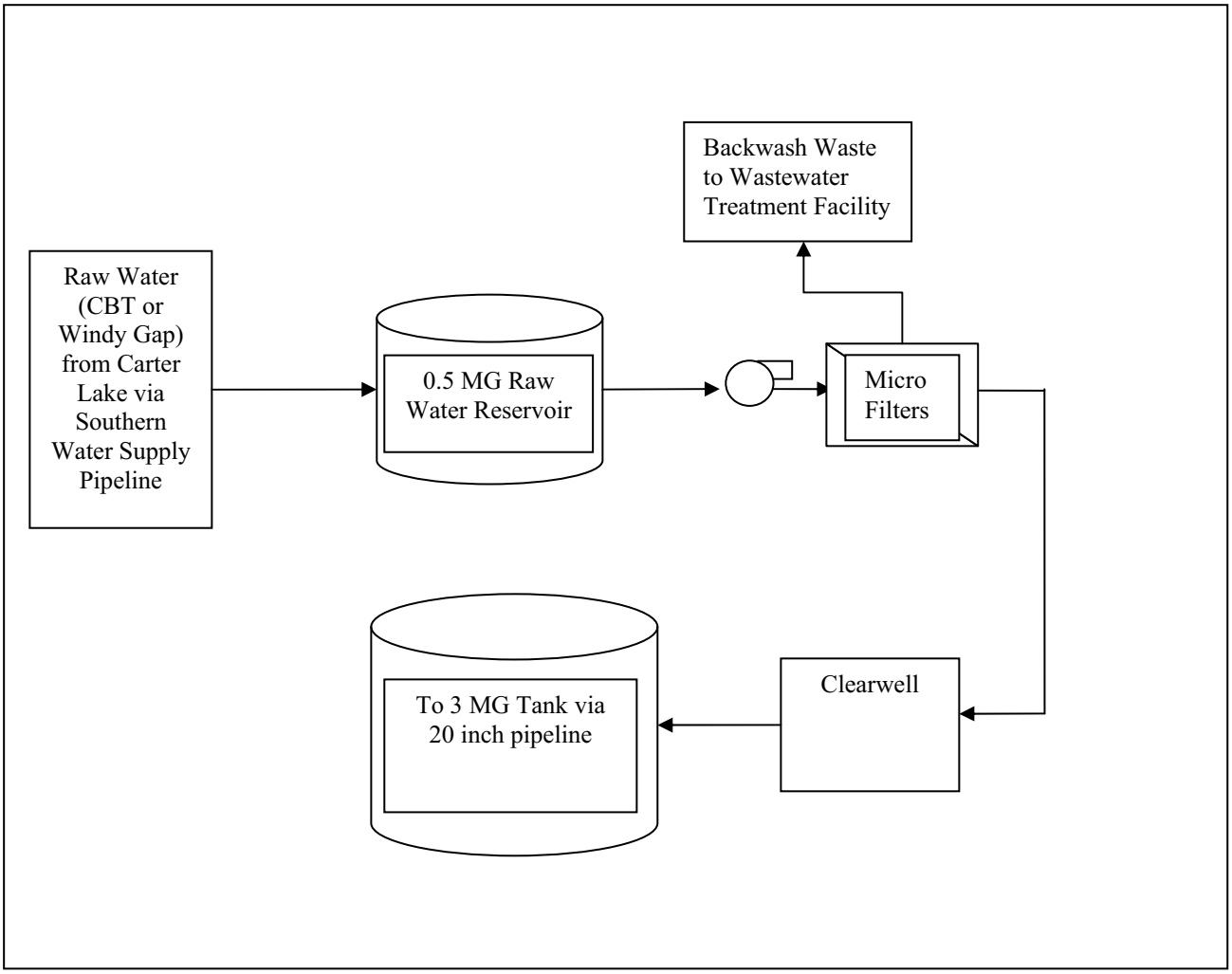
4.0 WATER TREATMENT SYSTEM

4.1 Introduction

In 1995, the City of Fort Lupton joined with the Town of Hudson to construct a nominal 3.0 MGD (3 x 1 MGD filter units) micro-filtration Water Treatment Plant (WTP). By contract, the City own 5/6th of the original capacity and Hudson owns 1/6th of the original capacity. Since the additional plant capacity was added, other improvements have also been added to the facility – most notable being the addition of two more micro-filtration units and the addition of 3 MG's of potable storage. A schematic of the existing water treatment facility operation is shown in Figure 4-1.

Figure 4-1 Schematic of Existing WTP Operations



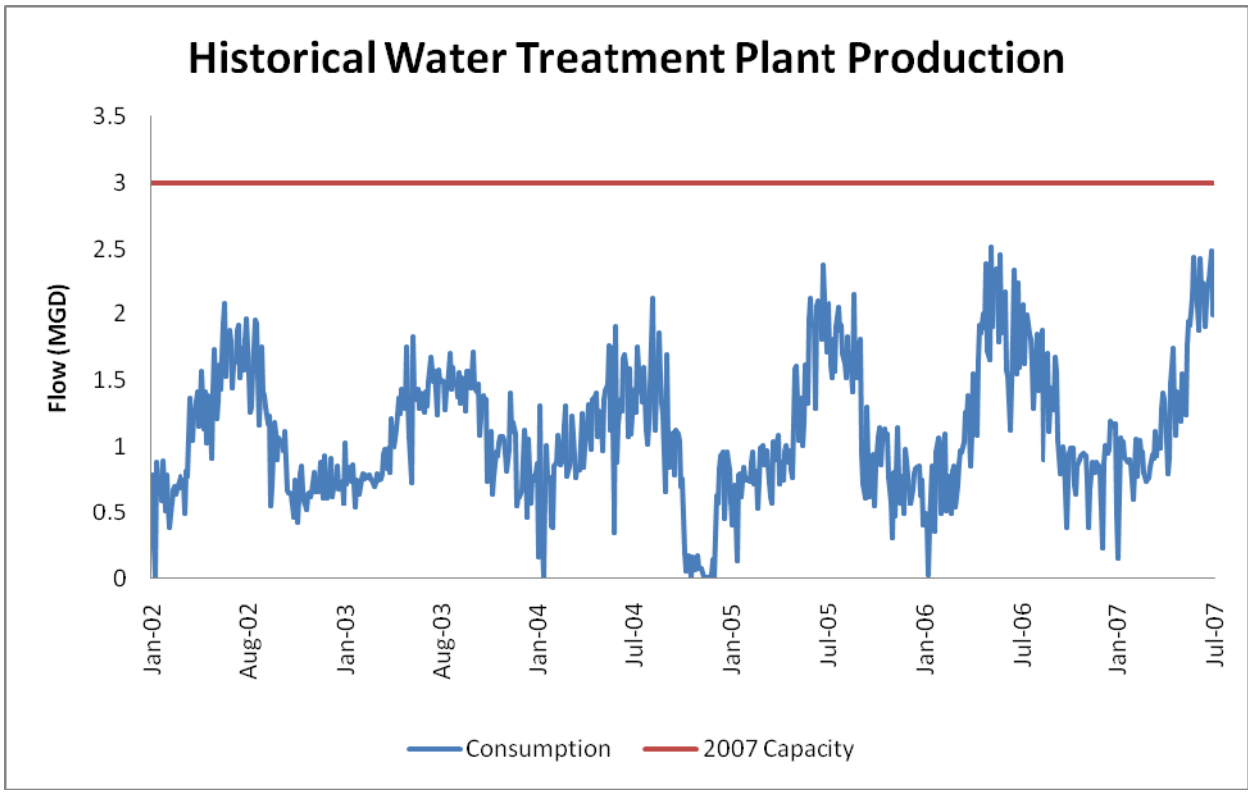
As part of the November 1999 Master Plan completed by RTW Inc., it was determined that the actual throughput of the WTP was closer to 0.85 MGD per filter. Accounting for lost production due to backwashes and cleanings, in addition to on-going wear and tear, the actual treatment

capacity was closer to 1.95 MGD. Since max day flows were approaching plant capacity, and to accommodate additional growth, the City expanded the facility in 2001 with the addition of two more micro-filtration units. As such, the City's share of capacity was equal to 4.5 filtration units each operating at approximately 0.85 mgd, or 3.83 MGD.

4.2 Existing Water Treatment System - USA 2007

Figure 4-2 highlights the throughput of the WTP over the last 5 years. As shown, the current max day demand is near 3 mgd.

Figure 4-2: Historical WTP Production



Although the water treatment facility is theoretically capable of delivering 3.83 mgd (4.5 filters at 0.85 mgd per filter), the WTP operators are currently experiencing difficulty meeting max day demands of around 3 mgd.. Much of the difficulty operators are experiencing is simply related to the wear and tear on the existing filters (two original filters have never been replaced) and a corresponding decrease in throughput. To regain lost capacity, the City needs to replace aging filtration units. In doing so, sound practice would provide some residual capacity for future growth. In addition, the City should not count on the filters to run at 100% of their rated capacity to meet peak system demands. As such, we recommend the City expand the WTP by adding an additional two (2) micro-filtration units to increase the City's firm capacity (i.e. one unit off-line) at the WTP. Based on 0.85 MGD per filter, the addition of two new filter units

(again with one filter unit off-line and ½ of one filter dedicated to the Town of Hudson) would bring the City's WTP capacity to 4.7 mgd.

As part of this project, the City should replace the filtration modules within the existing treatment train. This will increase the throughput of each filter while simultaneously assisting the City with compliance with the Disinfection By-Products (CBP) rule and reducing the amount of backwash waste. Since the previous design and construction provided for this expansion, these modifications should be relatively straightforward.

The City should note though that to attain compliance with the DBP rule will most likely come at the cost of some lost plant production. RTW Inc. is currently evaluating alternative processes to maintain compliance with the DBP rule. Their current un-formalized plan will utilize ferric sulfate as a coagulant aid just prior to the micro-filters. If this plan is implemented, the City should plan on a throughput of approximately 0.65 mgd per filter. Thus, the combination of replacing aged filters and adding two new filters will yield a firm capacity of (6.5 filters at 0.65 mgd/filter) 4.23 MGD.

A WTP expansion will provide additional water treatment capability and also "free-up" capacity at the wastewater treatment facility by reducing the amount of backwash water sent to the WWTP. For example, the current WTP operates at around 92% efficiency. For every 100 gallons of raw water delivered to the WTP, 8 gallons are sent directly to the WWTP. Due to improvements in micro-filtration technologies, the WTP efficiency can be increased to around 96% by changing out the filtration units. This increase in recovered water represents a significant opportunity to the City in terms of unrealized raw water purchases and utilization of capacity in both the wastewater collection and treatment systems. For example, at current max day demands of around 3 mgd, the WTP will send close to 240,000 gallons a day to the WWTP. This encumbers around 10% of the WWTP capacity. At a planning cost of $8/gallon for wastewater treatment, any reduction in flow to the WWTP is a significant opportunity for the City. For example, if the backwash water was reduced from 8% to 4%, the City would realize an opportunity savings (capacity gained without direct capital expense) at the WWTP of approximately $960,000. Likewise, the costs of raw water purchases that are not delivered are also significant. For example, using the same 92% to 96% improvement in capture at the WTP would yield another 67 ac-ft of raw water that is currently unutilized but could be utilized with the proposed improvements to the WTP. This is enough water for at least another 100 homes. Purchasing raw water shares on the open market for 100 homes would cost at least $1,000,000.

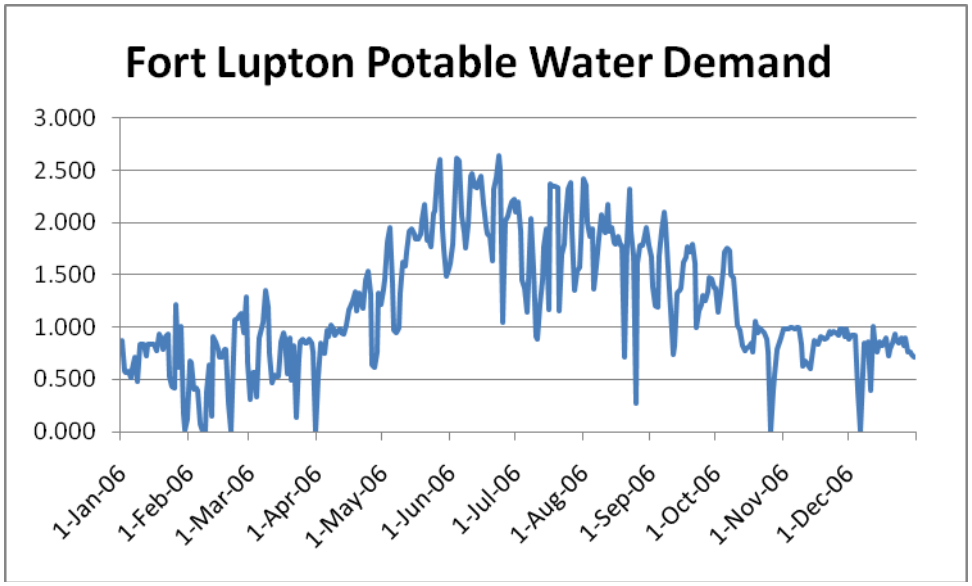
We recommend the WTP expansion include replacement of the existing "high pressure" filter modules with "low pressure" modules and installation of two (2) more micro-filtration skids. This change in filtration units combined with the proper chemical coagulant will also assist the City in compliance with the Disinfection By-Products rule. Congruent with the WTP expansion we recommend the City continue to investigate appropriate technologies and procedures to further maximize the efficiency of the WTP via a reuse or recycle program. Of course, the Town of Hudson should be apprised of any changes to the WTP.

4.2.1 Raw Water Storage

The WTP does not currently experience any major operational constraints. However, the facility is limited on the amount of raw water storage. More specifically, the City receives all of its raw water from NCWCD via a 20" pipeline that feeds into a 0.5 MG tank. The 20" SWSP pipeline requires annual maintenance (7 days is provided for in the City/NCWCD contract), during which time the operators must shut down the WTP. This is a stressful time for OMI. For example, when NCWCD took the line off service for four days last winter for maintenance, the system drained most of the potable water in storage. Currently, the City has 5 MG's of potable storage (approximately 5 days of storage with which to feed the system in winter) and has been able to meet system demands during this annual event. Although this sounds like a lot of storage, in reality it is only adequate to meet system demands ***in winter*** for ½ of the 7 days provided for in the NWD maintenance contract. To have enough potable water in storage to supply demands, again ***in winter*** would require the City to construct 10 MG's of storage!

Constructing 10 MG's of potable storage is problematic on many levels. As such, at a minimum, we recommend the City have a contingency plan in case of shutdown of the NCWCD pipeline. One approach could utilize well water. However, many details and water quality considerations would have to be evaluated and an emergency operations plan would have to be in-place to protect residents as well as City infrastructure. Thus, all things considered, we recommend the City endeavor to attain raw water storage at or near the WTP. This would mitigate the concerns associated with an emergency when the SWSP pipeline breaks and increase the total quantity of raw water that could be delivered through the SWSP. For example, Figure 4.3 shows the potable water use within the City in 2006. At a minimum, as currently configured, the City must purchase enough SWSP pipeline capacity to carry the peak system demand – approximately 3.0 MGD in 2007. Alternatively, if the City had storage "near" the WTP, the City could also draw from storage during the summer months and refill storage during the winter months – extending the value received from the SWSP.

Figure 4.3 – 2006 Potable Water Demand



4.3 Projected 5-year Water Treatment Facility Requirements (USA 2007-2012)

Assuming the City constructs the WTP improvements recommended above, the next question is "when will the next plant expansion be required?" To address this question, we have attempted to bracket a set of potential growth rates. Should the proposed growth along the southern boundary of the City transpire; the growth potential for the City is significant. However, most of the initial growth over the next 5 years will take the form of Industrial and Commercial - typically lower users of water. For the City to require another plant expansion within the next 5 years (based on a 2008 expansion to 4.23 MGD) would require growth to exceed 8% for the next 5 years – an unlikely event. Put another way, expanding the WTP as recommend in the USA 2007 plan will provide almost 1.4 mgd of capacity. Using a planning number of 1,500 gpd/acre times the 13.7 million square feet of estimated new industrial space predicted to accompany the proposed growth along the southern boundary of the City would require 0.47 mgd of the additional 1.4 mgd of capacity, leaving an additional 1 mgd for other growth. Based on these numbers we do not anticipate another WTP expansion within the next 5 years.

4.3.1 Projected 5-year (USA 2007-2012) WTP Expansion Costs

The cost data presented in this chapter for water treatment plant capacity was provided by Hydrologx – the filter manufacturer local representative.

Two new low-pressure filter modules - $955,000

Replacement of five existing high pressure filters with new low pressure filters is estimated to cost $699,500. This includes new modules, blowers, aeration manifold and installation labor. The City will need additional miscellaneous appurtenances associated with the expansion

including new o-rings/filtrate cups ($8500), chlorine dosing system ($10,000), CIP upgrade (in-line) ($25,000). The project will also require design, bid and construction phase services to protect the interests of the city. Typically, these services run around 15% of the construction cost or, say $250,000. Accordingly, we recommend the City budget $2,000,000 to expand the WTP to seven micro-filters.

4.4 Projected 20-year Water Treatment Facility Requirements (USA 2007-2027)

Based on data from the Comp Plan and CDIS projections, Weld County and the City of Fort Lupton will grow at an annual rate of around 3% - essentially doubling the size of the City over the next 20 years to a population approaching 15,000. Using the planning numbers defined herein, this would equate to a required WTP capacity of almost 6.4 mgd. Therefore, it is reasonable to predict that another WTP expansion would be required within the next twenty years. Based on a long-term 3% growth rate, a current max day demand of 2.9 mgd and a 2008 expansion of the WTP to 4.2 mgd, the WTP will need to be expanded again in 2020.

4.5 Projected Buildout Water Treatment Facility Requirements (USA Buildout)

Currently, the 14.4 cfs (9.3 mgd) carrying capacity of the SWSP limits the throughput of the Fort Lupton/Hudson WTP. Assuming a long-term throughput of 0.8 MGD per filter, and including one filter in reserve, the facility will ultimately need 13 micro-filters.