

# Chapter 7

## Reservoir

### 7.1 General

No new reservoirs are contemplated under the link project and also no additional storages are proposed either at the off-take point of link i.e. Somasila reservoir or at the tail end point i.e. Grand Anicut, for effecting the diversion of waters as envisaged under this project. The simulation studies of the Somasila reservoir presented in this chapter show that with the existing storage capacity of the reservoir, all its irrigation demands including the link canal demand could be met successfully.

Similarly, the Grand Anicut could also serve the purpose of accommodating the diverted water through the link canal for further delivery to its command area, without any additional storage capacity.

The details regarding the storages, levels and the criteria adopted for fixing the same for Somasila reservoir and Grand Anicut are furnished in the following paragraphs.

### 7.2 Fixation of levels and storages

#### 7.2.1 Somasila reservoir

The Somasila reservoir is the terminal reservoir on Pennar River. The project is formulated by Govt. of Andhra Pradesh to stabilise the existing Pennar delta system and the commands of the tanks under Kavali and Kanapur canals and also to provide irrigation to new areas through the South and North feeder canals in Nellore district. In addition, 409 Mm<sup>3</sup> of water for supply to Chennai city and 890 Mm<sup>3</sup> of water for irrigating 1.23 lakh ha under Telugu Ganga project in Nellore and Chittoor districts will also be met from the Somasila reservoir. The component of Chennai water supply would be met from the 425 Mm<sup>3</sup> of water to be diverted from Krishna through the Telugu Ganga Canal while the requirement of irrigation under the Telugu Ganga project would be met by diverting the flood flows of Pennar and Krishna rivers to the Kandaleru reservoir.

The principal levels and corresponding storages of the reservoir are furnished in Table 7.1.

**Table 7.1**  
**Principal levels and storages of Somasila reservoir**

	<b>Level (m)</b>	<b>Storage (Mm<sup>3</sup>)</b>
MWL	101.80	2483
FRL	100.58	2208
MDDL	82.30	214
DSL	82.30	214

### **7.2.2 Grand Anicut**

Grand Anicut is the terminal storage/regulating site on Cauvery river. The project is formulated long back by the Chola King, Karikala Cholan to regulate the flows of the Cauvery for irrigation purpose. The Grand Anicut controls the flow of the Cauvery to delta areas of about 3.78 lakh ha, through Cauvery and Vennar regulators. Also, it serves to supply the requirement of Grand Anicut Canal for irrigation of about 1.04 lakh ha. In addition, it regulates the flood flows of the Cauvery to Coleroon through Ullar. The principal levels of the Grand Anicut are furnished in the Table 7.2.

**Table 7.2**  
**Principal levels and storages of Grand Anicut**

	<b>Level (m)</b>	<b>Storage (Mm<sup>3</sup>)</b>
MFL	60.84	N.A.
Sill level	54.64	N.A.

## **7.3 Sedimentation studies and life of the reservoirs**

### **7.3.1 Somasila reservoir**

Silt observations on Pennar River are being made systematically for a long time. It shows that the Pennar River carries less silt compared to many other rivers of our country. Further, due to the construction of large number of reservoirs in the upper reaches of the Pennar and its tributaries, the silt is likely to be trapped in those reservoirs and relatively silt free water would flow into the Somasila reservoir.

### **7.3.1.1 Effect of the link proposal on the life of Somasila reservoir**

As per the Somasila project report-1984, prepared by the Irrigation Department, Govt. of Andhra Pradesh, the rate of silting considered for the fixation of DSL of Somasila reservoir is 0.019 ha.m / sq.km / year. The silt volume that gets deposited below MDDL during its life period of 100 years is 171.32 Mm<sup>3</sup> out of the total likely silt deposit of 398 Mm<sup>3</sup> and the remaining silt will get settled in the live storage capacity of the reservoir i.e., between MDDL and FRL. The live storage of the reservoir between MDDL and FRL being 1994 Mm<sup>3</sup>, the utilizable live storage of the reservoir at the end of 100 years would be 1767 Mm<sup>3</sup>. With the introduction of the link canal, no effect on the sedimentation of Somasila reservoir is anticipated since the water delivered to Somasila reservoir through Srisailem – Pennar and Nagarjunasagar – Somasila links will be silt free.

### **7.3.2 Grand Anicut**

Since, the Grand Anicut serves as a regulating structure across Cauvery without any storage, the siltation at this point will be very minimum.

#### **7.3.2.1 Effect of link proposal on the life of Grand Anicut**

As the silt carried by the diverted waters will get trapped to a large extent at the source reservoirs like Inchampalli, Nagarjunasagar, Somasila, etc; relatively silt free water will flow into the Grand Anicut. And as such, there may not be any effect on the life of the Grand Anicut due to these inter basin link proposals.

## **7.4 Annual evaporation losses from the reservoirs**

### **7.4.1 Somasila reservoir**

The average annual evaporation losses from Somasila reservoir are assessed as 266 Mm<sup>3</sup> (9.4 TMC). The monthly evaporation losses considered for simulation of Somasila reservoir are furnished in Table 7.3.

**Table 7.3**  
**Monthly evaporation losses of Somasila reservoir**

Month	Evaporation (cm)	Month	Evaporation (cm)
June	18.0	December	10.0
July	15.0	January	10.0
August	15.0	February	10.0
September	15.0	March	18.0
October	13.0	April	23.0
November	10.0	May	26.0

Source: Somasila project report Vol-1/4, Irrigation Department, Govt. of Andhra Pradesh

#### 7.4.2 Grand anicut

The Annual evaporation loss at Grand Anicut is considered as zero due to negligible storage.

### 7.5 Submergence area

#### 7.5.1 Somasila reservoir

Since it is proposed to utilise only the available storage facility of the existing Somasila reservoir, there would be no additional submergence under Somasila reservoir due to the link proposals of NWDA.

The details of submergence upto FRL, under the existing Somasila reservoir are furnished in Table 7.4.

**Table 7.4**  
**Details of submergence under Somasila reservoir**

I	Land under submergence (at MWL)		
(a)	Patta lands		8832 ha
(b)	Government lands		12370 ha
(c)	Forest lands		576 ha
	Total		21778 ha
II	Villages and families affected		
(a)	Fully affected villages		
i)	Main villages	29 Nos.	
ii)	Hamlets	48 Nos.	77 Nos.
(b)	Partially affected villages		
i)	Main villages	5 Nos.	
ii)	Hamlets	4 Nos.	9 Nos.
(c)	Families affected		20000 Nos.
III	Property affected		20327 Structures

## **7.5.2 Grand Anicut**

Since the maximum water level is confined within the flood banks of Cauvery River, no submergence due to the link proposal is anticipated.

## **7.6 Simulation studies of Somasila reservoir**

### **7.6.1 Inflows into Somasila reservoir**

As assessed in the respective water balance study, the Pennar basin up to Somasila dam site is deficit by 3822 Mm<sup>3</sup>. The Somasila – Grand Anicut link canal, being an integral part of the Mahanadi - Godavari - Krishna - Pennar – Cauvery - Vaigai - Gundar link essentially envisages to divert part of the surplus waters brought from Krishna to the Somasila reservoir through the Srisaillam-Pennar and Nagarjunasagar - Somasila links. The inflows into the Somasila reservoir considered for the purpose of simulation studies of the reservoir for effecting the diversion through the Somasila - Grand Anicut link consist of the following.

- 1) Yield from the catchments of Pennar basin up to Somasila dam site.
- 2) Diversion from Srisaillam – Pennar link.
- 3) Diversion from Nagarjunasagar – Somasila link.
- 4) The domestic water requirement of Chennai city from Telugu Ganga project.

#### **7.6.1.1 Yield from the catchment of Pennar basin up to Somasila dam site**

The net inflow of the catchment of Pennar up to Somasila is arrived at by adding the surplus yield series of each sub-basin that contribute to the river Pennar up to Somasila dam site. The surplus yield series of each sub-basin has been worked out by deducting ultimate surface water requirement for various purposes from the gross yield of respective sub-basins. While doing so, if there is any deficit, the same is treated as zero. For converting the yearly inflows into monthly flows, the actual observed monthly run-off data of Somasila dam site available for the period from 1972-73 to 1984-85 and observed flow data of Siddavattam (CWC) G & D site for the period from 1985-86 to 1988-89 have been made use off. The monthly inflows have been worked out in the same proportion as that of observed data.

### **7.6.1.2 Diversion from Srisaillam – Pennar link**

The simulation studies at Srisaillam reservoir have been carried out considering the annual inflows into the reservoir and the demands to be met from this reservoir and these studies are dealt in detail in the feasibility report of Krishna (Srisaillam) – Pennar link project (Technical Study No.FR 5/1997) prepared by NWDA. The annual diversion delivered at the Pennar river through Krishna (Srisaillam) – Pennar link is 2095 Mm<sup>3</sup>.

### **7.6.1.3 Diversion from Nagarjunasagar – Somasila link**

The simulation studies at Nagarjunasagar reservoir have been carried out considering the annual inflows into the reservoir and the demands to be met from this reservoir and these studies are dealt in detail in the feasibility report of Krishna (Nagarjunasagar) - Pennar (Somasila) link project (Technical Study No.FR 6/2001) prepared by NWDA. The annual diversion delivered at Somasila reservoir through Nagarjunasagar-Somasila link is 8426 Mm<sup>3</sup>.

### **7.6.1.4 Domestic water requirement of Chennai city from Telugu Ganga Project**

A quantum of 425 Mm<sup>3</sup> of water is received from Telugu Ganga project towards domestic water requirement of Chennai city.

## **7.6.2 Computation of gross inflows into the Somasila reservoir**

The monthly inflows into the Somasila reservoir during each year for the period from 1951-52 to 1980-81 are arrived at by adding the respective net inflows from all the above four sources i.e. yield from the catchment of Pennar basin up to Somasila dam, diversion from Krishna (Srisaillam)-Pennar link, diversion from Nagarjunasagar-Somasila link and contribution from Telugu Ganga project.

## **7.6.3 Demands from Somasila reservoir**

### **7.6.3.1 Demands of Somasila south and north feeder canals and Pennar delta**

As per the NWDA studies (Technical Study No. WB 115 / 1991), there will be a surface water deficit of 1453 Mm<sup>3</sup> at 75% dependability in Pennar delta sub-basin which is catered by Somasila reservoir. At the

ultimate stage of irrigation development, there will be an overall surface water deficit of 3822 Mm<sup>3</sup> at 75% dependability in Pennar basin up to Somasila dam site. Hence, Somasila reservoir may not be able to meet the needs of Somasila north and south feeder canals and Pennar delta. Keeping this in view, a quantum of 1453 Mm<sup>3</sup> of water is proposed to be provided to the Pennar delta sub-basin to make up the deficit, and this quantum is distributed month wise, considering the demand pattern of Pennar delta as given in the Telugu Ganga Project report.

#### **7.6.3.2 Demands of Kandaleru - Poondi canal**

As it is also proposed to take over the command area of Kandaleru-Poondi canal (to be irrigated by the flood waters of Pennar river, as per the proposals of Government of Andhra Pradesh) with the diverted water, the same cropping pattern as proposed by the Government of Andhra Pradesh is adopted. Since the irrigation is proposed mostly in rabi season in the command, it is proposed to divert the total requirement of 890 Mm<sup>3</sup>, uniformly in four months time i.e., from September to December every year.

#### **7.6.3.3 Demands of Chennai City for domestic use**

A quantum of 425 Mm<sup>3</sup> towards the domestic requirement of Chennai City is met in four months from July to October as planned by the Government of Andhra Pradesh.

#### **7.6.3.4 Demands of Somasila – Grand Anicut link**

The Somasila – Grand Anicut link is envisaged to carry 8565 Mm<sup>3</sup> of water annually to meet the following demands.

- i) 17 Mm<sup>3</sup> towards the domestic water requirements of the towns right side of the link canal.
- (ii) 275 Mm<sup>3</sup> towards the domestic water requirements of the areas in the command area.
- iii) 313 Mm<sup>3</sup> for additional water supply to Chennai city.
- iv) 500 Mm<sup>3</sup> for industrial water supply to Chennai city.
- v) 664 Mm<sup>3</sup> for irrigation of the proposed command area enroute the link in the Pennar delta and basin area covered by streams between Pennar and Palar.
- vi) 645 Mm<sup>3</sup> for irrigation of the proposed command area enroute the link in the Palar basin.

- vii) 1739 Mm<sup>3</sup> for irrigation of the proposed command area enroute the link in the basin area covered by streams between Palar and Cauvery.
- viii) 3855 Mm<sup>3</sup> by transfer to Cauvery basin to meet the deficit in Cauvery basin and further diversion from Cauvery to Vaigai and Gundar basins.
- ix) 557 Mm<sup>3</sup> of transmission losses enroute the link canal from Somasila to Grand Anicut.

The computation of all the above demands and their monthly distribution pattern are dealt in detail in Chapter on "Water and irrigation planning".

#### **7.6.4 Simulation studies**

The Pennar (Somasila) – Palar – Cauvery (Grand Anicut) link project is contemplated to divert water made available at Somasila dam by the preceding links namely Nagarjunasagar – Somasila and Srisailam – Pennar links for which the reservoir simulation studies were conducted for 30 years i.e., from 1951-52 to 1980-81. Hence the simulation studies of the Somasila reservoir were also carried out for a period of 30 years from 1951-52 to 1980-81 considering the monthly inflows from the preceding links, Telugu Ganga project and inflows from Pennar. The monthly demands to be met from the reservoir considered are in the following order of priority.

- (i) Chennai Water Supply Scheme as proposed under the ongoing Ganga project.
- (ii) Enroute irrigation under Kandaleru-Poondi Canal
- iii) Pennar delta sub-basin.
- iv) Enroute drinking water supply
- v) Additional water supply to Chennai for domestic use.
- vi) Industrial water supply (Chennai city).
- vii) Enroute irrigation under the link canal.
- viii) Transfer to Cauvery.

Initial condition of reservoir storage at half full has been considered for the simulation. The reservoir evaporation losses have been duly considered.



#### 7.6.4.1 Results of simulation

The results of simulation of Somasila reservoir for the period of 30 years from 1951-52 to 1980-81 in terms of success rate are presented in Table 7.5. The success rate of each demand is computed by dividing the number of years in which at least 95% of total demands are met by the total number of years of simulation i.e. 30 years.

**Table 7.5**  
**Results of Simulation of Somasila Reservoir for the period from 1951-52 to 1980-81 (30 years)**

Sl. No.	Component	Full demand including transmission losses (Mm <sup>3</sup> )	Success rate %
1.	Chennai Water Supply Scheme as proposed under the ongoing Telugu- Ganga project	425	86
2.	Requirement of Kandaleru and Poondi Canal	890	93
3.	Irrigation requirement of Pennar delta sub-basin	1453	83
4.	Drinking water needs of enroute and command area	302	83
5.	Additional water supply to Chennai city	329	83
6.	Industrial needs of Chennai city	520	90
7.	Enroute irrigation	3193	83
8.	Transfer to Cauvery	4221	80