CHAPTER – IX WATER TREATMENT PLANTS AND DESALINATION PLANTS (MODIFIED)

9.1. Fresh water sources

Surface Sources:

1. Poondi Lake
2. Red Hills Lake
3. Chembarambakkam Lake
4. Cholavaram Lake
5. Veeranam Lake

In addition to the above surface sources the following DSP sources are available:

1. Minjur DSP
2. Nemmeli DSP

The details on the existimg WTPs located at Kilpauk, Redhills, Chembarambakkam and Veeranam & DSPs located at Minur and Nemmeli have been furnished in the Chapter 6

Figure 9 - 1 Fresh Water Sources

9.2. Water Demand and Required Additional Capacity of WTP

In this Chapter zone wise water demand projections for various planning years have been arrived at. Seven water systems planned to cater to City area, Extended Area and CMA are shown in Drawing No. STP-MP-WS-004.

Abstract of demand projections and capacity additions required in the existing locations of the treatment plants, DSPs and new capacity creation required and their proposed sites etcare given in Table 9.1 below

9.3. WATER SUPPLY MANAGEMENT IN THE PROJECT AREA

The potential yield & present level of water supply from the existing sources are given in the Table below:

Table 9 - 1 Existing Supply

Sl. No.	Particulars	Potential Yield (in MLD)	Available in good years (in MLD)	Present availability (in MLD) (as on October 2015)
1.	**SURFACE WATER SOURCES**			
	Poondi, Red hills, Cholavaram &Chembarambakkam lakes (surface sources)	200	125	75
	Telugu-Ganga Project	930	400	200
	Veeranam Lake Source	180	100	100
2.	**GROUND WATER/Sub Surface water**			
	Northern well field /Southern Coastal aquifer	100	25	25
	Sub Surface water sources in Rest of CMA	32	32	32
3.	**SEA WATER DESALINATION**			
	Minjur DSP	100	100	100
	Nemmeli DSP	100	100	100
	Total	1642	882	632

Table 9 - 2 Sources Proposed / Suggested for augmentation

Sl. No.	Description of sources	Existing Yield (mld)	Augumented Quantity	Total Yield that will be available after Augmentation (mld)
	A) Surface Water Sources:-			
1	Local 4 Lake Sources (Internal)	125	75	200
2	Veeranam Lake Source	100	80	180
3	Telugu Ganga Project	400	530	930
5	New Mettur Project		700	700
6	External Sources			
	a) Madurantagam Lake		25	25
	b) Chengalpattu Lake		35	35
	c) Abandoned Quarries		10	10
	d) New surface storage projects		20	20
	e) Palar Source		30	30
7	Northern well fields	25	75	100
8	By Harvesting Rain Water in Off Stream Lakes		30	30
9	Existing Water sources in CMA (As per data collected)	32		32
	Total Fresh water from surface sources	**682**	**1610**	**2292**
	B) SEA WATER DESALINATION			
1	Minjur DSP	100		100
2	Nemmeli DSP	100	150	250
3	Peru DSP		400	400
	Total DSP supply	**200**	**550**	**750**
	Total Fresh water Supply	**882**	**2160**	**3042**

Table 9 - 3 Augmentation of Local Ground water Sources

S.No	Description of sources	Existing Yield (mld)	Augmented Quantity* (at the end of 2050)	Total Yield that will be available after Augmentation (mld)
	LOCAL SOURCES			
1	Source in Individual Dwellings (Bore wells & Open wells) in Chennai City	110	100	210
2	Source in Individual Dwellings (Bore wells & Open wells) in Rest of CMA	100	100	200
Total Ground Water sources		**210**	**200**	**410**

*Augmentation of the ground water sources by various artificial recharge techniques have been given in the main report.

Supply management to meet out the future fresh water demand and augumentation of the sources have already been discussed in Tables 6.8 and 6.9 under Chapter 6. However the Tables are furnished for reference.

The following Table shows the Year wise Demand and supply for the design periods:

Table 9 - 4 Supply management to meet out future fresh water demand-entire CMA

Quantity in MLD																
Year	Fresh Water Demand	Supply during October 2015			Cumulative Qty. of Sources Developed	Total Sources available	Excess	Capacity of Sources to be Developed								
								DSP		Surface Sources						
		Surface	DSP	Total				Nemmeli	Perur	Telugu Ganga	Veeranam Sub Surface	By Harvesting Rain Water in Off Stream Lakes	New Mettur Project	OWN Sources Local 4 Lake Sources (Internal)	External Sources (Madurantagam/Chengalpattu/Abanded Quarries/New surface storage projects/Palar source)	Northern well fields	Total
1.	2.	3.	4.	5. *(3+4)*	6. *col.16 + value above*	7. *(5+6)*	8. *(7-2)*	9.	10.	11.	12.	13.	14.	15.	16.	17.	18. Add. Col.9 to 17
2020	**1259**	682	200	882	410	1292	83	150		150	80			75		25	460
2025	**1341**	682	200	882	835	1717	426		400							25	425
2030	**1718**	682	200	882	885	1767	99								25*	25	50
2035	**1870**	682	200	882	1150	2032	182			180					35*		235
2040	**2041**	682	200	882	1545	2427	406					15*	350		30*		395
2045	**2577**	682	200	882	1930	2812	255					15*	350		20*		385
2050	**2844**	682	200	882	2160	3042	198			200					10*		210
							TOTAL	150	400	530	80	30	700	75	120	75	**2160**
	#	Since Perur DSP will start producing 400 MLD Desal. water Supply from Telugu Ganga may be restricted to 150 MLD, during 2025-2030.										Total including existing sources					**3042**
	*****	Additional sources to supplement the own source/DSP/TG/Mettur shall be developed as buffer and to be utilized during short fall in these sources.										Balance available over demand					**198**

The Total projected Fresh Water Demand during 2050 is 2844 MLD.

Table 9 - 5 Suggested commissioning schedule of the proposed projects to meet the Additional & Fresh Water Demand

Sl. No.	Source	Quantity to be Augmented in MLD	Probable Year of commissioning
	DSP sources		
1	Nemmeli	150	2020
2	Perur	400	2025
	Surface/Ground water sources		
3	Telugu Ganga	530	2020, 2035, 2050
4	Veeranm sub surface (Cauvery sub surface)	80	2020
5	By harvesting rain water in off stream lakes	30	2040, 2045
6	New Mettur project	700	2040, 2045
7	Improvements in own 4 lake sources	75	2020
8	External sources (Madurantagam lake, Chengalpattu lake, Abandoned quarries, new surface storage projects and Palar source.)	120	2030, 2035, 2040, 2045, 2050
9	Improving Northern well fields	75	2020, 2025, 2030
	Total	**2160**	

The above quantity of supply (except the external sources in item.8) has been allotted for each source.

The year wise allotment is given in the Table below:

Table 9 - 6 Allocation of water from each source for the design periods - in MLD

SOURCE WISE ALLOCATION							
Description	**Water Allocation**						
	2020	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
OWN SOURCE - 4 lakes							
Supply	125	200	200	200	200	200	200
Addl.Qty that will be recd.	75	0	0	0	0	0	0
Cumulative Total Qty.Recd	**200**	**200**	**200**	**200**	**200**	**200**	**200**
Allocation							
Poondi+Redhills Lake	100	176	141	100	100	100	100
Poondi+Sholavaram Lake	0	0	0	0	0	0	0
Poondi+Chembarambakkam lake	100	24	59	100	100	100	100
Total	**200**	**200**	**200**	**200**	**200**	**200**	**200**
TELUGU-GANGA PROJECT							
Supply	400	550	550	550	730	730	730
Addl.Qty Recd at poondi	150	0	0	180	0	0	200
Cumulative total Recd at poondi	**550**	**550**	**550**	**730**	**730**	**730**	**930**
Allocation							
Poondi to RH	72	21	150	230	75	60	172
Poondi-RH-KPS	333	338	344	348	353	357	362
Poondi-Chem	145	191	41	137	282	293	366

SOURCE WISE ALLOCATION							
Description	**Water Allocation**						
	2020	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
Poondi-Sholavaram	0	0	15	15	20	20	30
Total TG Supply	**550**	**550**	**550**	**730**	**730**	**730**	**930**
METTUR SOURCE							
Addl.Qty Recd	0	0	0	0	350	350	0
Total Cum.Qty.Recd	**0**	**0**	**0**	**0**	**350**	**700**	**700**
Allocation							
Mettur-Poondi-RH	0	0	0	0	200	350	300
Mettur-Poondi-RH-KPS	0	0	0	0	0	0	0
Mettur-Poondi-Sholavaram	0	0	0	0	0	0	0
Mettur-Poondi-Chem	0	0	0	0	0	0	50
Mettur-Chem	0	0	0		150	350	350
Total-Mettur Supply	**0**	**0**	**0**	**0**	**350**	**700**	**700**
VEERANAM SOURCE							
Veeranam WTP	100	180	180	180	180	180	180
Addl.Qty Recd	80	0	0	0	0	0	0
Total Veeranam	**180**	**180**	**180**	**180**	**180**	**180**	**180**
DESALINATION PLANTS							
Minjur	100	100	100	100	100	100	100
Addl.Qty Recd	0	0	0	0	0	0	0
Total Minjur	100	100	100	100	100	100	100
Nemmeli	100	250	250	250	250	250	250
Addl.Qty Recd	150	0	0	0	0	0	0
Total Nemmeli	250	250	250	250	250	250	250
Perur	0	0	400	400	400	400	400
Addl.Qty Recd	0	400	0	0*	0	0	0
Total Perur	0	400	400	400	400	400	400
Total from DSPs	**350**	**750**	**750**	**750**	**750**	**750**	**750**
OTHER SOURCES							
Well Fields	25	50	75	100	100	100	100
Addl.Qty	25	25	25	0	0	0	0
Cum.qty	50	75	100	100	100	100	100
From Rest of CMA	32	32	32	32	32	32	32
Addl.Qty	0	0	0	0	0	0	0
Cum.qty	32	32	32	32	32	32	32
By Harvesting Rain Water in Off Stream Lakes (will be connected to the 4 lakes of Chennai Water source)	0	0	0	0	15	15	0
Cum.qty	0	0	0	0	15	30	30
Allocation							
Redhills Lake					5	10	10

SOURCE WISE ALLOCATION							
Description	Water Allocation						
	2020	2025	2030	2035	2040	2045	2050
Sholavaram Lake					5	10	10
Chembarambakkam lake					5	10	10
Total from Others	**82**	**107**	**132**	**132**	**147**	**162**	**162**
GRAND TOTAL	**1362**	**1787**	**1812**	**1992**	**2357**	**2722**	**2922**
External Sources (Maduranthagam / Chengalpattu / Abanded Quarries / New surface storage projects / Palar source)	0	0	25	35	30	20	10
Sub total	0	0	25	35	30	20	10
Cumulative from Ext.Sources	0	0	25	60	90	110	120
ULTIMATE SOURCE QTY.	**1362**	**1787**	**1837**	**2052**	**2447**	**2832**	**3042**

If the external sources are developed during the design period these sources will contribute the required demand to each system and there will be no need to supplement from DSP sources to other systems, as given in the table above.

Table 9 - 7 Allocation of water from each system for the design periods- in MLD

SYSTEM WISE ALLOCATION							
Description	Water Allocation						
	2020	2025	2030	2035	2040	2045	2050
KILPAUK SYSTEM							
DEMAND	317	322	327	331	336	340	344
ADD 5% Treatment loss of above	16	16	16	17	17	17	17
Total Demand	**333**	**338**	**344**	**348**	**353**	**357**	**362**
SUPPLY	333	338	344	348	353	357	362
BALANCE	**0**	**0**	**0**	**0**	**0**	**0**	**0**
WTP CAP REQD	333	338	344	348	353	357	362
WTP CAP AVAILABLE	225	360	360	360	360	360	360
ADDL.WTP CAP REQD	108	0	0	0	0	0	2
ADDL.WTP CAP PROP	135	0	0	0	0	0	0
Total WTP Cap avilable at the end of the year	360	360	360	360	360	360	360
If any shortfall, Supply From	Minjur DSP	Minjur DSP	Minjur DSP	Minjur DSP	Minjur DSP	Minjur DSP	Minjur DSP
Excess Qty. Avialble	61	58	39	34	29	7	0
Supply to KPS System from Minjur#	0	0	0	0	0	0	0
Balance available from Minjur system#	61	58	39	34	29	7	0
For shortfall Supply From	-						
REDHILLS SYSTEM							
DEMAND	222	241	314	347	385	492	555

SYSTEM WISE ALLOCATION							
Description	**Water Allocation**						
	2020	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
ADD 5% Treatment loss of above	11	12	16	17	19	25	28
Total Demand	233	254	330	364	404	516	582
SUPPLY	172	197	291	330	380	520	582
BALANCE	-61	-57	-39	-34	-24	4	0
WTP CAP REQD	233	254	330	364	404	516	582
WTP CAP AVAILABLE	300	300	300	300	450	450	600
ADDL.WTP CAP REQD	0	0	30	64		66	0
ADDL.WTP CAP PROP	0	0	0*	150	0	150	
Total WTP Cap avilable at the end of the year	300	300	300	450	450	600	600
If any shortfall, Supply From	Minjur DSP+ Veeranam	Minjur DSP+ Veeranam	Minjur DSP+ Veeranam	Minjur DSP+ Veeranam	Minjur DSP+ Veeranam	Minjur DSP+ Veeranam	Minjur DSP+ Veeranam
Excess Qty. Avialble Minjur	61	58	39	34	29	7	0
Excess Qty. Availble - Veeranam	68	64	48	42	35	17	6
Total Excess aailable under Minjur & Veeranamm	129	122	87	76	64	24	6
Shortage in RH system	-61	-57	-39	-34	-24	4	0
Supply to KPS System from Minjur#	0	0	0	0	0	0	0
Supply to RH System from Minjur#	61	58	39	34	29	0	0
Supply to RH system from Veeranam	0	0	48	42	35	0	6
Balance available after sparing to RH system#	0	2	49	42	40	28	6
Balance available after sparing to Chem. system#	368	364	348	342	485	467	606
*Addl Requiremnt of 30 MLD will be supplemented from Minjur DSP. Hence no need for Addl.WTP							
CHEMBARAMBAKKAM SYSTEM							
DEMAND	260	283	416	467	524	716	804
Deduct for 32 mld from CMA	228	251	384	435	492	684	772
ADD 5% Treatment loss of above	11	13	19	22	25	34	36
Total Demand	239	264	403	457	517	718	808
SUPPLY	277	247	132	269	569	785	958
BALANCE	6	-49	-303	-220	20	35	118
WTP CAP REQD	271	296	435	489	549	750	840
WTP CAP AVAILABLE	530	530	530	530	530	530	730
ADDL.WTP CAP REQD	0	0	0	0	0	188	78
ADDL.WTP CAP PROP	0	0	0	0	0	200	100
Total WTP Cap avilable at	530	530	530	530	530	730	830

SYSTEM WISE ALLOCATION							
Description	Water Allocation						
	2020	2025	2030	2035	2040	2045	2050
the end of the year							
If any shortfall, then Supply From	Nemmeli DSP+ Veeranam	Nemmeli DSP+ Veeranam	Nemmeli DSP+ Veeranam	Nemmeli DSP+ Veeranam	Nemmeli DSP+ Veeranam	Nemmeli DSP+ Veeranam	Nemmeli DSP+ Veeranam
Excess Qty. Availble - Veeranam	68	64	48	42	35	17	6
Excess Qty. Availble- Nemmeli DSP	1	379	283	245	202	71	1
Total Excess Qty. Availble	69	443	331	287	237	88	7
Supply to Chembarambakkam system	68	60	283	245	202	71	1
From Veeranam	68	64	48	42	0	17	0
From Nemmeli	0	1	255	178	0	18	118
Balance available after sparing to RH system#	69	394	28	67	237	88	7
CHOLAVARAM SYSTEM							
DEMAND	22	23	48	58	69	115	133
Deduct for supply from Well Fields	-3	-52	-52	-42	-31	15	33
ADD 5% Treatment loss of above	0	-3	-3	-2	-2	1	2
Total Demand	22	21	45	56	68	116	134
SUPPLY FROM OWN + POONDI	0	0	15	15	25	30	40
Supply from Well Fields	25	75	100	100	100	100	100
TOTAL SUPPLY	25	75	115	115	125	130	140
BALANCE	3	54	70	59	57	14	6
Bal.For which WTP Reqd	0	0	0	0	0	16	34
WTP CAP. REQD	22	21	45	56	68	116	134
WTP CAP. AVAILABLE	0	0	0	0	0	0	25
ADDL.WTP CAP. REQD	0	0	0	0	0	16	9
ADDL.WTP CAP. PROP	0	0	0	0	0	25	25
Total WTP Cap avilable at the end of the year	0	0	0	0	0	25+	50
VEERANAM (PORUR WDS)							
DEMAND	112	116	132	138	145	163	174
SUPPLY	180	180	180	180	180	180	180
BALANCE	68	64	48	42	35	17	6
For shortfall Supply From							
Excess Qty. Availble from the respectine system							
MINJUR DSP-SYSTEM							
DEMAND	39	42	61	66	71	93	100
SUPPLY	100	100	100	100	100	100	100

SYSTEM WISE ALLOCATION							
Description	Water Allocation						
	2020	2025	2030	2035	2040	2045	2050
BALANCE	61	58	39	34	29	7	0
For shortfall Supply From							
Excess Qty. Availble							
NEMMELI DSP-SYSTEM							
DEMAND	249	271	367	405	448	579	649
SUPPLY	250	650	650	650	650	650	650
BALANCE	1	379	283	245	202	71	1
For shortfall Supply From	-						
Excess Qty. Availble							
TOTAL DEMAND	1258	1336	1714	1865	2037	2575	2841
TOTAL SUPPLY	1337	1787	1812	1992	2357	2722	2972
BALANCE	79	451	98	127	320	147	131

Table 9 - 8 Additional Capacity of WTP Requirement

Sl. No.	Existing /Proposed Treatment Plant Site	Existing Capacity of WTP in MLD	Capacity to be phased out	Balance capacity available	New WTP Proposed							Total New WTP / DSP	Cumulative WTP/DSP Capacity in MLD						
					2020	2025	2030	2035	2040	2045	2050		2020	2025	2030	2035	2040	2045	2050
1	Kilapuk	270	45	225	135							135	360	360	360	360	360	360	360
2	Redhills	300	0	300				150		150		300	300	300	300	450	450	600	600
3	Surapet	14	14	0									0	0	0	0	0	0	0
4	Chembarambakkam	530	0	530						200	100	300	530	530	530	530	530	730	830
5	Cholavaram	0	0	0	25*			50*		70*		145	25	25	25	75	75	145	145
6	Veeranam (Vadakuthu)	180	0	180								0	180	180	180	180	180	180	180
	Total WTP	**1294**	**59**	1235	**160**	**0**	**0**	**200**		**420**	**100**	**880**	**1395**	**1395**	**1395**	**1595**	**1595**	**2015**	**2115**
	Desalination Plants			0															
7	Minjur DSP	100	0	100								-	100	100	100	100	100	100	100
8	Nemmeli DSP	100	0	100	150							150	250	250	250	250	250	250	250
9	Perur	0	0	0	100					100	200	400	100	100	100	100	100	200	400
	Total DSP	**200**	**0**	200	**250**	**0**	**0**	**0**	**0**	**100**	**200**	**550**	**450**	**450**	**450**	**450**	**450**	**550**	**750**
	Total	**1494**	**59**	**1435**	**410**	**0**	**0**	**200**	**0**	**520**	**300**	**1470**	**1845**	**1845**	**1845**	**2045**	**2045**	**2565**	**2865**

*WTP is optional for Cholavaram system, if the well Field water is not available. When well field water is not available, required raw water may be diverted from Poondi to Cholvaram lake and accordingly the allocation for Redhills and Chembarambakkam lakes may be revised. Based on the raw water flow the capacity of WTP may be proposed.

9.4. Balancing the System deficit by other systems:

1. Kilpauk system

Suffcient Raw Water will be supplied from Redhills lake to meet out the Demands for all the design periods. Hence there will be no deficits during the design periods.

2. Redhills system:

After supplying to KPS the balance raw water will be urtilised to serve the demand of Redhills system. However during the periods 2020 to 2040 there will be shortage of supply from surface water sources. During these periods the surplus water available from Minjur and Veeranam systems will be supplemented to Redhills system as shown in the table below.

REDHILLS SYSTEM	2020	2025	2030	2035	2040	2045	2050
DEMAND	222	241	314	347	385	492	555
ADD 5% Treatment loss of above	11	12	16	17	19	25	28
Total Demand	233	254	330	364	404	516	582
SUPPLY	172	197	291	330	380	520	582
Excess/Shortage	-61	-57	-39	-34	-24	4	0
If any shortfall, Supply From	Minjur DSP+ Veeranam	Minjur DSP+ Veeranam	Minjur DSP+ Veeranam	Minjur DSP+ Veeranam	Minjur DSP+ Veeranam	Minjur DSP+ Veeranam	Minjur DSP+ Veeranam
Excess Qty. Avialble Minjur	61	58	39	34	29	7	0
Excess Qty. Availble - Veeranam	68	64	48	42	35	17	6
Shortage in RH system	-61	-57	-39	-34	-24	4	0
Supply to RH System from Minjur#	61	58	39	34	29	0	0
Supply to RH system from Veeranam	0	0	0	0	0	0	6

3. Chembarambakkam system:

There is shortage of supply during the periods 2025 to 2035 in Chembarambakkam system. During these periods the surplus water available from Nemmeli and Veeranam systems will be supplemented to Chembarambakkam system as shown in the table below.

CHEMBARAMBAKKAM SYSTEM	2020	2025	2030	2035	2040	2045	2050
DEMAND	260	283	416	467	524	716	804
Deduct for 32 mld from CMA	228	251	384	435	492	684	772
ADD 5% Treatment loss of above	11	13	19	22	25	34	36
Total Demand	271	296	435	489	549	750	840
SUPPLY	277	247	132	269	569	785	958
Excess/Shortage	6	-49	-303	-220	20	35	118

CHEMBARAMBAKKAM SYSTEM	2020	2025	2030	2035	2040	2045	2050
If any shortfall, then Supply From	Nemmeli DSP+ Veeranam	Nemmeli DSP+ Veeranam	Nemmeli DSP+ Veeranam	Nemmeli DSP+ Veeranam	Nemmeli DSP+ Veeranam	Nemmeli DSP+ Veeranam	Nemmeli DSP+ Veeranam
Excess Qty. Availble - Veeranam	68	64	48	42	35	17	6
Excess Qty. Availble- Nemmeli DSP	1	379	283	245	202	71	1
Total Excess Qty. Availble	69	443	331	287	237	88	7
Supply to Chembarambakkam system	68	60	283	245	202	71	1
From Veeranam	68	64	48	42	0	17	0
From Nemmeli	0	1	255	178	0	18	118

4. Cholavaram system

From Northern well Fields the existing and augumented quantity will be made available throughout the design period. For balance quantity Raw Water will be supplied from Poondi lake to meet out the Demands for all the design periods

5. Veeranam System (Porur WDS)

For 2020 the Demand is 116 MLD and the supply is 100 MLD. However upto 180 MLD the supply can be effected. There will be no shortage in supply as another 80 MLD will be made available from the Sub surface sources of river Cauvery at the down stream of Coleroon.

6. Minjur system

The Demand is less than the regular supply of 100 MLD up to the Ultimate stage (2050). Therefore there is no need to supplement from other systems

7. Nemmeli system

Since the total quantity from DSP sources that will be available after commissiongof the 2 plants., viz., 150mld at Nemmeli (2020) & 400 mld at Perur (2025) will be 650mld during 2025, there will be no shortage in the system.

The excess quantity that will be available during the intial design periods, will serve as supplemental sources to other systems., viz Chembarambakkam, Redhills etc.

9.4.1. Additional WTP Construction Phasing

For Planning Year 2020

Following works related to WTP to be included for 2020

1) Creation of Backwash water recycling system at following existing plant
   - ✓ Kilpauk 135 and 90 MLD Plant
   - ✓ Redhills 300 MLD Capacity Plant
   - ✓ Veeranam 180 MLD capacity Plant
2) Creation of New Water treatment Plants and Desalination plants at following Locations
   - ✓ 135 MLD capacity WTP at Kilpauk PS
   - ✓ 25 MLD WTP at Cholavaram (Optional)
   - ✓ 150 MLD DSP at Nemmeli
3) Replacement of open sludge drying with sludge drying beds by mechanical sludge drying at existing & proposed WTP.

For Planning Year 2025

Creation of Desalination plants at following locations

- ✓ 400 MLD DSP at Perur

For Planning year 2035

Creation of WTP capacity at following sites

- ✓ 50 MLD WTP capacity at Sholavaram.
- ✓ 150 MLD WTP capacity at Redhills

For Planning year 2045

- ✓ 150 MLD WTP Plant capacity at Redhills
- ✓ 200 MLD WTP Plant capacity at Chembarambakkam.
- ✓ 70 MLD WTP capacity at Cholavaram.

Total capacities of WTP at the end of 2050 will be 2115 (1235(E)+880(P)) MLD and total capacitiy DSP will be 750 MLD (200(E)+550(P)).

9.5. Technology adopted in Water Treatment Plants

9.5.1. Process

The basic process adopted for treatment of surface water is the conventional process adopted in most of the cities in India and abroad and the will remain the same, as used in most of the existing plants. The Process comprises of the following unit process.

i. Aeration
ii. Pre Chlorination
iii. Coagulation Flocculation and solid liquid separation
iv. Filtration
v. Disinfection

Several combinations of these Unit operations for the above treatment steps are available. Appropriate configuration shall be selected based on the raw water quality and other requirement of the site. Technology selection shall be done considering the following requirements

- Delivery of the desired treated water quality standards.
- Least space requirement
- Least manpower requirement
- Least water wastage
- Optimum power consumption.

9.6. Design Norms

Design Norms for the treatment plants are listed in **Table 9.6**

Table 9 - 9 Design Norms

S. No	Treatment Plant Unit and design Parameter	Range Given in Manual	Value recommended for use	Reference
1	**Chlorine Contact Tank (CCT)** Pre-chlorination to be carried out in contact tank by injecting Chlorine in solution from by Vacuum Type Chlorinator a) Contact Time b) Dose	15 to 30 minute	20 minute 2 to 4 PPM or Based on chlorine demand of raw water	CPHEEO manual for Water Supply and Treatment –Chapter-7
2	**Flash Mixing Tank** HRT	60 Sec	60 Sec at normal flow and 45 Sec during overload conditions	CPHEEO manual for Water Supply and Treatment –Chapter-7

S. No	Treatment Plant Unit and design Parameter	Range Given in Manual	Value recommended for use	Reference
	Velocity Gradient Net Power Input	300 72 watts/m^3	300 72 watts/m^3	
3	**Flocculation Unit Mechanical Type** HRT Depth Velocity Gradient	 10 to 40 min 3 to 4.5 m 10 to 70 S^{-1}	 25 min for normal flow 20 min during overload 3 to 4.5 70 S^{-1}	CPHEEO manual for Water Supply and Treatment –Chapter-7
4	**Clarifier Horizontal Flow Circular Type** HRT Surface Loading Rate Weir Loading Rate Mechanism Type 9.6.1. Sludge Draw off	 2 to 2.5 Hours 30 to 40 $m^3/m^2/d$ 300 $m^3/m/d$	 2.5 Hours for Normal flow 35 $m^3/m^2/d$ 300 $m^3/m/d$ Centrally Driven Telescopic Arrangement	CPHEEO manual for Water Supply and Treatment –Chapter-7
5)	**Lamella Clarifier** HRT Loading Rate	 1.5 hours 90m/d	 1.5 hours 90m/d	
6	**Rapid Gravity Sand Filter (Single Media) Declining rate Constant Head Type** Filtration Rate Backwash Rate Air Scour rate Sand Size Uniformity Co efficient Operation Backwash Water Injection	 4.8 to 6 m/hour 15 to 25m/hour 40 to 55 m /hour 0.45 to 0.7 mm 1.7 to 1.3	 6m/hour Normal flow 6.35/ hour when one filter is taken out 20 m/hour 55 m/hour 0.6 mm 1.5 Automatic PLC Based Directly by pump / Overhead Tank	CPHEEO manual for (Water supply and Treatment)
7	**Chlorine Contact Tank** HRT Dose	 20 to 30 min	 30 min 2 to 3 PPM or based on Chlorine Demand	
8	Chlorination Equipment		Gas Chlorinator Vacuum type for all plant above 5 MLD capacity	
9	**Clear Water Sump** HRT	 30 to 60 min	 60 min	
10	Water Wastage	1 to 5 % of throughput volume	Shall be restricted to below 1.5 %	Wastewater to be recycled after recovery, loss shall not exceed 1.5% of Throughput volume

S. No	Treatment Plant Unit and design Parameter	Range Given in Manual	Value recommended for use	Reference
11	Capacity of Filter Back wash collection Sump		This Shall be equal to volume of two filter backwash	
12	**Lamella Clarifier** For Processing Filter Backwash water HRT Loading Rate	 1.5 hours 90m/d	 1.5 hours 90m/d	
13	**Sludge Thickener** For Thickening Sludge Solid Loading		 50 kg/day/m^2	
14	**Chemical for Coagulation** a)Chemical b)Capacity for Day Tank c)Storage Capacity		 Poly Aluminum Chloride / Aluminum Sulfate (Ferric Alum) Sufficient for 24 hour dosing at Max dose condition in one or more tank One Month's requirement at Max dose	
15	**Chlorination** Chemical Draw Off Storage to be provided		 Liquified Chlorine Gas Not more than 7.5 kg / hour / tonner (based on ambient temperature) One Month's requirement	
16	Disposal of Waste from WTP		Conforming to Environment Act Handling storage and disposal of hazardous waste	

9.7. Wastewater recovery

Each plant, existing as well as proposed, shall have arrangement for recycling of the Dirty backwash water. It is proposed that plant shall be designed for separate collection of dirty backwash water and clariflocculators sludge. Dirty backwash water and sludge shall be separately treated for removal of solids and pathogens and recycled into the plant before pre-chlorination stage.

A typical flow sheet for wastewater recovery system is given in Drawing NoSTC-MP-SW-009.

9.8. Sludge Drying and Disposal

It is proposed that the sludge produced in all the treatment plant shall be properly dried and disposed off in environmentally safe manner. For drying, mechanical sludge drying is recommended. Mechanical sludge drying is carried out in filter press or solid bowl centrifuge. This process requires less land and manpower for sludge handling. Water treatment Plant sludge is classified as hazardous waste and disposal is required to be carried out as per norms stipulated for disposal of hazardous waste. Since sludge content alumina and organic matter it can be best disposed off for brick manufacturing.