

### 5.3.2 Opa Water Supply Scheme

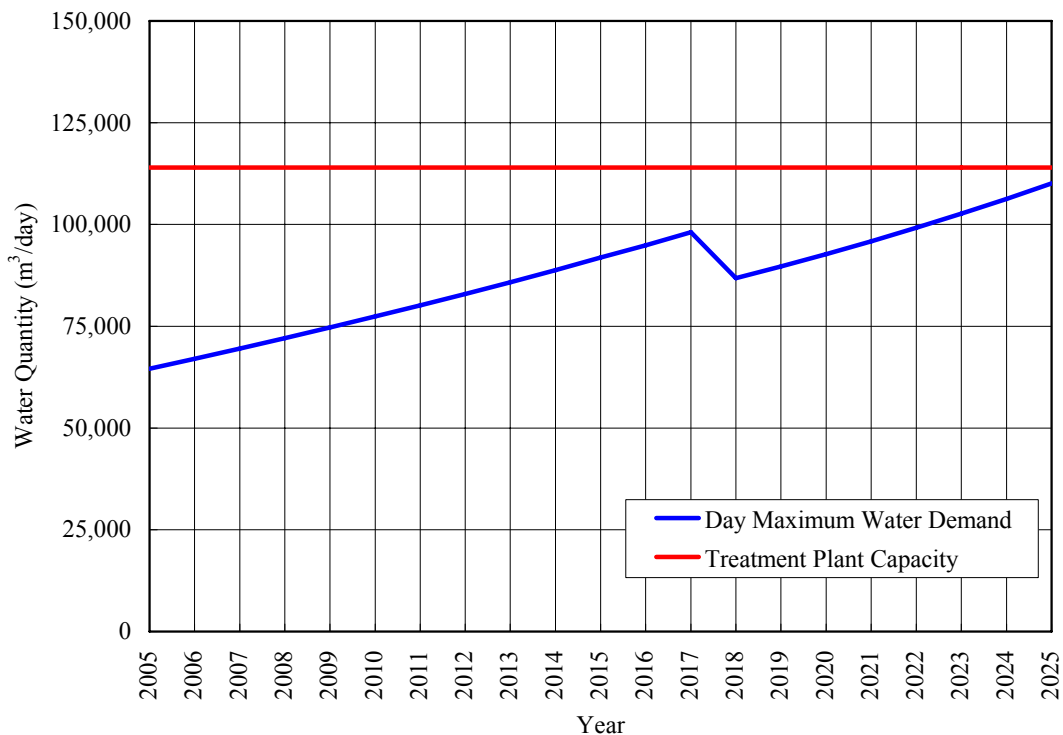
#### (1) System Development Plan

##### a. Expansion of Treatment Plant

The raw water requirement for the Opa WSS is 123,200 m<sup>3</sup>/day (as described in section 5.3.1 and shown in Figure 53.1) which is equivalent to the existing treatment capacity of 112,000 m<sup>3</sup>/day (including 10% plant loss). Considering the raw water availability the Opa WSS cannot further expand its treatment capacity.

The PWD plans to construct a new intake facility at Ganjem to pump water from the Madei River and to deliver it to the Curti Plant. This facility would have a capacity of 30,000 m<sup>3</sup>/day. The raw water availability for the Opa WSS includes this amount of water.

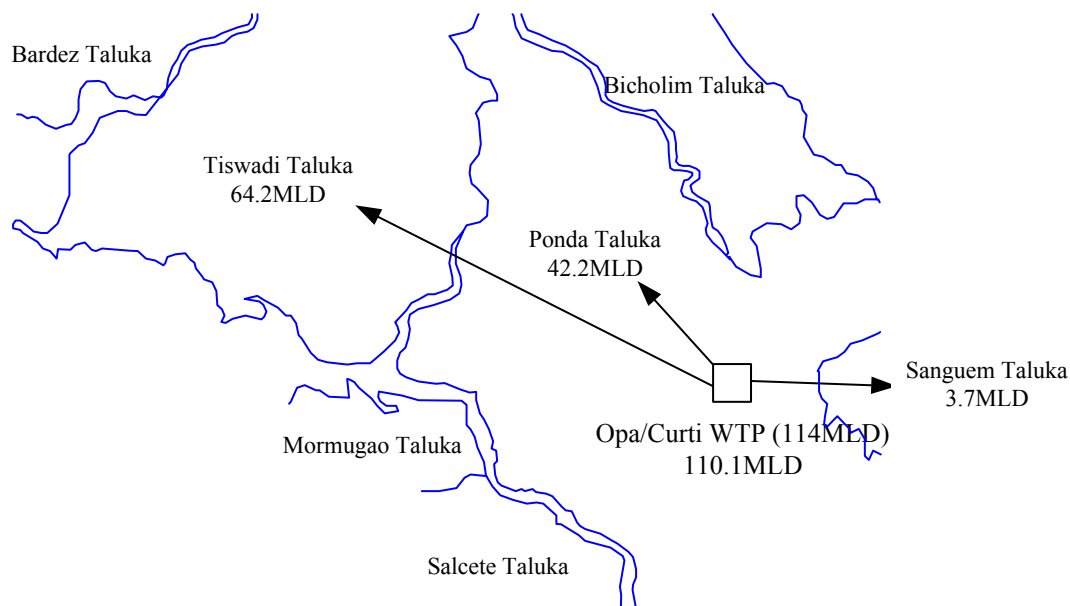
The relationship between water demand and supply capacity shows that the Opa WSS can meet demand until 2025 (refer to Figure 53.7). Therefore expansion of the existing treatment plant is not required for the Opa WSS.



**Figure 53.7 Water Demand and Supply Capacity for the Opa WSS**

b. Transmission Plan

As mentioned in section 5.2, the study proposes that the northern part of Sanguem Taluka will be supplied by the Opa WSS. The Opa WSS supplies water to Tiswadi, Ponda and Sanguem Talukas as shown in Figure 53.8.



**Figure 53.8 Transmission Plan for the Opa WSS**

**(2) Treatment Plant**

a. Water treatment Plant Capacity

The master plan does not require the expansion of the water treatment plant because the water shortage is covered by the proposed expansion of the Salaulim water treatment plant. The existing WTP has four plants, with individual treatment capacities of 8 MLD, 12 MLD, 52 MLD, and 40 MLD.

b. New Intake Facility at Ganjem

According to the letter from Water Resources Department, No: 13/2/CE-WRD-EO/2006-07/68, dated on 1st of June, 2006 as shown in Table 52.1, the raw water of 30,000 m<sup>3</sup>/day from the Madei River (diversion from Ganjem) is required for the Opa WSS in future. The proposed intake facilities include as follows. Details are shown in Volume IV Appendix M52 Planning for Water Treatment Plant.

- Intake facilities with raw water transmission pumping station at Ganjem
- Raw water transmission pump units: Q6.94 m<sup>3</sup>/min x H194 m x 314 kW x 4 units
- Raw water transmission mains: dia. 700 DIP L=12.3 km

c. Implementation Schedule

The timeline for implementation schedule is shown in Table 53.8. Rehabilitation and improvement of the existing 8MLD and 12 MLD water treatment plants and construction new intake facilities at Gajem will be conducted during Stage I. In Stage II, the 52 MLD and 40 MLD plants will be rehabilitated and improved. During these stages, the installation of chlorine safety equipment, replacement of equipment that has exceeded its design life, and installation of a generator and flow meters will be undertaken. To improve the treated water quality, pre-chlorination equipment is required for iron and manganese treatment, and it is proposed to modify the coagulation process in order to more efficient treatment of turbidity.

**Table 53.8 Implementation Schedule for Opa WTP**

Stage		Existing Plants
Stage I	Components	Construction of New Raw Water Facility Rehabilitation and Improvement of the 8 and 12 MLD plants - Installation of safety equipment (for all plants) - Replacement of existing raw water pumps and backwash pumps - Installation of generator and flow meters (for all plants) - Installation of pre-chlorination equipment
Stage II	Components	Rehabilitation and Improvement of the 52 and 40 MLD plants - Replacement of existing raw water pumps and backwash pumps - Installation of generator - Installation of pre-chlorination equipment - Modification of coagulation process

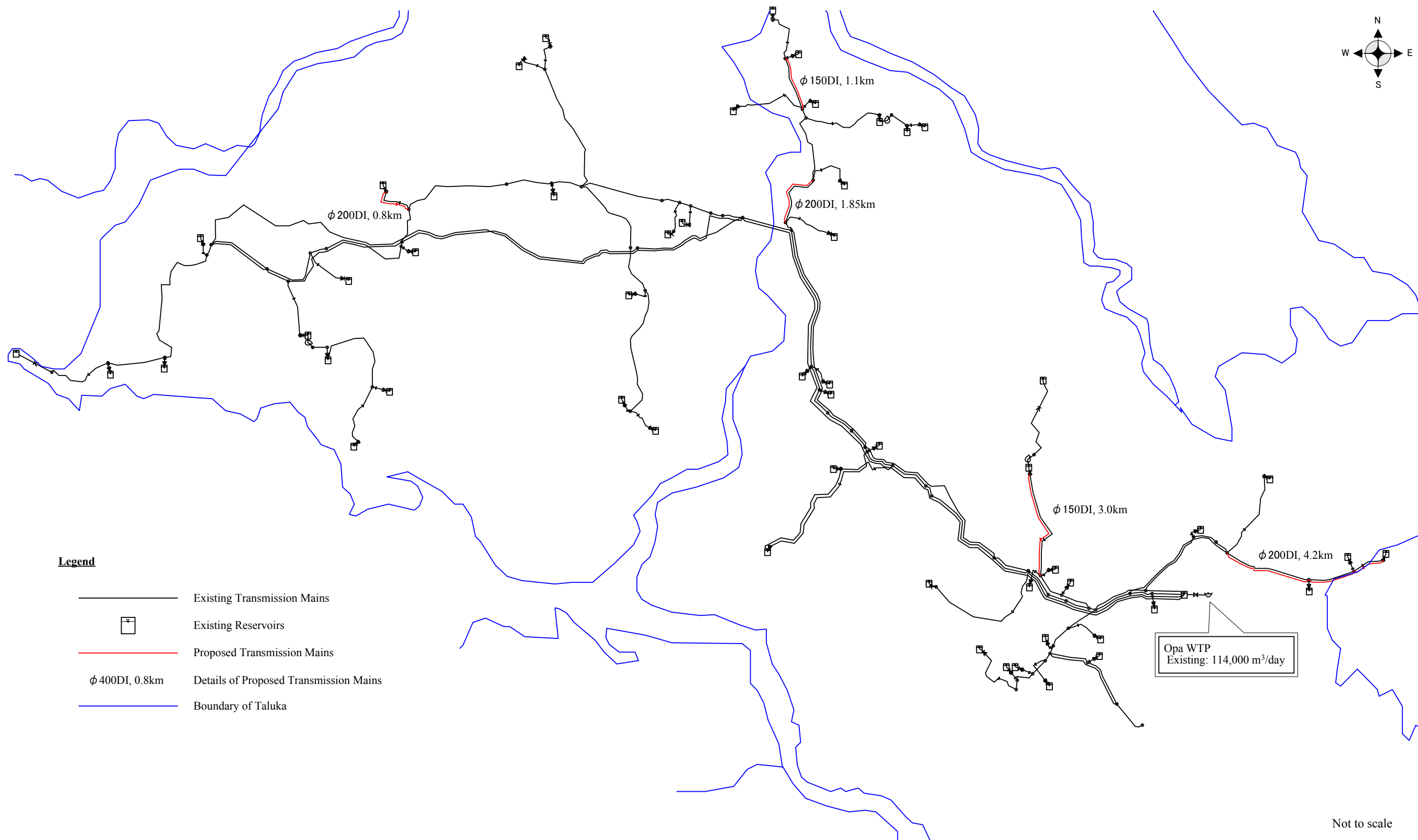
**(3) Transmission System**

a. Proposed Transmission System

To cover future service areas and to meet the increased demand, the transmission system shown in Figure 53.9 and summarised in Table 53.9 is proposed. Calculations performed using WaterCAD are attached in Volume IV Appendix M53 Results of Hydraulic Analysis.

**Table 53.9 Proposed Transmission Mains for the Opa WSS**

Material	Diameter (mm)	Length (km)
Ductile Iron	200	10.35
	150	4.10
Total		14.45



**Figure 53.9 Proposed Transmission System for the Opa WSS in 2025**

It should be noted that the pipeline (of 900 mm ductile cast iron) that the PWD is currently installing from the Banastari Bridge to Althino Reservoir at Panaji, is assumed to be completed in time for the proposed Master Plan projects.

b. Rehabilitation of the Existing Transmission System

The Opa WSS has a total length of 17.7 km asbestos cement (AC) pipelines installed from 1957 to 1971 (Sector Status Study – WSS Goa, 2004) as the tapping pipelines from transmission mains to reservoirs. The Study proposes that the existing 17.7 km of AC pipelines will be replaced with ductile iron pipes.

The Master Plan also recommends the replacement of 30% of old pipes installed before 1975, which is an estimated length of 32.0 km, to secure the transmission system of the Opa WSS.

**(4) Reservoirs**

a. Proposed Reservoirs

The Master Plan does not require new reservoirs for the Opa WSS because it already covers most areas in the Tiswadi and Ponda Talukas.

b. Rehabilitation of the Existing Reservoirs

The Opa WSS has 80 reservoirs, as summarised in Table 53.10. A detailed list of reservoirs is attached in Volume IV Appendix M31 Existing Water Supply System. Table 53.10 also identifies the reservoirs that need to be rehabilitated. The Master Plan assumes about 20 percent of the existing reservoirs will be rehabilitated by 2025.

**Table 53.10 Existing Reservoirs**

Reservoir Volume (m <sup>3</sup> )	Number of Reservoirs	
	Existing	to be rehabilitated
5,000	1	0
800	22	6
650	4	1
400 & 450	2	0
300	30	7
200	2	1
150	9	2
100 and less	10	2
Total	80	19

Note: not include the reservoirs at Opa WTP and Curti WTP

### (5) Pumping Stations

#### a. Proposed Pumping Stations

According to the Master Plan, the Opa WSS does not require the construction of new pumping stations. This is because the Opa WSS already covers most of the Tiswadi and Ponda Talukas.

#### b. Rehabilitation of the Existing Pumping Stations

The design life of the pumping equipment is assumed to be 15 years. Therefore, the pumping equipment in all the existing pumping stations should be replaced by 2025. Details are shown in Table 53.11.

**Table 53.11 Pumping Equipment Replacement Details**

Name of Station	Pumping Unit (pump and motor)		Name of Station	Pumping Unit (pump and motor)	
	Rated Output (kW)	No. of Units		Rated Output (kW)	No. of Units
Apewal	13.1	3	Altinho	5.4	3
Wadiwada Betqui	1.5	2	Taligao	4.9	3
Merces	2.1	3	Nagali	1.5	2
Bombolim	5.1	3			

### (6) Distribution Pipeline and House Connections

#### a. Proposed Distribution Pipeline and House Connections

The proposed length of distribution pipelines was calculated by multiplying the number of

house connections to be installed (which reflects the increase in population served) by the unit pipeline length per connection (which is 14.26 m as mentioned in section 5.1.2). Table 53.12 shows the proposed number of house connections and length of distribution pipelines.

**Table 53.12 Proposed Number of House Connections and Length of Distribution Pipelines in the Opa WSS (incremental basis)**

Year	2007	2008	2009	2010	2011	2012	2013
Distribution Pipeline (m)	24,173	24,301	24,384	24,476	23,833	23,951	24,107
Number of House Connection	1,695	1,704	1,710	1,716	1,671	1,680	1,691
Year	2014	2015	2016	2017	2018	2019	2020
Distribution Pipeline (m)	24,217	24,375	23,895	24,089	18,780	20,930	21,191
Number of House Connection	1,698	1,709	1,676	1,689	1,317	1,468	1,486
Year	2021	2022	2023	2024	2025	Total	
Distribution Pipeline (m)	21,303	21,590	21,875	22,194	22,515	436,180	
Number of House Connection	1,494	1,514	1,534	1,556	1,579	30,588	

b. Rehabilitation of the Existing Distribution Pipeline and House Connections

The design life of the distribution pipelines is assumed to be 50 years. It is planned that 2 % of the existing 704km of distribution pipelines will be replaced every year. Therefore, between 2007 and 2025, 38 % of the pipelines will be replaced. As a result the existing 268km of distribution pipelines will be replaced during the 19 years from 2007 to 2025.

The design life of the water meters at the house connections is assumed to be 10 years, and it is planned that all 59,900 existing water meters will be replaced within 10 years. As a result about 129,000 water meters will be replaced during the 19 years from 2007 to 2025.

**(7) Planning Summary**

In conclusion, the components of the Opa WSS are summarised in Table 53.13. Figure 53.10 depicts the Opa WSS in 2025.

**Table 53.13 Components of Master Plan for the Opa WSS**

Facility	Proposed	Rehabilitation/ Replacement
Treatment Plant	-	112,000 m <sup>3</sup> /day
Transmission Main	14.45 km	49.7 km
Reservoir	-	19
Pumping Station	-	7
Distribution Pipeline	436 km	268 km
House Connection	30,600	129,000



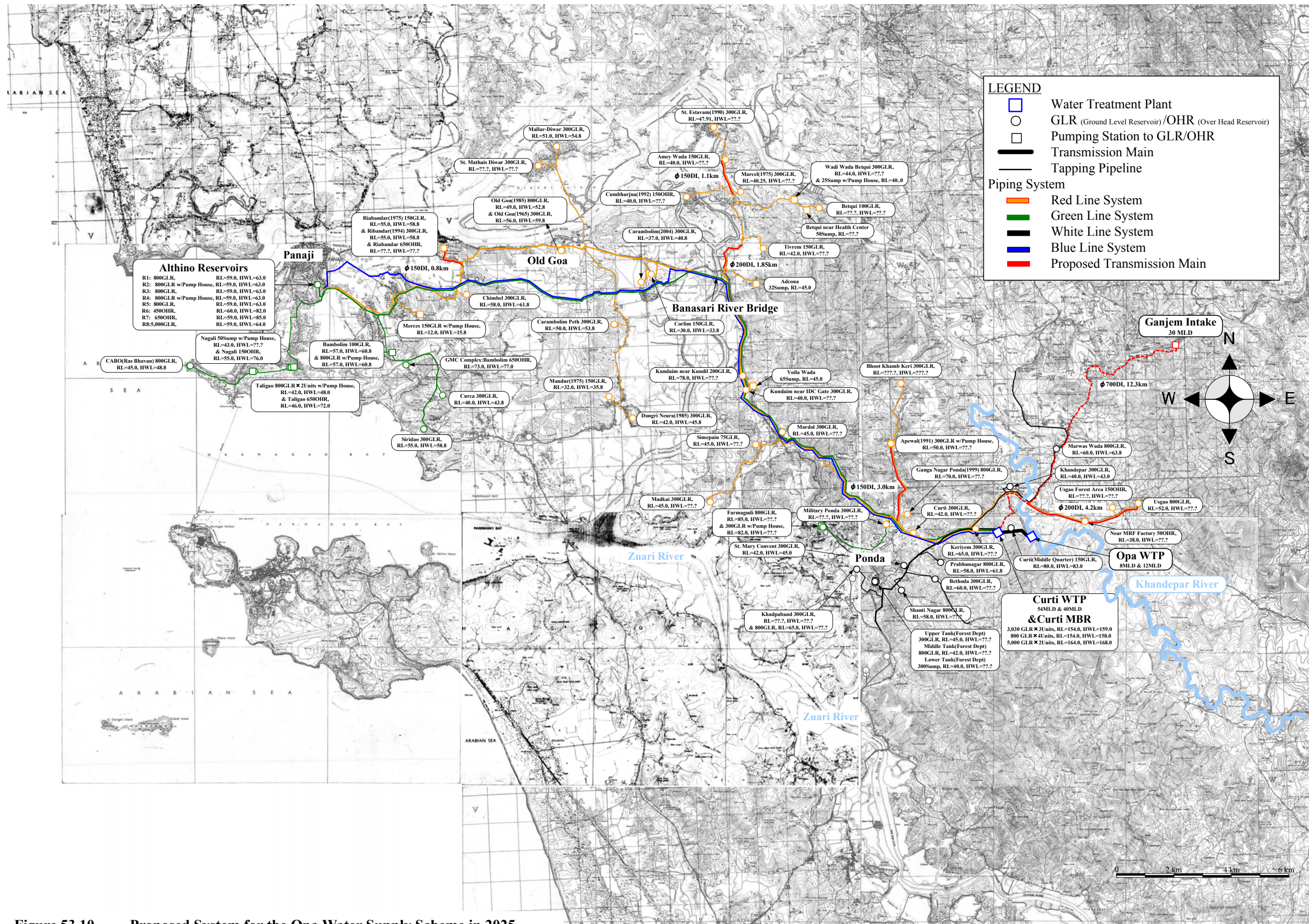


Figure 53.10 Proposed System for the Opa Water Supply Scheme in 2025