiramandalam Reservoir, Gotta Barrage and Bhyri Open Head Channel Mouth were visited.

PROPOSED NERADI BARRAGE SITE

The team of VWDT alongwith officials of Governments of Andhra Pradesh and Odisha first visited the proposed Neradi Barrage site. The Layout Plan of the barrage was displayed at the site. The officials of Andhra Pradesh explained the details of the proposed barrage. It was informed that both the States had agreed on 30.9.1962 to share the water yield of 115 TMC of Vansadhara river at Gotta Barrage on 50:50 basis. Odisha agreed for acquisition of 106 acres of land situated within its territory for facilitating construction of Neradi Barrage. The Chief Minister of Odisha on 03.10.1962 informed his counterpart that Andhra Pradesh may go ahead with construction of the Neradi Barrage subject to certain conditions. Thereafter, a number of meetings were held between the officials of the two States to sort out various technical issues. Unprecedented rains occurred in Vansadhara river catchment in September, 1980 resulting in a heavy flood in Vansadhara river. Keeping it in view, it was agreed that the barrage should be designed for a flood discharge of 6 lakh cusec instead of the earlier agreed flood discharge of 2.3 lakh cusec. The VWDT team was informed that though the land requirement increased from 106 acres to 1326 acres to accommodate the revised figure of the flood,

but Government of Odisha insisted that the land acquisition should be restricted to 106 acres only. Odisha raised a number of issues regarding the afflux and the height of the protection wall. Therefore, both the States agreed in 1991 that the mathematical model studies may be conducted before proceeding with the construction of Neradi Barrage. These studies were carried out by CWC and the results showed that the river regime is stable and afflux beyond 6 km is within the permissible limits. Later on, at the insistence of Government of Odisha, Andhra Pradesh agreed for conducting the physical model studies by Central Water and Power Research Station (CWPRS), Pune. Odisha raised number of objections to the results of both the studies and did not accept these reports.

It was informed that the length of the barrage between the abutments would be 696 m with 30 numbers of spillway vents. The sill level of the spillway vents would be 67.970 m and pond level would be at 71.630 m. The site of the proposed barrage was visited from the right bank of the river i.e. Andhra Pradesh side. It was observed that the flow in the river was quite less, say of the order of less than 100 cusec.

The officers of Odisha mentioned that there will be submergence upto 9 km upstream from the barrage while considering the design flood of 6 lakh

cusec and heavy siltation on upstream side of the barrage, which would affect interests of Odisha.

SIDE WEIR AT KATARAGADDA

The team then visited the Side Weir site at Kataragadda. The Layout Plan of Side Weir, Flood Flow Canal and its Head Regulator, Escape Channel and Silt Ejector alongwith other design features related to the Side Weir were displayed at the site. The sill level of the Side Weir has been fixed in such a way that the flow exceeding 4000 cusec in the river will spill over the Side Weir towards the Flood Flow Canal and, in case the flow is less than 4000 cusec, all the water will flow into the river. Further, the flow spilled over the Side Weir exceeding 8000 cusec would come back to the river through the Escape Channel.

It was noted by the Team of VWDT that in pursuance of the Interim Order of VWDT dated 17.12.2013, construction of Side Weir at Kataragadda, Flood Flow Canal and its Head Regulator, etc. were in progress. 40% work of the Side Weir was reported to have been completed. 25% work of Head Regulator and 25% work of Scour Sluice were also completed. Works relating to Stilling Basin and Escape Channel, etc. were also in progress.

The officials of Odisha reiterated their apprehension that the Side Weir was located in the bend in the river where the flow in the river approaches the Side Weir almost at perpendicular direction and maximum water would be withdrawn by Andhra Pradesh. They also mentioned that there will be aggradation on the left bank i.e. Odisha side of the river.

FLOOD FLOW CANAL

The design capacity of the Flood Flow Canal is 8000 cusec. The construction work of Flood Flow Canal off taking from the Side Weir at Kataragadda was in full swing and about 17 km out of the total length of 29.471 km had been completed while the works in the length of 10.65 km was in progress. The cement concrete lining in Flood Flow Canal was also in progress in 3.1 km reach of the canal.

HIRAMANDALAM RESERVOIR

The purpose of the Hiramandalam Reservoir is to store the water withdrawn from the river Vansadhara either through the Side Weir at Kataragadda or from Neradi Barrage (whenever constructed) and utilise the stored water for drinking and irrigation purposes as per the need. The storage capacity of Hiramandalam Reservoir is 19.359 TMC.

The construction work of Hiramandalam Reservoir was in progress and 80% of the work of Main Earthdam was completed. The work of Link Head Sluice was in progress. 74% work of the Surplus Channel was also complete. 85% work of Link Canal and 88% work of the Head Regulator was also complete.

Between the Side Weir at Kataragadda and Hiramandalam Reservoir, construction of two Balancing Reservoirs, namely, Singidi (storage capacity 0.0686 TMC) and Parapuram (storage capacity 0.404 TMC) was also in progress.

GOTTA BARRAGE

The Gotta Barrage across river Vansadhara at 48 km downstream of proposed site of Neradi Barrage was constructed in the year 1978. It comprises of 22 numbers of vents in the spillway portion of the barrage and 2 numbers of Scour Sluices. On the day of the visit, there was almost no flow in the river at the barrage. Left Bank Canal offtakes from Gotta Barrage for irrigating a command area of 1,48,230 acres. The discharge capacity of the Canal at the Head is 2480 cusec.

BHYRI OPEN HEAD CHANNEL MOUTH

Thereafter, Bhyri Open Head Channel Mouth on river Vansadhara was visited. The arrangement for diverting the water from the Vansadharariver was reported to be century old system. Presently, Groyne structure across the river is built through which water is diverted to the mouth of Open Head Channel, which ultimately carries the water to the Main Canal controlled by a Head Regulator. The Groyne structure is rehabilitated and the silt deposited in the Open Head Channel is cleared well before the onset of the monsoon. It was reported that the system was functioning very well and farmers were utilising the water for agricultural fields.

(B) VISIT TO LEFT BANK OF THE RIVER

On second day, the Collector & District Magistrate and the Superintendent of Police of Gajapati District alongwith other officials of the Government of Odisha received the team of the VWDT. The Gauging Site on river Vansadhara at Kashinagar mainained by CWC, proposed site of Neradi Barrage and the left bank opposite to Side Weir at Kataragadda were visited from the left bank of the river i.e. Odisha side.

GAUGING SITE AT KASHINAGAR

The Gauging Site on river Vansadhara at Kashinagar maintained by the Central Water Commission (CWC) was visited. The staff of CWC present at the Gauging site informed that the Highest Flood Level (HFL) in the river recorded at Kashinagar was 57.64 m on 18th September, 1980. The discharge measured on the day of the visit was 1.02 cumec (i.e. 36.02 cusec) at water level of 53.37m.

The officials of Odisha mentioned that after the 1980 flood, there had been heavy siltation towards left bank of the river and the main channel has shifted towards the right bank of the river.

PROPOSED NERADI BARRAGE SITE

The team visited the proposed Neradi Barrage site from the left bank of the river i.e. Odisha side. The officials of Odisha stated that the Government of Odisha had agreed in-principle for the construction of Neradi Barrage subject to limiting the acquisition of land to 106 acres in Odisha territory and afflux limited to 3 km upstream of the barrage in the year 1961. They also apprehended that the people of Sara village are farming on the left bank of the river and their land would get submerged due to construction of the barrage. This will affect the Sara village. The Andhra Pradesh officials stated that the

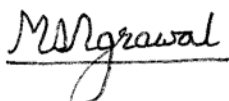
proposed Protection Wall upstream of Neradi Barrage will provide adequate protection to Sara village.

LEFT BANK OPPOSITE TO SIDE WEIR AT KATARAGADDA

The team visited the left bank area opposite to the Side Weir at Katragadda. The officials of Odisha reiterated that the flow of the river is approaching the Side Weir almost perpendicularly. This will result in maximum flow of water towards the right bank and aggradation of the silt towards left bank of the river. The villagers also expressed their views before the team and mentioned about the submergence of the agricultural land due to construction of the proposed Neradi Barrage. They desired that adequate compensation may be provided to them for the same and the Sara village should be protected from the submergence in case of the construction of Neradi barrage.

Thereafter, the team alongwith officials of Odisha and Andhra Pradesh reached Paralakhamudi, where the Collector & District Magistrate, Gajapati District joined the team during the lunch.

The Team thanked the officials of Andhra Pradesh and Odisha for making the necessary arrangements for the visit.


(M.S. AGRAWAL)
ASSESSOR


(A.D. BHARDWAJ)
ASSESSOR

**LIST OF TEAM OF VANSADHARA WATER DISPUTES TRIBUNAL AND
OFFICIALS OF ANDHRA PRADESH AND ODISHA PRESENT DURING SITE VISIT**

VWDT OFFICIALS

1. Shri A.D. Bhardwaj, Assessor
2. Shri M.S. Agrawal, Assessor
3. Shri Harish Chander, Registrar

ANDHRA PRADESH OFFICIALS

1. Shri D. Ramakrishna, Sr. Tech. Adviser
2. Shri M.T. Raju, CE, North Coast
3. Shri V.V.S. Rama Murti, TAC Consultant
4. Shri R. Satyanarayana, TAC Consultant
5. Shri B. Appala Naidu, SE, Vamsadhara Project
6. Shri T. Giridhara Rao, Dy. Director (VT)
7. Shri R. Appala Naidu, EE, Vamsadhara Project
8. Shri M. Seetha Ram Naidu, EE, Vamsadhara Project
9. Shri M.Vijaya Kumar, EE, Vamsadhara Project
10. Shri P. Nageshwara Rao, DEE, Vamsadhara Project
11. Shri S. Seetha Ram, DEE, Vamsadhara Project
12. Sushri T.D. Usha Rani, DEE, Vamsadhara Project
13. Sri M. Venkala Krishna, DEE, Vamsadhara Project
14. Shri J.V. Rama Rao, AEE (VT)

ODISHA OFFICIALS

1. Dr. Yoganarasimhan, former Professor IIT and Expert Witness to VWDT
2. Shri C.V. Prasad, former Chief Engineer and Expert Witness to VWDT

3. Shri R.C. Tripathy, former Engineer-in-Chief, WR & Expert Witness to VWDT
4. Shri Arun Kumar Padhy, former Chief Engineer & Expert Witness to VWDT
5. Shri Rabindra Kumar Panda, CE & BM, R.V.N. Basin, Berhampur
6. Shri Sudhansu Samal, IAS, Collector & DM, Gajapati
7. Shri Sushil Kumar Panigrahi, SP, Gajapati
8. Shri Saroj Kumar Pattanaik, SE, SIC, Berhampur
9. Shri Upendra Sethy, Deputy Director, P.P.F., WR, Bhubaneswar
10. Shri Hari Mohanty, AEE, Vansadhara Water Dispute Cell, Bhubaneswar
11. Shri Krushna Chandra Panda, EE, PKID, Gajapati
12. Shri S.K. Ratha, AEE, Parlakhemundi Irrigation Sub Division
13. Shri B.Ch.Padhy, Assistant Engineer

**BEFORE THE VANSADHARA WATER DISPUTES TRIBUNAL
NEW DELHI**

IN THE MATTER OF:

Water disputes between the States of Orissa and
State of Andhra Pradesh regarding the Inter-State
river Vansadhara and the river valley thereof, and

IN THE MATTER OF:

I.A. No. 1/2010 PREFERRED BY THE STATE OF ORISSA

Dated: December 17, 2013.

**CORAM: HON'BLE JUSTICE DR. M.K.SHARMA, CHAIRMAN
HON'BLE MR. JUSTICE B.N.CHATURVEDI, MEMBER
HON'BLE MR. JUSTICE GHULAM MOHAMMED, MEMBER**

FOR THE STATE OF ORISSA:

1. Shri Raju Ramachandran, Sr. Advocate
2. Shri Mohan V. Katarki, Advocate
3. Shri R.S.Jena, Advocate-on-Record

FOR THE STATE OF ANDHRA PRADESH:

1. Shri C.S.Vaidyanathan, Senior Advocate
2. Shri S.Satyanarayana Prasad, Senior Advocate
3. Shri BadanaBhaskar Rao, Additional Advocate General
4. Shri A Satya Prasad, Senior Advocate
5. Shri Y.Rajagopala Rao, Advocate-on-Record
6. Shri M.VishnuVardhan Reddy, Advocate

JUSTICE DR. M.K.SHARMA:

1. Mahatma Gandhi once said "Earth provides enough to satisfy every man's need but not every man's greed". Unfortunately, it is the man's greed and to some extent their need

also which has led to the present environmental degradation all around. Such degradation has been always and everywhere causing havoc upon the entire world of life and material bases. In order to avoid conflict and struggle in our life, the protection of environment must be both our motto as well as the ultimate goal. India has all along the tradition of protecting the environment by showing respect to it. Respecting environment has indeed been a part of our heritage. The concept of 'Panchabhootas' i.e. Air, Water, Earth, Fire and Atmosphere are indeed essential for making life meaningful. Our tradition has taught us to be respectful to the nature by worshipping plants, trees, sky, air, water and mother earth.

2. Mankind, during the initial stages of life was in harmony with nature and there was practically no stress at all on the environment around. With the progress and development of the civilization and the growth of the population there has been a pressure in the environment as mankind has been extracting from the nature energy, power, water and firewood etc. in quantity more than what could be actually extracted from the nature. Consequent thereupon there has been a clash between the need of the man and what nature could actually give to the mankind.

3. It cannot be disputed that there has to be economic development in a developing country like ours, but at the same time we must clearly remember that such development has to be in the closest possible harmony with the environment as otherwise there would be only development but no environment which would result in total devastation. This is what is called sustainable development, meaning thereby that whatever development that we think of could be sustained by the nature and the environment.

4. Out of the various natural resources, water and air are considered to be the most precious natural resources, but as we look around, we find that we have sufficient air around us although a part of it could be polluted. But so far as water is

concerned, it is decreasing and depleting in quantity through the years because of various reasons like global warming and lack of rainfalls due to failure of monsoon etc. But it is accepted by each and every one that water plays a key role in the socio-economic development of the country. Water has always been given a unique and sacred position by all the civilizations which have grown across the world. One common factor across the world is that each civilization has grown by the side of a river. No other entity touches all aspects of our life as water does. Water is indeed a life line for us and our social and economic activities, our culture, our festivals all revolve around water in one way or the other.

5. With the depletion of the quantum of water available with us, another difficulty that is being faced is that the demand for water has grown more owing to the growth of population, and therefore, there is also a nightmare of water scarcity which is looming large in the horizon. We have seen number of conflicts and disputes amongst communities, States and countries with regard to user of water.

6. The need of the hour therefore, is optimising the utilization of available water for which a proper planning has to be done, which would involve participation and coordination of all the stake holders. Water availability and its demand and proper planning of its utilization is of utmost importance in the present day environment for our livelihood and also in order to sustain, maintain and promote sustainable development. Efficient planning and management of country's water resources will also depend upon the availability of requisite data and therefore, there is a need to have a National Information System consisting of data at watershed level and integration of the same to State level and National level.

7. We have stated the aforesaid facts as we are concerned with a dispute arising out of use of water of a river called 'VANSADHARA RIVER' flowing through two States namely Orissa

and Andhra Pradesh. This river is an important East-flowing river originating just South-West of Lanjigarh Village, Kalahandi District Orissa at an elevation of about 1300 Meters above sea level. The river flows for a total length of about 265 Kms., out of which 154 Kms. of length lies in Orissa, whereas remaining 82 Kms. lies in Andhra Pradesh before it falls into the sea. This also indicates that approximately 29 Kms. length of the river forms the common boundary between Orissa and Andhra Pradesh as it runs through both the States. The Vansadhara River basin has a catchment area of 10830 Sq. Kms. of which 8960 Sq. Kms. (82.7%) lies in Orissa and the remaining 1870 Sq. Kms. (17.3%) lies in Andhra Pradesh.

8. The Vansadhara river is rain fed river and the river basin experiences rainfall mainly from the South-West monsoon which contributes about 74% of average annual rainfall of 1067 mm. The monsoon is active from the month of June to November for the purpose of hydrological study.

9. Andhra Pradesh and Orissa are co-riparian States of Vansadhara Basin. Orissa is the upper riparian while Andhra Pradesh is the lower riparian. The people inhabiting the near about area of the river in both the States are totally dependant on the water of this river for the purpose of drinking, agriculture and their livelihood. In that view of the matter after independence of the country steps were taken for development of Vansadhara river basin. As a part of the said development, State of Andhra Pradesh somewhere in 1950 proposed construction of Gotta reservoir and Neradi barrage across river Vansadhara. In terms thereof Gotta reservoir stood constructed consequent upon which some area of irrigated land was submerged. The construction of the aforesaid Gotta barrage was completed sometime in the year 1982.

10. The proposal to construct the barrage across the river Vansadhara called 'Neradi barrage' is proposed to be constructed 48 Kms. upstream of Gotta barrage. Since the said project when constructed would amount to submerging of a large area of land

both of Andhra Pradesh and Orissa, mutual consultation between the two Governments of Andhra Pradesh and Orissa were required.

11. Consequent upon such mutual discussion the Governments of Orissa and Andhra Pradesh agreed on 30.9.1962 to share the waters of Vansadhara river and its valley. The said agreement was signed by the Additional Chief Engineer of Orissa and Additional Secretary, Public Works Department of Andhra Pradesh and is acted upon and accepted by both the States. The minutes of discussion leading to signing of the agreement record as follows:

"From the date available, it has been estimated that the yield of Vansadhara river at Gotta Reservoir is 115.00 TMC. The requirement of Andhra Pradesh for Gotta Irrigation Project and Neradi anicut is 47.4 TMC. The total quantity of water for the existing irrigation in Andhra Pradesh is about 7 TMC so the total requirement of water of Andhra Pradesh for the existing irrigation and Projects which are now being taken up is 54.5 TMC. The requirements of water for the projects in Orissa State have been roughly estimated to be 55 TMC".

.....
.....

Thus the yield of Vansadhara basin is just sufficient to meet the requirements of both the States. The water of Vansadhara basin may consequently be utilized by both Andhra Pradesh and Orissa on 50 : 50 basis. It is agreed that the projects in Andhra Pradesh can be taken up immediately on this basis".

12. In view of the aforesaid agreement arrived at between the two States it is an agreed position that the water of Vansadhara river could and would be utilised by the two States on 50 : 50 basis and ratio . Therefore, there is no dispute between the two

States with regard to the water sharing of this river nor the same is raised before us. The only dispute that stands out is regarding construction of the Neradi Barrage which although at one stage was mutually agreed upon but is now being opposed by the State of Orissa on various grounds. Records indicating such agreement are recorded in the minutes of the meeting held on 27.7.1980. The following decision is recorded:

“(A) Andhra Pradesh will confine acquisition of Orissa lands to 106 acres as originally provided in the proceedings of the Inter-State agreement. It was agreed that the 106 acres acquisition would be exclusive of the river bed. It was also agreed that the left flood bank would be realigned and re-designed with the above acquisition in view. It was agreed that the embankment will be done with revetments wherever necessary and the money would be deposited with the Govt. of Orissa for execution of the left flood bank. The expenditure on the maintenance over flood bank, it was agreed, will be a charge on the project. The problem regarding water logging in the rear of left flood bank was discussed and it was agreed, that catch drains on the land side of the embankment would be provided to avoid water logging. It was agreed that the construction of flood banks on both sides of the river should be taken up simultaneously.

(B) The Chief Engineer, Irrigation, Orissa State pointed out that the original agreement provided for utilization of water only during the first crop period at Neradi barrage. It was agreed that the project report should be revised for ensuring withdrawal of water from Neradi barrage during the first crop period and all flow thereafter or

beyond first December is let down in the river for use by both the States."

In this connection, the following decision of the meeting dated 10.6.1992 is extracted:

"Hydrology data upto 1991 and mathematical model studies will be supplied by the Irrigation Department, Andhra Pradesh within 10 days. Mathematical Model has a linkage with the aggradation of the river bed which in turn will affect the Orissa portion by floods beyond the stipulated 3 Kms. Andhra Pradesh Engineers however, assured that the backwater effect will be limited to 3 Kms. Sharing of water would be on 50:50 basis. It was agreed in principle that Orissa Government would have no objection to the Government of Andhra Pradesh going ahead with construction of the barrage, but the height of the barrage would be subject to mathematical model studies and hydrological data."

13. In view of such position and there being some objection on the part of the State of Orissa regarding construction of the Neradi Barrage, the State of Andhra Pradesh has proposed construction of a side weir on its side of the river as a temporary measure to utilise effectively some of the water of the river before it falls into the sea. This Side Weir would have a pond near the gate and also escape channel for sending the excess river water back to the river and thereafter it shall be connected by a link canal of about 2-1/2 Kms.

14. In this connection we may make a reference to the letter of the Chief Minister of Orissa who in his letter dated 3.10.1962 informed the Chief Minister of Andhra Pradesh that he had taken note of the record of discussions held between the Engineers of

the two States on 4.9.1962 and 30.9.1962 and that Andhra Pradesh may now go ahead with the construction of the Neradi Barrage. Subsequent thereto the State of Andhra Pradesh split the Neradi Irrigation Project into two stages – stage - (i) consisting of construction of Gotta Barrage and left main canal; stage - (ii) consisted of construction of Neradi Barrage alongwith the Flood Flow Canal and three offline reservoirs. A meeting was held on 15.12.1978 between the two Chief Ministers of Orissa and Andhra Pradesh wherein it was decided that Andhra Pradesh would send immediately the Neradi Project Report to Orissa for incorporating Orissa's requirement on the left side of the river. From the records placed before us we find that the Chief Ministers and officials of the two States are meeting from time to time. Pursuant to such meetings although broad consensus has been arrived at with regard to water sharing of the river Vansadhara but no agreement could be arrived at with regard to the construction of Neradi barrage resulting in submerging of 106 acres of land of Orissa and also construction of Side Weir with a link canal of about 2-1/2 Kms.

15. During September, 1980 unprecedented floods occurred in Vansadhara Basin. In view of the unprecedented floods the State of Orissa wanted Andhra Pradesh to modify the design of Neradi Barrage. During the meeting held in February 1985 between the two States it was agreed that the Neradi Barrage should be designed for a peak flood of 6 lac cusecs of water. In order to confine the acquisition of land to only 106 acres in Orissa for implementing the Neradi Project, the State of Andhra Pradesh forwarded a proposal in February 1987 to Central Water Commission as well as to the State of Orissa duly proposing for construction of a flood protection wall of 3.5 Kms. upstream of the Barrage on left bank in Orissa territory and also for construction of a catch drain for draining the water behind the protection wall. The aforesaid proposal of Andhra Pradesh was discussed in a meeting convened by the Central Water Commission on 8.4.1988 wherein the Engineers of the co-basin

States participated. In the said meeting the proposal with regard to afflux was agreed to. It was agreed that the afflux due to the barrage as computed by Andhra Pradesh and the effect of afflux beyond 3 Km. of protection wall upstream of the barrage is within permissible limits.

16. Despite the aforesaid agreement which was arrived at between the two States, the State of Orissa expressed its reservation and took up a stand that mathematical model studies should be conducted before proceeding with construction of barrage. The aforesaid proposal of the State of Orissa was accepted by the Government of Andhra Pradesh and they proceeded to get the mathematical model studies conducted through the Central Water Commission.

17. Consequent thereto a meeting took place between the Chief Minister of Orissa and Irrigation Minister of Andhra Pradesh on 15.2.2001 wherein it was recorded as follows:

"Government of Orissa Officers pointed out that people of Gunupur and surrounding areas are very much apprehensive, in view of devastating experience of 1980 floods. This being a sensitive issue, all the design parameters are to be checked very carefully before taking any decision. It was further pointed out that only mathematical model studies are not enough. Physical model studies are to be conducted, which will be more reliable. It was agreed that CWPRS, Pune may be associated with the conduct of physical model studies from the beginning and shall have access to the data being used."

18. In consonance with the aforesaid agreement the State of Andhra Pradesh engaged the services of Central Water and Power Research Station for conducting the physical model studies for Neradi Project. They were also authorised to conduct the physical model studies regarding the construction of Side Weir Project. The said studies were duly completed.

19. The Tribunal had the advantage of visiting the premises of the aforesaid Central Water and Power Research Station at Pune and to see and observe the functioning of the physical model studies both for Neradi Project as also for the Side Weir Project. During the aforesaid visit and verification of the physical model studies, the State of Orissa raised certain objection with regard to the results of the model studies which were however, negated and explained by the authorities and scientists at Central Water and Power Research Station.

20. Since a dispute is raised by the State of Orissa with regard to the construction of Neradi Barrage and also with regard to the possible effect and consequence of such construction and also in view of the inordinate delay in construction of the aforesaid Neradi Barrage which was proposed about 5 decades back, the State of Andhra Pradesh proposed the construction of a Side Weir on its side of the river as a temporary measure to enable the State of Andhra Pradesh to draw about 8 TMC of Water to meet its immediate irrigation requirement. In the said proposal the State of Andhra Pradesh has further proposed that 300 meter long side weir with crest level of 70.4 meters (0.9 meter above bed level) is proposed at 2 Km. upstream of proposed Neradi Barrage. The State of Andhra Pradesh has also made it explicit when it proposed that the aforesaid side weir would be so constructed that water from the river Vansadhara would enter into the proposed side weir only when discharge in the river is more than 4000 cusecs, which would happen when the river would reach a level of 70.4 meters.

21. The aforesaid proposal of the State of Andhra Pradesh was also opposed by the State of Orissa and it conveyed its objection against the implementation of construction of the proposed side weir on the ground that such diversion would deprive the existing & possible irrigation projects of 30,000 acres and also would adversely affect the supply of drinking water to 18 villages, apart from causing irreparable damage to the environment, flora, fauna

and river morphology. The State of Orissa also conveyed its apprehension that the flow on the right side of the river Vansadhara would increase as a result of construction of the side weir in which event, according to them, the right side of the Vansadhara river would suffer degradation on one hand whereas the left side would suffer aggradation. Another apprehension of the State of Orissa was that such aggradation, if caused, as apprehended, would decrease and would cause shift of the river flow towards right side bank which falls within the territory of Andhra Pradesh, which in turn in course of time would cause shift of the river course towards the side of Andhra Pradesh. The further apprehension of the State of Orissa was that the left side of the bank would get completely cut off due to aggradation as a consequence of which the river would undergo morphological changes.

22. Although there was stiff opposition by the State of Orissa to the construction of the side weir, yet the State of Andhra Pradesh started mobilising resources with the intention of going ahead with the construction of the side weir project and therefore, the State of Orissa filed a complaint as envisaged under Section 3 of the Inter-State River Water Disputes Act, 1956, with the Ministry of Water Resources, Government of India on 14.2.2006 seeking constitution of an Inter-State Water Disputes Tribunal and to refer the water dispute between the State of Orissa and Andhra Pradesh in respect of inter-State river Vansadhara and its valley for adjudication to it.

23. After receipt of the aforesaid complaint dated 14.2.2006 the Ministry of Water Resources, Government of India, took initiative to settle the dispute through negotiations, but no positive result came out of the aforesaid effort. As the dispute was not resolved till then and also as no tribunal was constituted as requested by the State of Orissa, a petition was filed under Article 32 of the Constitution of India by the State of Orissa before the Supreme Court of India with a prayer for directing the Central Government

to constitute a Tribunal in terms of Inter State River Water Disputes Act and to refer all the water disputes in respect of the Inter-State River Vansadhara to it for adjudication. The said writ petition was registered and numbered as Writ Petition (Civil) No. 443/2006. The aforesaid writ petition was heard on merit and by judgment rendered on 6.2.2009 the Supreme Court of India issued a direction to the Central Government to constitute a Water Disputes Tribunal in terms of Section 3 of Inter-State River Water Disputes Act and refer the water dispute to the Tribunal. The Supreme Court while disposing off the writ petition further directed that pending constitution of the Tribunal and reference of the above dispute to it, the State of Andhra Pradesh would maintain status quo. The operative part of the said order reads as follows:

"I also direct that pending constitution of the Water Disputes Tribunal and reference of the above dispute to it, the State of Andhra Pradesh will maintain status quo as of date with regard to the construction of the Side Channel Weir and the Flood Flow Canal at Katragadda. Once the Tribunal is constituted the parties will be free to apply for further interim orders before the Tribunal."

24. Pursuant to the aforesaid order passed by the Supreme Court, the Central Government constituted the Vansadhara Water Disputes Tribunal by issuing a Gazette Notification on 24.2.2010. After constitution of the said Tribunal the first meeting of the tribunal was held on 9.9.2010 when I.A. No. 1/2010 filed by the State of Orissa and I.A. No.2/2010 filed by the State of Andhra Pradesh were taken up and both the states were directed to file their counter affidavit within 4 weeks. So far as I.A. No.1/2010 is concerned, the tribunal proceeded to pass an order on 9.9.2010 which reads as follows:

"Until further orders the State of Andhra Pradesh is directed to maintain status quo as of date with

regard to the construction of the side channel and flood flow canal at Katragadda”.

As a consequence thereof there is status quo maintained by both the parties with regard to the construction of Neradi Barrage as also with regard to the construction of the Side Weir on the bank of river Vansadhara falling in the State of Andhra Pradesh till date.

25. Subsequent thereto pleadings in respect of both the applications have been completed by the parties. The Tribunal also undertook a local inspection of the site as well as the visual inspection of the model situated within the premises of Central Water and Power Research Station, Pune, as stated herein before.

26. After completion of the pleadings, arguments of both the parties were heard on I.A. No.1/2010, as it was stated that the said application requires early disposal and that I.A. No.2/2010 could be taken up for consideration at a subsequent stage.

27. After hearing counsel appearing for both the parties, order on I.A. No.1/2010 was reserved. By the present order we propose to dispose of I.A. No.1/2010 in terms of observations and directions passed herein.

28. By filing the aforesaid application the State of Orissa has raised serious objection against construction of the Side Weir with Link Canal by the respondent State of Andhra Pradesh on the ground that once the construction of the said Side Weir is permitted and it is so constructed the same would naturally facilitate free flow of water of the river Vansadhara by way of gravity into the Side Weir followed by Link Canal, as a consequence of which it is apprehended by the State of Orissa that the water from the river would start flowing into the canal consequently drying the existing river bed downstream of Katragadda. It was also submitted by the State of Orissa that such diversion would also deprive the existing and possible irrigation project of 30,000 acres in Orissa lying on the left bank of river Vansadhara which is situated downstream of Katragadda.

29. The other apprehension of the State of Orissa as pointed out in the application was that the villagers inhabiting 18 villages in Orissa lying on the left bank will also be substantially deprived of drinking water and fulfilling other requirements including the requirements of flora and fauna particularly during the non-monsoon months as there would be possibility of river bed on the side of Orissa State getting dry due to morphological change. It was suggested by the State of Orissa that as a result the ground water table would also be affected. A strong apprehension is also raised that once a diversion through the Side Weir is allowed to be constructed there is every possibility of the river bed scouring towards the right bank with deposit of silt and sand occurring on the left bank towards Orissa resulting in morphological changes in the river leading to environmental changes, shifting the course of the river from the present channel towards the Flood Flow Canal.

30. The State of Andhra Pradesh however, in its pleadings filed in respect of the aforesaid application denied the allegation and submitted that all the aforesaid apprehensions are misplaced and incorrect. It was pointed out by the State of Andhra Pradesh that it proposes to utilize only about 8 TMC of water after construction of the Side Channel Weir at Katragadda. It was also pointed out that the State of Orissa had not provided the detail of the water requirement of its inhabitants or the cultivable land in its territory, as alleged in their pleadings.

31. The State of Andhra Pradesh in its additional reply has pointed out and dealt with the issue of water requirement for irrigable area of 30,000 acres lying in the State of Orissa downstream of Side Weir at Katragadda. It had also worked out the domestic and livestock requirement for 18 villages by adopting national norms. For arriving at the final figure of 3.85 TMC for growing paddy in an area of 30,000 acres the norms as adopted by National Commission for Integrated Water Resources Development have been adopted. After giving the calculations, it was suggested that in terms of a practical and proper calculation

the domestic water requirement would work out to 0.116 TMC with another 0.058 TMC being added as a provision for livestock requirements. According to the State of Andhra Pradesh the total water requirement of the State of Orissa for irrigation as well as domestic requirement, on their own showing and on appropriate calculation on the basis of the norms adopted by National Commission for Integrated Water Resources Development would work out to only 4.02 TMC and thereby the State of Andhra Pradesh indicated that all the apprehensions of the State of Orissa are totally baseless and misplaced.

32. The State of Andhra Pradesh also relied on the mathematical study report of the Central Water Commission in support of their contention that there would be no morphological changes as suggested by the State of Orissa. The State of Andhra Pradesh has particularly relied upon the following passage from the aforesaid report which reads as follows:

"The general characteristics of the river like 'Width-Depth Ratio, Plan forms, Channel Characteristics, Bed Forms etc., had already been analysed in the previous study and given in the report submitted in March, 1994. The analysis done at that time had shown that the river is fairly stable and straight in the reach under study. A comparatively stable river indicates of low value of 'n', the manning's roughness coefficient, because of the absence of morphological activities like meander, bank erosion etc."

.....
.....

"The river is slow in responding to the changes in its morphological conditions. It means that if any structure is built across the river the morphological changes resulting from this would continue for a period of 1600 years. In other words, the final regime condition after the

construction of any structure is not likely to be attained within the life span of the structure."

33. Relying on the said passage the State of Andhra Pradesh suggested that it is explicit that the morphological changes are not going to occur in Vansadhara river due to the construction of the Side Weir and therefore, all the apprehensions of the State of Orissa that the river's shift towards Flood Flow Canal and that there would be sizeable environmental changes are baseless and are incorrect.

34. It was also stated that the morphological changes, if at all take place, would take place over a long period of time as stated by the Central Water and Power Research Station in its letter dated 12.03.2008, which reads as follows:

"In this connection this is to state that morphological behaviour of a river is generally referred to bank line or plan form changes which are noticed only after sufficient long periods. Their assessment is possible by comparison of past river courses available through survey plan, toposheets or satellite imageries. These are 'macro-level' changes, as long reaches and time-spans are involved."

35. The State of Andhra Pradesh has completely denied the allegation of drying up of the existing bed downstream of Katragadda and also the allegation of adverse effect on flora and fauna and ground water table.

36. Counsel appearing for the State of Orissa very forcefully submitted that unless the interim order passed by the Supreme Court and also by the Tribunal is continued the objection raised by the State of Orissa would be rendered infructuous. He also drew attention of the Tribunal to the problem of sedimentation of the river which according to him would definitely cause morphological changes in the river and would also cause adverse environmental

impact. In support of his aforesaid contention he referred to the extract of Kishan Ganga interim award pertaining to sedimentation and its management as well as principle No.3, Basic principle No.15 – Precautionary Approach of the report of U.N.Conference on Environment and Development (Rio Declaration). He also contended, relying on the pleadings filed and referred to above that the interest of the Government of Orissa would be adversely affected on account of inadequate water supply to 18 villages downstream of Katragadda as well as to sizeable area of land, which to his estimation is about 30,000 acres of irrigable land.

37. On the other hand counsel appearing for the Government of Andhra Pradesh also submitted with equal force that the documents on record would clearly establish that the apprehension of morphological changes in the river is misplaced and baseless, in view of the categorical assertion in the mathematical study report of the Central Water Commission and also as stated in the letter of the Central Water and Power Research Station dated 12.3.2008. According to him the population of 18 Villages and 30,000 acres of irrigable land would require only about 4 TMC of water whereas 81.91 TMC of water of the river usually goes waste to the sea every year. According to his estimation and statement the maximum flow possible through Flood Flow Canal would be 6400 cusecs and under best hydrological conditions the State would be able to draw the aforesaid water only for 55 days in a year. As against the aforesaid possibility, the Government of Andhra Pradesh only sought to take 8 TMC of water through the Side Weir when the flow in the river is more than 4000 cusecs and that according to the counsel is a justified claim in view of loss of water quantified at 81.91 TMC which usually goes waste to the sea every year. The counsel relied upon the decision of the Supreme Court in respect of Babhali Barrage being State of Andhra Pradesh Vs. State of Maharashtra and others, Original Suit No.1/2006 with Writ Petition (Civil) No. 134/2006.

38. Counsel appearing for the parties during the course of their arguments relied upon and referred to various decisions of the Supreme Court and various reports which would be referred to and discussed in our discussion on the contentions which follow hereinafter.

39. The contention of the State of Orissa that since Supreme Court has passed an order directing for maintenance of status quo in respect of any construction in the course of Vansadhara river including that of construction of a Side Weir and that order being functional and operative for the last 4-1/2 years, therefore, there is no scope to vary the said order is concerned, suffice it to say that the aforesaid order was passed by the Supreme Court only as an interim measure as is clearly visible from the tenor of the order passed. The Supreme Court passed the said interim order which was made operative till the prayer of stay with regard to construction of the Side Weir is taken up for consideration by the Tribunal. Therefore, the idea in passing the order of the Supreme Court also was to get the stay application heard on merit by the Tribunal and to get the same adjudicated and decided on appreciation of various documents, pleadings and other aspects of the matter. A perusal of the order of the Supreme Court would show that the interim order was passed only as a stop-gap arrangement and while passing the said order therefore, no discussion was at all made with regard to issue involved in the case and also with regard to the issue of strong prima facie case, balance of convenience and sufferance of irreparable loss and injury. Therefore, the aforesaid submission of the State of Orissa has no merit.

40. The next submission of the counsel appearing for the State of Orissa was that the interim order should be continued in order to protect ecological integrity, protection and preservation of the eco-system in the neighbourhood of the river Vansadhara and if any construction of the Side Weir is made the same would definitely adversely affect the ecological balance in the area, for

water is a precious part of the eco-system. In this connection it may be stated that the proposal of Andhra Pradesh is only to construct a Side Weir and therefore, it cannot be argued that such construction would in any manner affect the ecological balance in the aforesaid area. Besides, even if permission for construction of such a Side Weir is granted the same would in any case be subject to all the precautionary principles like grant of permission from the Ministry of Environment and Forests. Besides, clearance and permission shall also have to be statutorily obtained from the Technical Authority of Ministry of Water Resources and Ministry of Tribal Affairs before taking up the aforesaid venture on the side of the State of Andhra Pradesh.

41. All the objections with regard to adverse effect on flora and fauna and other ecological balance in any case be subjected to scrutiny of all those Statutory authorities as prescribed and the views of the said authorities would clinch the issue. Consequently, it would be more appropriate to leave the said issue for consideration of such statutory authorities constituted of experts on the subject.

42. Therefore, sufficient safeguards are provided for to examine and ascertain whether or not such a proposal of construction of a Side Weir would in any manner create obstruction to the concept of protection and preservation of the eco-system there being well oiled mechanism laid down by the Government of India for according such permission of construction. The apprehension of the State of Orissa in that regard is belied. These findings also receive support from the reasoning and decision rendered by the Supreme Court in Suit No.1 dated 28.2.2013 (State of Andhra Pradesh Vs. State of Maharashtra and others, reported in 2013 (3) Scale page 102). In the said decision also the Supreme Court has allowed construction of a barrage across the river Godavari under almost similar circumstances. So far as presence of factors for grant of injunction, this is what was said in paragraph 57 of the judgment:

"Alternatively, even if we accept the stand of Andhra Pradesh that utilization of waters to the extent of 60 TMC for new projects by Maharashtra from below the three dam sites mentioned in clause II (i) upto Pochampad dam site can be only from water flowing through the river from the catchment area and not from the pondage/water spread area of Pochampad dam, the question that arises for consideration is, whether Andhra Pradesh is entitled to injunction against Maharashtra from setting up Babhali barrage in the suit filed under Article 131 of the Constitution."

In paragraph 58 reference was made to the U.S. Supreme Court decision, which was also referred to during the course of hearing in the present case also. For better understanding para 58 is also extracted below:

"The US Supreme Court in State of Washington Vs. State of Oregon has expounded two principles, one a context between the states is to be settled in the large and ample way that alone becomes the dignity of litigants concerned and two, burden of proof falls heavily on complainant in a suit for injunction when states are involved. The above principles are sound principles in law and, in our view, there is no reason for not applying them to a suit of this nature. We are of the considered view that in a suit for injunction filed by one state against the other state, the burden on the complaining state is much greater than generally required to be borne by one seeking an injunction in a suit between private parties. The complaining state has to establish that threatened invasion of rights is substantial and of a serious magnitude. In the matter between states, injunction would not follow because there is infraction of some rights of the complaining state but a case of high equity must be made out that moves the conscience of

the Court in granting injunction. We shall consider whether burden of that degree has been discharged by Andhra Pradesh on the charge of wrong doing by Maharashtra in construction of Babhali barrage and a case of substantial injury of a serious magnitude and high equity made out."

43. The circumstances under which the aforesaid decision was rendered are somewhat similar to the facts of the present case and that would be clear once we read paragraph 79 of the judgment which reads as follows:

"Moreover, admittedly rainfall during monsoon months is the major contribution to the Godavari river flows. Monsoon contributes about 90% of the river flow. During monsoon months, the gates of Babhali barrage shall remain lifted. Thus, river flow towards Pochampad dam during monsoon shall not be affected in any manner whatsoever. There is no diminution of flow during monsoon irrespective of construction of Babhali barrage by Maharashtra. The only difficulty is in respect of non-monsoon season which contributes about 10 per cent of the flows that too is not well defined and well spread. If this difficulty is taken care of, virtually there is no injury to Andhra Pradesh much less substantial injury in as much as the inhabitants of seven districts (Adilabad, Nizamabad, Karimnagar, Warrangal, Nalgonda, Khammam, and Medak) shall not be deprived of water for drinking purpose and irrigation which is the main concern of Andhra Pradesh. On the other hand, if Babhali barrage is made operational subject to certain conditions and some supervisory mechanism is put in place to ensure that those conditions are strictly adhered to, Maharashtra may be able to meet drinking water requirement of 58 villages and three towns and also provide water for irrigation to 7995 hectares. The matter needs to be viewed in this perspective as well."

44. A strong case was sought to be made out on behalf of the State of Orissa with regard to sedimentation and silting in the river thereby causing morphological changes in the Vansadhara River provided permission is granted for construction of the Side Weir on its side as proposed by the State of Andhra Pradesh. The mathematical model studies to which reference was made hereinbefore which were carried out by the Central Water Commission to evaluate the Hydrodynamical and morphological consequences of construction of Neradi barrage concluded that the river is morphologically stable besides in the physical model studies carried out by Central Water and Power Research Station regarding the proposed Side Weir at Katragadda, it is recorded that morphological changes in the Vansadhara river near Katragadda Side Weir cannot be assessed from the model studies, as it is felt that the river channel has not shown any tendency to vitiate from time to time. In the said studies it is also concluded that even after the construction of a Side Weir the position would not alter drastically but it would be necessary to keep a close watch on the river behaviour from year to year. From the aforesaid and records available to which reference was also made hereinbefore, it is clearly established that there may not be any noticeable changes in the morphology of the river post construction of Katragadda Side Weir, if any.

45. So far the apprehension of silting and sedimentation taking place near the construction of the Side Weir is concerned the record before us fully discloses that such apprehension is also baseless. Be that as it may, even if such sedimentation and silting occurs due to the construction of the Side Weir and functioning of the same, these could be properly tackled and taken care of by directing de-silting of the area near the construction of the Side Weir as and when such silting and sedimentation is noticed.

46. We also cannot lose sight of another major factor. The river Vansadhara originates in the State of Orissa and it runs for about

154 Kms. within the territory of Orissa and thereafter for the duration of such a long distance of 154 Kms. there are only couple of noticeable irrigation projects constructed by the State of Orissa and there is also no existing major irrigation project which has been undertaken by the State of Orissa as of today even between 154 to 183 Kms. which is the joint area between both the States. There is no dispute with regard to the fact that on an average atleast 81.91 TMC of the river water is going to the sea yearly. Instead of wasting that much of water which goes to the sea, if the State of Andhra Pradesh desires to utilize only 8 TMC of water by the same through the Side Weir and that also only for a short period of about 60 days in a year and that also in monsoon time, the same would not in any manner adversely affect the interest of the State of Orissa, for the total quantity of water being so used by taking it through the Side Weir will only be about 8 TMC.

47. There is also an apprehension on the part of the State of Orissa that the existing river bed downstream of Katragadda would dry up once such construction as proposed is made. The aforesaid apprehension of the State of Orissa has arisen on account of possible aggradation on the left bank of Vansadhara. However, in their affidavit they have stated that the aggradation would take place on the side of Orissa as well as in front of the Side Weir at Katragadda. It is also a known fact that aggradation and degradation in a river is a natural phenomenon and it keeps on changing depending upon the flow of water during the future monsoon season. There could be no dispute to the fact which is also apparently visible from the model available on the site of the Central Water and Power Research Station that major portion of the river flow even after the construction of the Side Weir would keep on flowing in the river itself and it is only when the flow is more than 4000 Cusecs the water would then only spill over into the Side Weir.

48. Another contention which was substantially advanced during the course of arguments by the State of Orissa was regarding

deprivation of drinking water supply to 18 villages and also deprivation of existing irrigation system of water to 30,000 acres of cultivable land and also causing irreparable damages to their environment, flora and fauna. The aforesaid apprehension appears to be illusory, for assuming that even the quantity of 8 TMC of water is taken through the Side Weir, the same would occur only for a particular period of approximately 60 days in a year and that also during the full monsoon season and for the rest of the period the entire water in the river would go down according to the river course only and even during that period of approximately 60 days there shall be sufficient flow of water as it is the monsoon period and therefore, there would be no obstruction at all for the State of Orissa drawing and distributing drinking water to all its neighbouring villages and also irrigating the cultivable land situated nearby in terms of its entire requirement. While giving the aforesaid statistics of supplying of drinking water to 18 villages and irrigating 30,000 acres of land, the State of Orissa has not provided any calculation or the details of the water requirement for its inhabitants or the cultivable land in its territory. The State of Andhra Pradesh, during the course of arguments urged on these aspects and stated that without such statistics such tall claims should not be entertained.

49. In the pleadings filed before us by the State of Andhra Pradesh they have sought to give some statistics and have worked out the water requirement for irrigable area of 30,000 acres lying in the State of Orissa downstream of Side Weir at Katragadda. Similarly it has also worked out the water requirement for the inhabitants of the 18 villages by adopting the national norms. For arriving at the final figure of 3.85 TMC for growing paddy in an area of 30,000 acres the norms adopted are the norms adopted by the National Commission for Integrated Water Resource Development. While working out the drinking water requirement for the domestic and livestock in 18 villages of Orissa the population details of 12 villages as available from the census of 2001 have been taken and have been projected for the year 2050.

Relying on the same it is calculated that the domestic water requirement of all the 18 villages would come to about 0.116 TMC and therefore, the total water requirement for irrigation as well as domestic requirement has been worked out to about 4 TMC of water. We agree with the aforesaid calculation and hold that quantum of about 4 TMC would be sufficient to meet the present and future domestic and irrigation requirement of the State of Orissa at the downstream of the Side Channel Weir at Katragadda. From the data made available by the Central Government to both the State Governments it is clearly established that there would be still ample water in the river to meet the present and future requirements of both the States.

50. The proposed construction of the Side Channel Weir consists of stilling basin, silt excluder and escape channel, which would definitely ensure lesser silt in the flood flow canal. The hydraulic behaviour of side channel weir is very complex and difficult to predict.

51. We may also record the statement of the counsel of the State of Andhra Pradesh that as and when permission is granted for construction of Neradi barrage and after such construction is completed, the proposed Side Weir even if constructed would get submerged under water. Besides, as per the agreements of both the States which are also being acted upon, the water of Vansadhara has to be utilised by the two co-riparian States namely – Andhra Pradesh and Orissa on 50:50 ratio and basis. 8 TMC of water proposed to be diverted through the Side Weir forms and constitutes a part of 50% share of Andhra Pradesh and therefore, there could be no objection from the State of Orissa on that score also.

52. We, therefore, are of the considered opinion that the State of Andhra Pradesh has been able to establish that balance of convenience is on their side and also that they would suffer irreparable loss and injury, if the Side Weir is not allowed to be constructed, for the State would be deprived to utilise that

quantity of water for irrigation and other ancillary purpose. The burden which is on the shoulder of State of Orissa to prove a strong prima facie case in its favour could not be discharged. Rather the facts and documents on record tilt the scale in favour of the State of Andhra Pradesh. In State of Washington Vs. State of Oregon, reported in 297 US 517, the US Supreme Court has held that the burden of proof falls heavily on complainant and more heavily, than in a suit for an injunction where States are not involved.

53. Considering the entire facts and circumstances of the case, therefore, we allow the Government of Andhra Pradesh to construct the Side Channel Weir along with the ancillary works as proposed, but with certain conditions which are enumerated hereinafter:

- (i) A Supervisory Flow Management and Regulation Committee consisting of three members – one from the Central Water Commission; one from the State of Andhra Pradesh; and one from the State of Orissa with the member/representative from the Central Water Commission acting as the Chairman of the Committee, shall be constituted to supervise the construction as also functioning of the Side Weir and also for implementation of the order of the Tribunal;
- (ii) The Project proposal must get clearance from the Central Water Commission, Ministry of Water Resources, Ministry of Environment and Forest, Ministry of Tribal Welfare and other statutory clearances as would be required;
- (iii) The Supervisory Committee shall supervise the operation of the gates of the Side Channel Weir including the closure of the same;
- (iv) The Committee shall select the place for its office which shall be provided by the State of Andhra Pradesh. The

expenses for the maintenance of office and all expenses for conducting the monitoring activity would be borne by the State of Andhra Pradesh;

- (v) The Committee shall maintain the record of the flow upstream of the Side Channel Weir and that passing through the side channel Weir. The Committee shall permit the opening of the gate only when the flow in the Vansadhara river upstream of Side Channel Weir exceeds 4000 Cusecs and the flow downstream of the Side Channel Weir is equal to or more than 4000 Cusecs;
- (vi) The Committee shall ensure that total spill from the Side Channel Weir during the months of June to November in any year would not in any case exceed 8 TMC, constituting a part of 50% share of water of State of Andhra Pradesh;
- (vii) The Committee would also ensure that during the period from the month of June to November the gates would be closed as soon as the spill over from the Side Channel Weir equals to 8 TMC and it shall so remain closed till the next monsoon year;
- (viii) The gates of the Side Channel Weir would remain closed during 1st of December to 31st of May so that the entire water flowing through the Vansadhara river could flow down the river for use by both the States;
- (ix) That the Committee should also ensure that if there be any silting or sedimentation near the gate of the Side Weir same should be got cleared through the staff and the agency of the State of Andhra Pradesh every year after the monsoon.
- (x) The Committee shall also make a periodical survey, as it deems necessary, on the alleged issue of aggradation and degradation and take appropriate steps thereto and to

ensure that the bed level of the Side Weir at all times shall be as per its original design.

54. These conditions shall have to be scrupulously followed and maintained. It is also made clear that this order granting permission to construct the Side Weir with its ancillary work and the conditions laid herein are all temporary in nature and could be varied by the Tribunal as and when there is appropriate cause and reason for it.

55. With these observations and directions I.A. No.1 /2010 stands disposed of.

Sd/-

DECEMBER 17, 2013.

(DR. M.K.SHARMA, J.)
CHAIRMAN

Sd/-

(B.N.CHATURVEDI, J.)
MEMBER

Sd/-

(GHULAM MOHAMMED, J.)
MEMBER