

CHAPTER 9 – WATER SYSTEM FACILITIES

9.1 Introduction

Based upon the hydraulic modeling described in Chapter 6 and the condition assessment of facilities provided in Chapter 7, improvements to the water source, pumping, storage, and treatment facilities are required to provide potable water in sufficient quantity and quality to meet the demands of GWA customers. This Chapter will summarize improvements needed to the wells, booster stations, reservoirs, and water treatment facilities.

9.2 Wells

The current operation of GWA's wells though functional poses operational challenges and some security risks. The uncertainty of designating the Northern System as Ground Water Under the Direct Influence (GWUDI) of surface water necessitates consideration of alternatives to the current system design and operation.

Some or all of the existing wells could qualify for filtration avoidance, but additional monitoring is required to determine if they qualify. For example, Figures 2-1 and 2-2 in Chapter 2, Water Regulatory Issues, show which wells have had coliform hits during the past 5 years, but the quantities have not been sufficiently quantified to determine if filtration avoidance could be met. If any well does not meet the filtration avoidance criteria, filtration would need to be added, or the well would need to be abandoned. Adding filtration to each well is impractical. Beginning a process of adding filters to individual, problematic wells could occur. However, there is no guarantee that more wells could fail to meet the filtration avoidance criteria in the future.

GWA has completed the design of a water transmission line that extends from the Agana Heights Reservoir to the Chaot Reservoir. Wells A-1, A-3, A-5, A-6, A-12, A-23, A-25, A-31, and A-32 will be connected to this transmission line. Wells A-31, A-23, A-6, A-25, and A-5, are five of the six wells that have the most frequent coliform hits. On-site chlorination at the well we will be relocated to each reservoir. If filtration is required, it can also be located at the respective reservoirs.

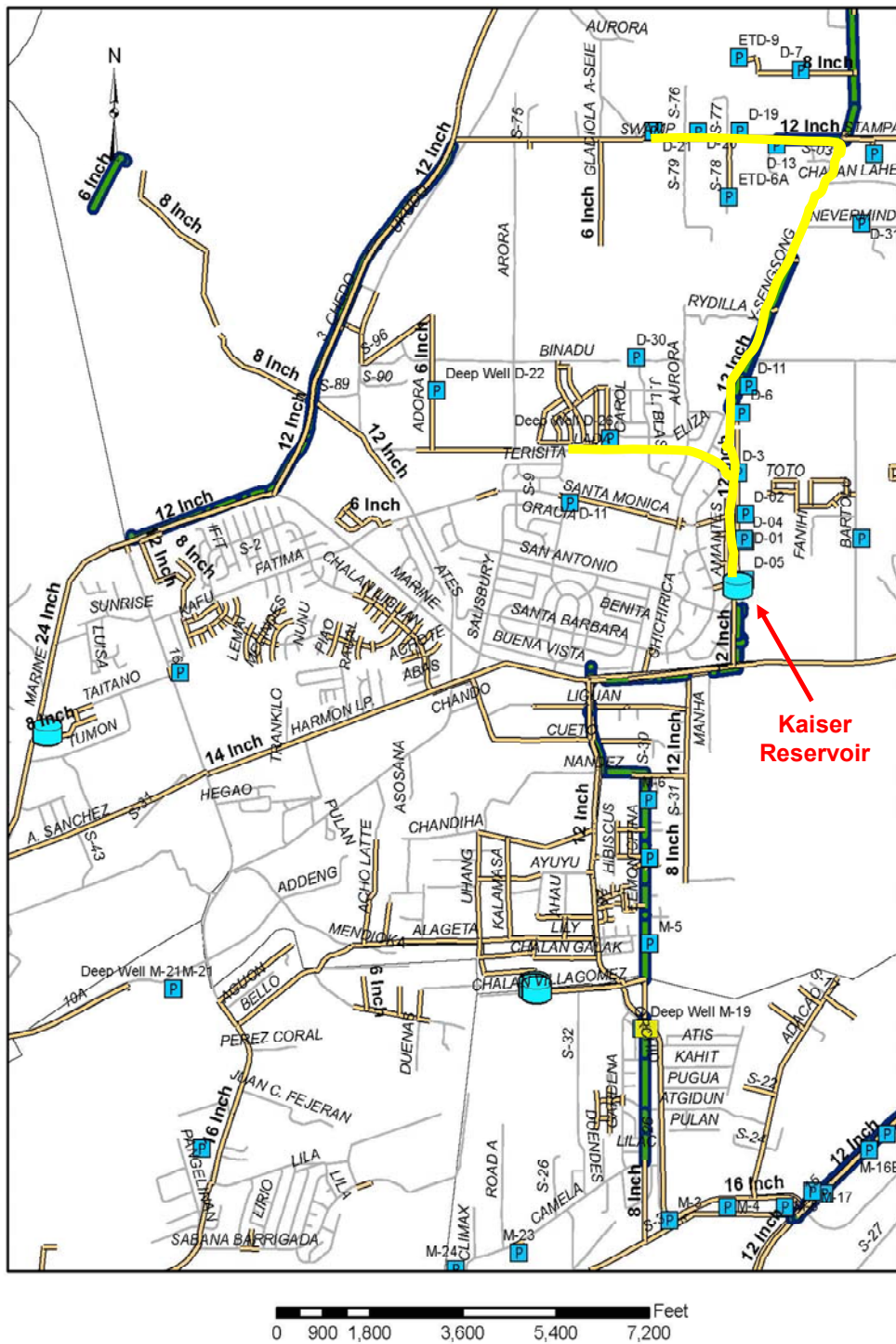
Given the uncertainty of the GWUDI designation, the ability of each well to meet the filtration avoidance criteria, and the security risks associated with the existing system design, transmission lines to potential common treatment points is a practical approach. Table 9-1 identifies transmission lines in order of priority. Some of the wells are isolated or sufficiently distant from the proposed transmission line that they need to be evaluated as to cost and feasibility. It is possible that a focused effort on local and system water loss, could reduce or eliminate the need for connecting isolated wells.

Table 9-1 – Recommended Raw Water Transmission Lines

No.	Description	Well Series	Comment
1	A transmission line extending from Chaot Reservoir to Agana Heights Reservoir along Route 4. (Figure 9-1)	A-series wells A-1, A-3, A-5, A-6, A-12, A-23, A-25, A-31, A-32.	This transmission line has been designed and is being prepared for bid. Though not included at this time, wells A-29 and A-30 should be connected to this transmission line in the future.
2	A branched transmission line from Swamp Road along Route 28 and Route 27a to Route 28, connecting to Kaiser Reservoir. (Figure 9-2)	D-series (except D-14, D-22, D-23, and D-24), EX-05A, G-501, and Y-12.	Wells D-19, D-7, D-4, D-21, D-13, and D-17, have a history of fecal coliform hits, though only D-4 showed their presence from 2003 through 2005. This is the second highest concentration of wells with fecal coliform hits, following the A-series for which the design is already complete.
3	A branched transmission line from the Well AG-01 on Route 9, extending along Route 3 to Route 28, and further extending to the Astumbo Reservoirs. A secondary branch would pick up several wells not on the main transmission line. (Figure 9-3)	AG-01, AG-02, HGC-02, F-Series, D-22, D-23, D-24 and the EarthTech wells.	This is the third highest concentration of wells with fecal coliform hits, including wells F-13, F-2, F-10, and D-22. The existing 12-inch line along Route 9 between Well AG-1 and Yigo Reservoirs is isolated from the F-series wells by a valve.
4	A transmission line along Route 26 to near Route 1 and connecting to Barrigada Reservoirs. (Figure 9-4)	EX-11 and M-Series, except M-12, M-14, M-17B, M-18, M-20A, and M-21.	Wells M-12, M-15, and M-18 need to be evaluated for inclusion in this transmission line or Item 2 above. Well NAS-1 also needs to be evaluated due to its isolation and distance from this transmission line.
5	A branched transmission line extending from Ypaopao along Route 1 to Yigo Reservoirs. A branch would extend along Route 29 to connect wells Y-03, Y-7 (inactive), and Y-9. (Figure 9-5)	Y-series wells except Y-12 and, possibly Y-15.	Well Y-15 is sufficiently distant from this proposed transmission line that it should be evaluated separately for inclusion or separate treatment.
6	A transmission line extending from Chaot Reservoir along Route 15 to Mangilao Reservoirs. (Figure 9-6)	A-series wells not included in Item 1, except for A-29 and A-30.	Wells A-17 and A-19, might need to be included on a separate branch.
7	A transmission line to connect wells M-17A, M-20A and M-21 to Barrigada Heights Reservoir.	Wells M-17A, M-20A, and M-21.	--

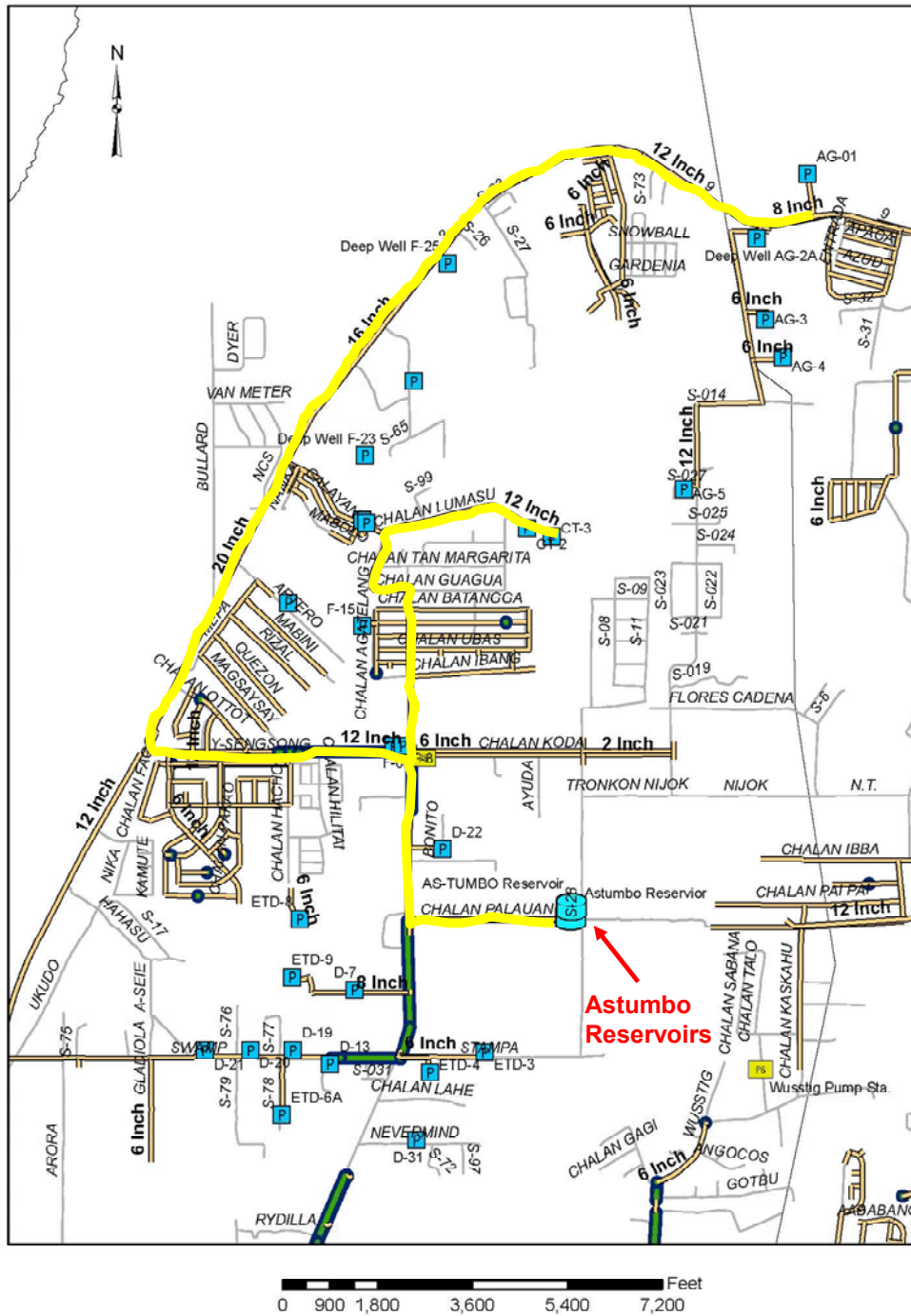
“This is a draft report and is not intended to be a final representation of the work done or recommendations made by Brown and Caldwell. It should not be relied upon; consult the final report.”

Figure 9-2 – Proposed Transmission Line 2



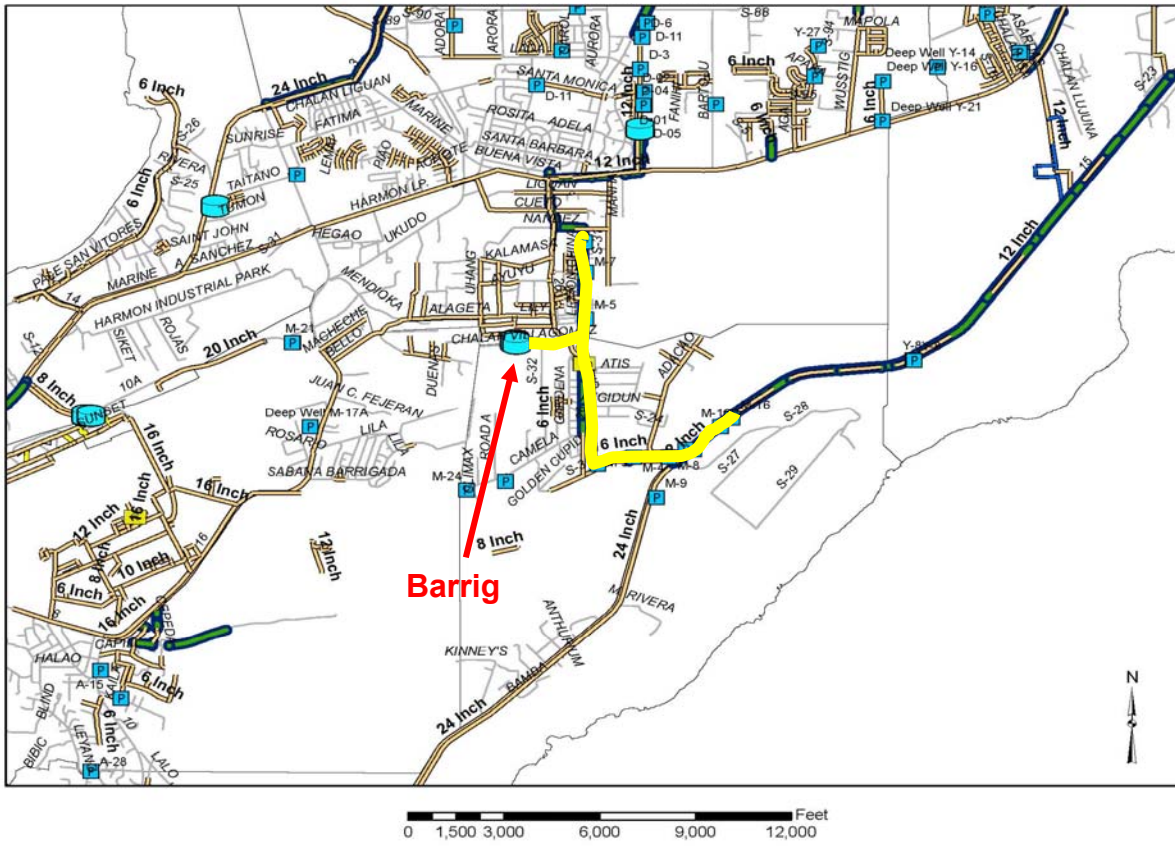
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Figure 9-3 – Proposed Transmission Line 3



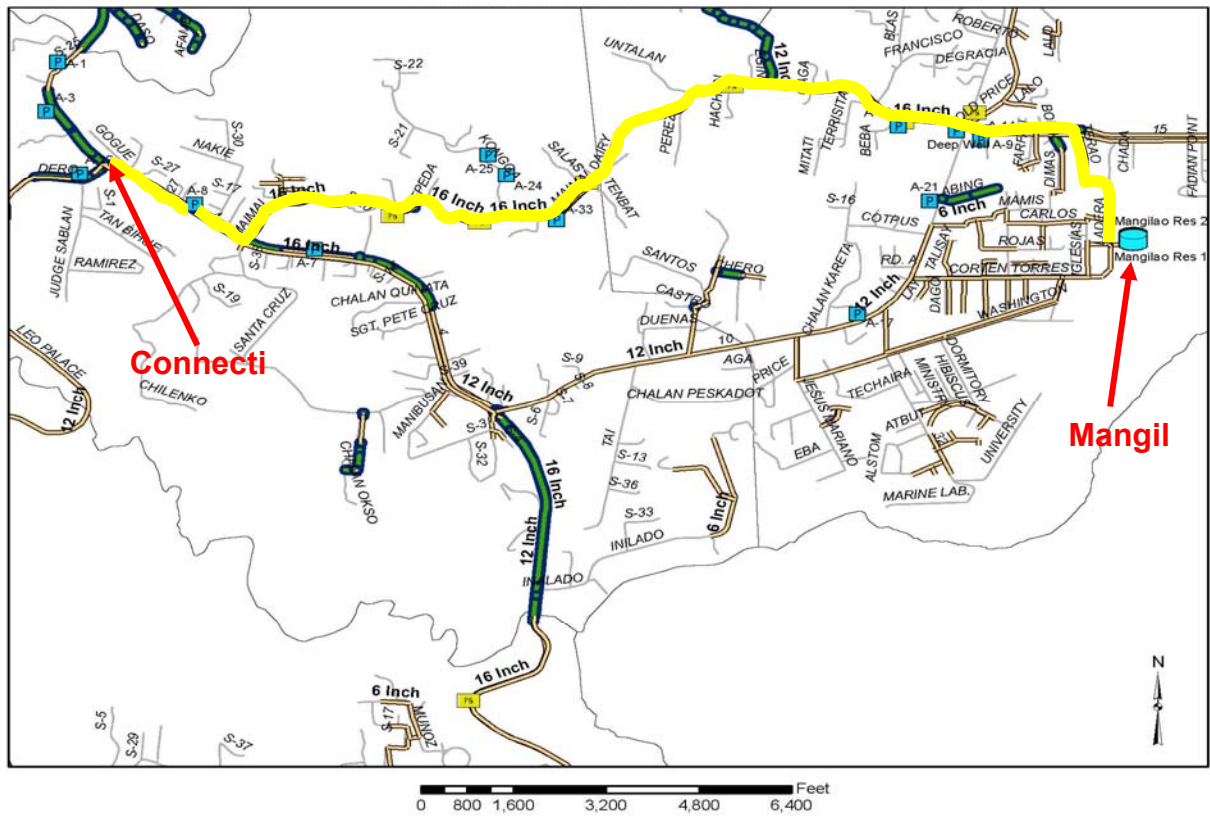
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Figure 9-4 – Proposed Transmission Line 4



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Figure 9-6 – Proposed Transmission Line 6



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9.3 Booster Pump Stations

Recommended booster pump stations to improve water service pressures in the distribution system are summarized in Table 9-2.

Table 9-2 – Recommended Booster Pump Station

No.	System	Area	Description	Pump Requirements	Comment
1	South	Agat	Provide BPS along Route 2 to boost pressure from Agat/Umatac Reservoir to Lasafua Reservoir.		Capacity of Lasafua Reservoir is inadequate to supply its service area.
2	Central	Talofofo	Provide BPS along Route 4A to boost pressure from Windward Hills #2 Reservoir to Talofofo.		New 12-inch transmission line required as well.
3	Northern				

9.4 Reservoirs

Recommended reservoirs to improve water storage for fire protection or adequate service pressures are summarized in Table 9-3.

Table 9-3 – Recommended Reservoirs

No.	System	Area	Description	Tank Requirements	Comment
1	South	Agat	Provide 0.1 MG reservoir to replace existing Lasafua Reservoir.	Overflow elevation should be set at 428 feet to match existing, or higher.	Capacity of Lasafua Reservoir is inadequate to supply its service area.
2	Central	Talofofo	Provide elevated tank in Talofofo.	Capacity to be determined.	Tank finish floor elevation should be set high enough to service homes in the 300 to 382-foot elevation.
3	Northern	Mataguac	Provide 0.1 MG reservoir downstream from the Mataguac BPS.	Overflow elevation to be determined.	BPS currently discharges directly into the distribution system.
4	Northern	Astumbo	Provide additional storage next to Astumbo #1 and #2.	Overflow elevation to be set at 570 feet. Capacity to be determined.	Fire protection storage inadequate in this area.
5	Northern	Barrigada	Provide additional storage near to Barrigada #3.	Overflow elevation to be set at 481 feet to match Barrigada #3.	Evaluate cost effectiveness of using only a partially full Barrigada #2 (due to overflow elevation at 497.8 feet) compared to constructing a new tank.

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9.5 Water Treatment Facilities

The Ugum Water Treatment Plant is the primary source of drinking water for the Southern Public Water System. Two low producing wells (MJ-01 and MJ-05) provide back-up supplies, but are insufficient to serve the entire Southern System. Though performance reliability of the Ugum WTP has improved over the past two years there risks associated with existing equipment and structures. Needed improvements are listed in Table 9-4.

Table 9-4 – Ugum Water Treatment Plant Improvements

No.	Description	Requirement	Comment
1	Replace dual media filters with membrane filters.	Plant capacity of 3.0 to 7.0 million gallons per day depending on raw water turbidity.	One of the existing filters cannot be used due to structural earthquake damage. A project for installation of membrane filters in two of the dual media structures is currently underway and expected to be completed by December 2006.
2	Construct a new finished water reservoir.	2.0 million gallon reservoir.	The existing reservoir has structural and corrosion damage but cannot be taken off-line as the sole source reservoir. A second reservoir would provide an opportunity to rehabilitate the existing reservoir.
3	Provide chemical feed equipment redundancy.		
4	Construct raw water storage reservoir.	60-day reserve or 120 million gallon capacity.	