WATER STORAGE AND WATER SUPPLY STUDY

MARCH 2012

HDR

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1 Executive Summary

Kansas City's water supply contract with Raymore will expire in the year 2021. The contract allows for Raymore and Kansas City to negotiate new limits and to develop a new contract based upon the mutually agreeable limits. Raymore requested that HDR evaluate Raymore's water supply options and make a recommendation on procuring an additional wholesale water supply allocation. A second task, a follow up on the first, was to evaluate the cost of ground storage and a pump station versus elevated storage as water storage options to meet peak hour demands.

1.1 Water Supply Options

HDR re-evaluated the population and water projections provided in Raymore's 2009 revised Water Master Plan report. We examined the report projections, historical water usage and current trends. Based on this review a revised population and corresponding water demand projections were developed. HDR's projected water demands indicate that Raymore will need between 2.3 and 3.45-million gallons per day (MGD) for an average day in the year 2032. To meet a maximum demand day, Raymore will need between 5.1 and 8.97-MGD. The contract with Kansas City limits Raymore to 3-MGD per day from Kansas City. The revised projections indicate Raymore will exceed the contract limits in the next two years during a maximum day event and will exceed the contract limits during summer months in 2017. HDR recommends the City obtain an additional 6.0-MGD of water supply to meet the City's year 2032 maximum day water demands. Table 1-1 presents the estimated population growth and water use over the next 20-years.

Table 1-1, Population and Water Demand Projections

Year	Population	Average Day Demand (MGD)	Maximum Day Demand (MGD)
2010	19,206	1.26	3.28
2012	20,642	1.52	3.95
2017	24,176	2.38	6.19
2022	27,604	2.76	7.18
2027	31,060	3.11	8.08
2032	34,519	3.45	8.97

Several water supply options were considered to meet the City of Raymore's additional need of 6.0-MGD as a source of drinking water. The options considered include:

- Water from a reservoir
- Well water
- Independence, Missouri, Water Department
- Harrisonville, Missouri, Water Department
- Public Water Supply District No. 7 of Cass County, Missouri
- Kansas City, Missouri, Water Services Department
- Tri-County Water Authority, Independence, Missouri
- WaterOne of Johnson County, Kansas

A reservoir and well water supplies were not extensively evaluated because they require long transmission mains, construction of treatment facilities and pumping stations, which would include a high capital investment. They were therefore eliminated from further consideration

Independence, Harrisonville, and Public Water Supply No. 7, cannot provide sufficient capacity to meet Raymore's water demand, and were not considered further.

Each of the remaining three utilities; Kansas City, Tri-County, and WaterOne, currently provide water to municipalities or water districts outside of their corporate boundaries, has some capacity available, and are willing to supply additional water to Raymore. None of the providers are able to provide the additional 6-MGD immediately. Kansas City is the only provider able to supply an additional 1-MG immediately. Connection to WaterOne or Tri-County will require construction of new facilities. Each of these providers was evaluated further as a potential wholesale water provider. The evaluation and recommended plan of action came down to cost of water provided.

Given the City's high growth rate over the last ten years as well as future population projections, HDR recommends that the City begin negotiations on a new contract for total water supply capacity to supply a maximum day demand of 9-MGD. This can be in the form of a single source for delivery or a dual source. A dual source of supply is recommended because one supplier may have some unforeseen inability to deliver water.

Determining Raymore's recommended course of action going forward has been difficult due to changes in Kansas City's water rates and the actions of other water entities neighboring Raymore. At this time it appears The City of Belton will contract with WaterOne as an additional source of water supply. Public Water Supply District No.1 of Jackson County (Grandview) discussing a contract with Tri-County Water Authority.

Since providing Raymore with a draft of this report in June 2011, a Kansas City Star newspaper article appearing on July 28th of 2011, quoted City Manager Troy Schulte as saying water rates in Kansas City are expected to rise 10% annually to help Water Services pay for infrastructure improvements needed in their system. In January 2012, Kansas City announced a rate increase of 12% beginning in May. The Kansas City Star article and Kansas City's letter announcing the rate increase this year are included in Appendix B.

Raymore's existing water rate per 1,000-gallons from Kansas City is approximately $2.78, when meter fees and re-pumping costs are included. A 12% rate increase will increase the price to purchase water from Kansas City to $3.11 per 1,000-gallons. The rate increase planned for 2013 is expected to be another 10%. For the purposes of this report the rate increases expected over the following 9-years is 8% and the final 10-years of the 20-year study period will be 3%.

In conversations with Kansas City, Raymore may need to construct a new pipe line to Harrisonville's unused KCMO connection, to obtain additional water from Kansas City; the debt for the water line and new connection to supply an additional 6-MGD will add another $1.01 per 1,000-gallons.

The estimated cost for Raymore to connect to Water One and obtain an additional 6-MGD will require Raymore to pay a system development charge estimated to be $16.8-million and expend an estimated $10.3-million for pipe and connection costs. Water One's water rate is currently $2.53/1,000-gallons. Because of the estimated up front costs Water One was not evaluated further.

The proposed rate from Tri-County Water Authority for Raymore to receive an additional 6-MGD is $5.44 per thousand for the first ten years and $5.94 for the second ten years of a 20-year expansion

program. After 20-years the TCWA rate would drop to a commodity charge or approximately $3.16-per thousand.

Figure 1-1 is a graphical representation of Raymore's monthly water usage (left scale) and estimated costs per 1,000 gallons (right scale) over the next 20 years.

Figure 1-1, Monthly Water Demand Projections and Cost per 1,000-Gallons

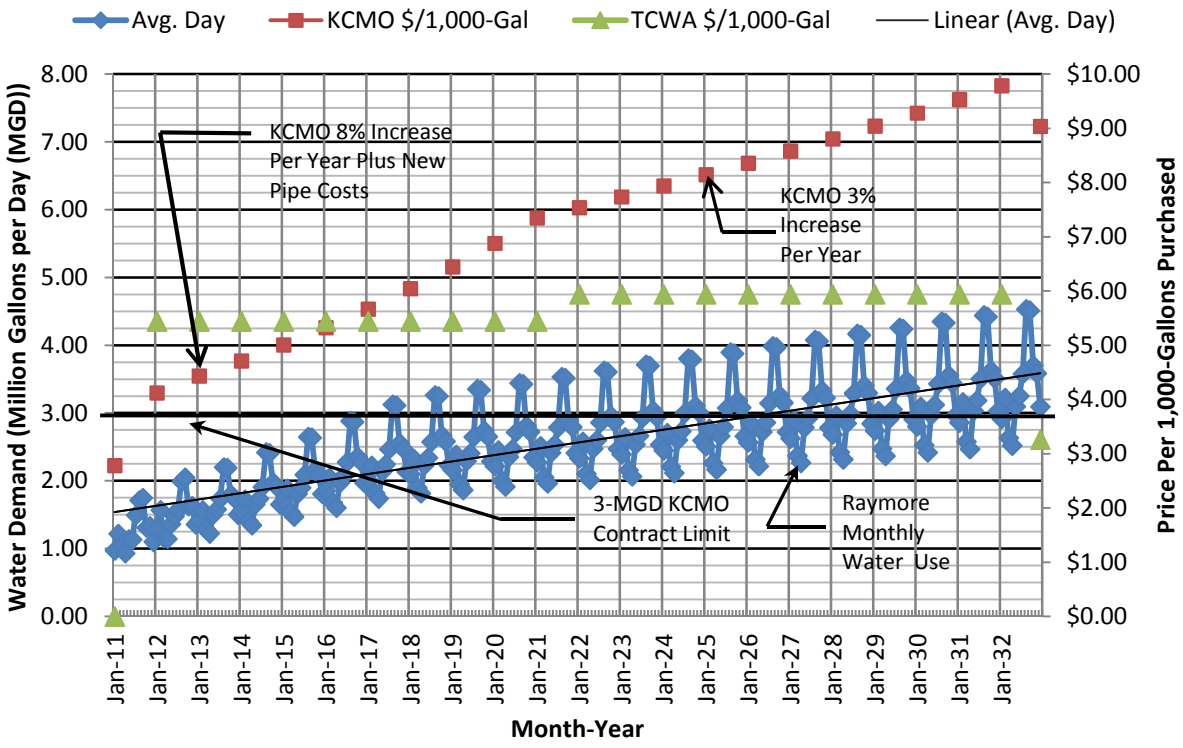


Figure 1-1, shows Raymore will exceed current Kansas City contractual limits of 3-MGD in the summer of year 2017. The yearly average flow is estimated to be 1.5-MGD in 2012 and 3.5-MGD in 2032. Maximum day flows during the summer months are expected to reach 9-MGD in the year 2032 and approximately 4-MGD this summer.

Kansas City increased rates 12% in 2011 and 2012 and are expected to increase rates 10% in 2013. After 2013 rates are estimated to increase 8% each year for 9-years with 3% increases after year 2021. The estimated cost for purchasing water from Kansas City in 2012 is $3.11 per thousand gallons. Assuming Raymore constructs a water main to the Harrisonville connection the estimated cost assuming a 20-year pay back would add $1.01 per year to the price of Kansas City Water. After 20-years when the cost of the new main to the Harrisonville connection is paid off, the price of water is estimated to be $8.87 per thousand gallons.

Figure 1-1, shows the estimated cost of purchasing water from Tri-County Water Authority. The cost is estimated to be $5.44 per thousand gallons between 2012 and 2021 and $5.94 per thousand gallons between the years 2021 and 2032. After the improvements are paid off the cost of water

from Tri-County is estimated to drop to $3.26 per thousand gallons. The pricing information is preliminary and depends on the number of water districts that contract for water from Tri-County.

Figure 1-1 estimates the cost of water from Tri County Water Authority would be less expensive than purchasing water from Kansas City in the year 2017 assuming Raymore must construct the Harrisonville connection to obtain 6-MGD of additional water. If Raymore can meet its future water demands through their existing connections and does not need to construct a water main to the Harrisonville connection, then Tri-County becomes the least expensive option in the year 2020, assuming the price increases discussed above.

Based upon the expected change in the price of water from Kansas City and Raymore's desire for a dual source of supply, ***HDR recommends Raymore proceed with contracting with Tri-County Water Authority as a secondary source of water supply***. This option will give Raymore a second source of water in the event Kansas City has an emergency and cannot deliver water; and it will provide Raymore more of a voice in controlling the price of water. There will be additional costs in the short term for Raymore, but as can be seen in Table 1-1 after project loans are paid, the price of water would decrease.

1.2 Elevated Storage versus Ground Storage and Pump Station

The contract with the City of Kansas City requires Raymore to have a total system storage capacity of 2.06-MG, based upon year 2010 water demands. Raymore currently has 2.5-million gallons (MG) in elevated storage and 0.75-MG in ground storage for a total of 3.25-MG. It is expected that Raymore will need additional water storage in the year 2015, to comply with the current Kansas City contract. This equates to the average day water demand of 2.02-MGD, a maximum day water demand of 5.25-MGD and a population of 22,798.

The Missouri Department of Natural Resources (MDNR) *Design Guide for Community Water Systems* dated August 29, 2003, recommends a community have "sufficient capacity to provide minimum design needed fire flow for the length of fire duration and shall provide adequate storage to meet diurnal peak flow with fire flow being considered". The suggested fire flow storage based upon a population greater than 10,000 people is 3,500-gpm for 3-hours or 630,000-gallons. Generally storage of one average day with fire flow is recommended. With backup generators at the Kansas City facilities that provide water to Raymore and having two separate sources of supply reduce the odds of system failure. Too much storage can lead to water stagnation issues and thus MDNR has stated the primary concern for storage systems is "public health". The generally accepted guide for the amount of storage needed is an average day of storage plus fire flow. Using this standard; Raymore would need additional storage in the year 2021 or when Raymore's average day water demand reaches 2.70-MGD. Based upon the flow projections this corresponds to a population of 26,914.

Figure 1-2 is a graph of water storage requirements based upon Kansas City, Missouri's contractual requirements verses the MDNR *Design Guide for Community Water Systems* recommended requirements. The graph illustrates that additional storage is needed in the year 2015 and 2032 if the water demands projected in Figure 1-1 are accurate based upon Kansas City's contractual requirements.

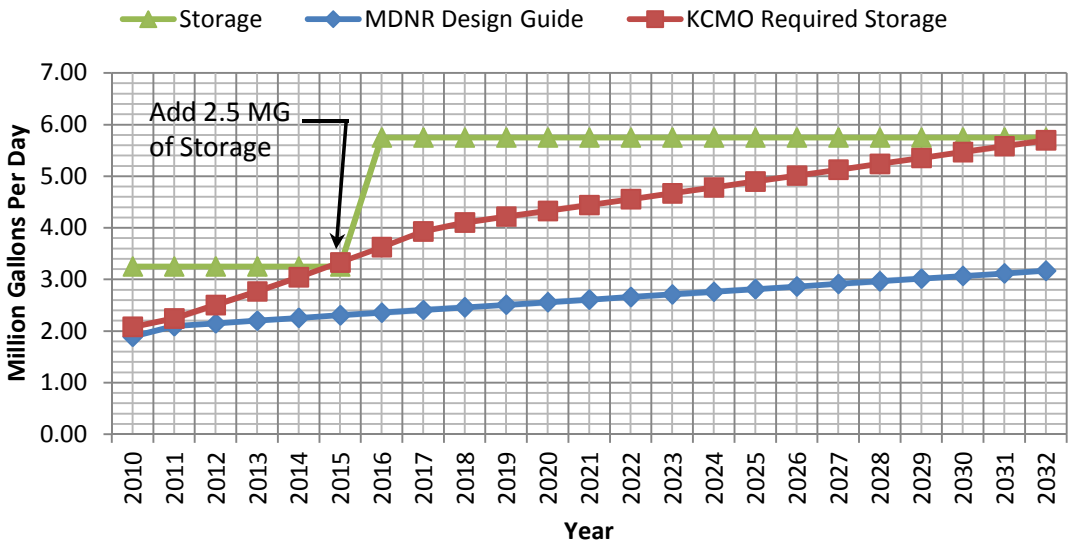


Figure 1-2, Water Storage Requirements

HDR evaluated the capital cost of each type of storage at the sites recommended in the updated 2009 Water Master Plan. Both capital cost and operational cost were compared and evaluated. The capital cost of a ground storage tank and pump station is less than an elevated storage tank. When operation and maintenance (O&M) costs were included in the evaluation, a booster pump station and ground storage tank is less expensive than an elevated storage tank during a 20-year time frame. If the time frame is expanded beyond 20-years, the elevated storage facility will become less expensive due to pump replacement and energy costs. If the supplier can meet Raymore's hydraulic pressure gradient, then an elevated storage tank will be the recommended option for Raymore.

Elevated storage is estimated to cost $6.9-million and a ground storage tank with pump station is estimated to cost $5.4-million. The decision to build ground storage and a pump station verses elevated storage will depend upon the hydraulic gradient that the supplier can provide, the location at which the water can be provided, and the price of steel and concrete at the time of construction.

It is recommended that Raymore plan for a new storage facility in the year 2015 if they remain with Kansas City or 2021 if they contract with Tri-County, depending upon population growth and the average day water demand. The choice of elevated or ground storage depends upon the source of supply. Obtaining additional water from Kansas City will require Raymore to construct ground storage and pumping facilities if they are required to obtain the additional water from the Harrisonville connection. Tri-County will meet Raymore's hydraulic grade for elevated storage, which has the least costs when O& M is considered. Raymore should reevaluate water demands yearly to determine if the storage requirements are being met and if the timing for additional storage is changing.

2 Background

The City of Raymore was one of Missouri's fastest growing cities in the last decade with a 72% increase in population according to US Census data. Raymore grew from 11,146 people in the year 2000 to 19,206 in the year 2010. With this growth came additional infrastructure needs for water, sewer, roads and City services. Population growth in Raymore slowed with changes in the economy in the years 2007 to 2009, but it did not stop, the City continued to add water meters through this time frame unlike a lot of surrounding communities. It is expected that population growth will continue, but at a slightly slower pace than it did in the last decade.

Raymore residents currently receive their water from the City of Kansas City, Missouri and continued growth in Raymore is dependent upon receiving additional water supply to meet demand. Raymore's existing contract with Kansas City, limits the volume of water Raymore can receive to 3.0-million gallons per day (MGD) with an additional 1-MGD available for emergencies.

Raymore's neighbor communities also receive water from Kansas City, Missouri. These communities have also expressed concerns about receiving additional supply from Kansas City. The City of Belton's water purchase agreement with Kansas City expired in 2010 and the City has been unable to negotiate a new agreement for additional water and is now working on a contract with Water One of Johnson County, Kansas. The City of Pleasant Hill reported they were unable to fill their storage facilities and obtain their contract amounts on a summer day in 2010. Kansas City explained to Pleasant Hill they had an emergency and needed to supply a nearby power plant with water from the same transmission main that supplies Pleasant Hill. Kansas City indicated the power plant had priority under the circumstances.

In the 1990's Kansas City limited water supply to Raymore, which in turn had to limit heavy water usage by it's customers by restricting the washing of cars and watering of lawns. It took time, but the City of Kansas City responded with improvements in their wholesale water supply system by constructing a 20-million gallon water storage and pumping facility in Lee's Summit, Missouri and new transmission mains. In 2009, the City of Raymore initiated negotiations to increase contractual limits with representatives of Kansas City Water Services Department but negotiations were unsuccessful.

Concerned by past difficulties negotiating an increase in the contractual volume of water from Kansas City, Raymore decided to evaluate their supply options. Raymore contracted with HDR Engineering, Inc., to develop a report evaluating Raymore's potential water supply options and estimated costs. The report was to also include an evaluation of elevated water storage versus ground storage and pumping costs, so the City has a screened and selected option when they begin developing additional peak day storage capacity.

3 Existing Water Demands and Facilities

3.1 Demands

In 2004, Raymore had a Water System Master Plan developed. The Master Plan projected future water demands based on estimated population growth. At that time the housing industry was booming all across the United States. The housing bubble burst when the economy slowed in 2007 and 2008, and the growth projections used in the 2004 Master Plan exceeded actual growth. The City had the water projections revised based on more conservative population growth projections. Table 3-1 lists the revised water demand projections from the 2009 evaluation.

Table 3-1, 2009 Water Demand Projections

		Average Day in MGD		
		Low	**Medium**	**High**
Year	**Population**	**Projection**	**Projection**	**Projection**
2010	19,321	2.05	2.05	2.46
2015	22,798	2.47	2.47	2.96
2020	26,224	2.88	2.88	3.46
2025	29,676	3.26	3.26	3.91
2030	33,137	3.64	3.64	4.37
		Maximum Day in MGD		
		Low	**Medium**	**High**
Year	**Population**	**Projection**	**Projection**	**Projection**
2010	19,321	6.15	5.33	7.38
2015	22,798	6.41	6.41	8.88
2020	26,224	7.49	8.64	10.37
2025	29,676	8.48	9.78	11.74
2030	33,137	9.47	10.92	13.11

Note: Projections taken from the Burn's & McDonnell Revised 2009 Master Plan Report

The "Low" and "Medium" projections used an estimated 2.76 people per metered connection and 300 gallons per metered connection day of water use to develop an average daily demand, which equate to 106 and 109 gallons per person per day of water use for the years 2010 to 2030, respectively. For the "High Projection" average day, the report uses 360 gallons per meter per day, which equates to 127 and 131 gallons per person per day for the years 2010 to 2030. The report states the numbers used are higher than averages because part of the historical data was during a period of voluntary rationing, limited data, and rainy periods. The 2009 report assumption is that water use per person will continue to rise.

Historical water use data for Raymore obtained from records and previous reports is presented in Table 3-2.

Table 3-2, Historical Water Use Data

Year	Population	Water Meters	People/ Meter	gpcd	gpmd	Average Day	Maximum Day	MD/AD
2000	11,265	4,068	2.77	80.78	223	0.91	1.81	1.99
2001	11,523	4,341	2.65	77.24	204	0.89	2.19	2.46
2002	13,071	4,753	2.75	71.15	196	0.93	1.97	2.12
2003	13,814	5,193	2.66	91.21	242	1.26	3.29	2.61
2004	14,333	Data Not Available						
2005	15,270							
2006	16,306	6,433	2.53	74.24	188	1.21		
2007	17,178	6,623	2.59	70.47	183	1.25		
2008	17,703	6,751	2.62	68.38	179	1.22	2.44	2.00
2009	18,594	6,740	2.76	65.11	180	1.17		
2010	19,206	6,808	2.82	63.03	178	1.26		
Averages			2.68	73.51	197			2.24
Historic Per WSMP 2004				110.00	296			2.60
Used in the WSMP 2009			2.76	130.00	300			3.00

Table Abbreviations and Notes;

gpcd = gallons per capita per day

gpmd = gallons per meter per day

Average Day = Annual Water Used divided by Number of Days in Year
Maximum Day = Maximum Day water usaged obtained from 2004 Master Plan by Burns & McDonald and 2009 Letter.

MD/AD = Is the Maximum Day Demand divided by the Average Day Demand
WSMP 2004 = 2004 Water System Master Plan, WSMP 2009 Revised Water System Master Plan

Calculations performed by HDR on water records indicate the average gallons used per person between the years 2006 and 2010 is 68.25-gpcd and 73.51-gpcd between 2000 and 2010. The historical data also shows the average gallons used per meter connection per day over the ten year period was 197-gallons. Using the historical data from the last five years, the following modified water use projections were developed in Table 3-3.

Table 3-3, Water Use Projections Based Upon Historical Average Data

Year	Population	Water Meters	People/ Meter	gpcd	gpmd	Average Day	Maximum Day	MD/AD
2015	22,798	8,507	2.68	68.25	183	1.56	3.49	2.24
2020	26,224	9,785	2.68	68.25	183	1.79	4.01	2.24
2025	29,676	11,073	2.68	68.25	183	2.03	4.54	2.24
2030	33,137	12,360	2.68	68.25	183	2.26	5.07	2.24

Using historical averages, the water demand projections indicate the City will need 2.3-million gallons per day on the average day in the year 2030 and 5.1-million gallons per day on the maximum day in the year 2030. The 2009 Revised Water Master Plan "Low Projection" indicates a year 2030 average day demand of 3.6-million gallons per day, and 9.5-million gallons per day on the maximum day.

WaterOne has also noticed reduced water usage per metered connection over the last decade consistent with Raymore's historical water use data. WaterOne reported a decrease of 41-gallons per meter per day. Between 1994 and 2003 the average meter use was 194 gallons per day. Since 2003, the average water use per meter per day has decreased so that in 2010 the average water use is 154-gallons per meter day.

The May 2011 issue of Opflow by the American Water Works Association (located in Appendix C, Opflow Magazine Article) states, recent data shows the country as a whole is reducing water usage according to a 2010 Water Research Foundation Report, "North American Water Usage Trends Since 1992". The magazine article reports an average 1.4 percent decrease in water use per year per customer since 2001. The articles states this is due to "high-efficiency plumbing fixtures; a decline in persons per household in many locations, utility led water efficiency programs …increased conservation practices and awareness; economic conditions; and price elasticity." Regulatory standards mandated decreased water usage for toilets, faucets and shower fixtures in 1994, and clothes washers and dish washers beginning in 2010. The magazine article states "All other factors being equal, typical residents living in a home built in 2011 would use 35 percent less water for indoor purposes than a…home built before 1994."

The data in Table 3-2, show the trend for water use in Raymore per person dropped over the last decade; from 80-gallons per capita day (gpcd) to 63-gpcd. Prior to developing recommendations for future water use standard guidelines need to be considered. The Missouri Department of Natural Resources (MDNR) Design Guide recommends 100-gpcd is to be used for facilities planning purposes; therefore 100-gpcd was used as a minimum per capita water rate in the demand projections in Table 3-4. Table 3-4 presents the proposed water use projections to be used for planning purposes according to MDNR standard guidelines.

Table 3-4, Proposed Water Use Projections for New Water Purchase Agreements

Year	Population	Water Meters	People/ Meter	gpcd	gpmd	Avg Day	Max Day	MD/ AD	Peak Hour
2015	22,798	8,507	2.68	100	268	2.28	5.93	2.60	8.89
2020	26,224	9,785	2.68	100	268	2.62	6.82	2.60	10.23
2025	29,676	11,073	2.68	100	268	2.97	7.72	2.60	11.57
2030	33,137	12,364	2.68	100	268	3.31	8.62	2.60	12.92

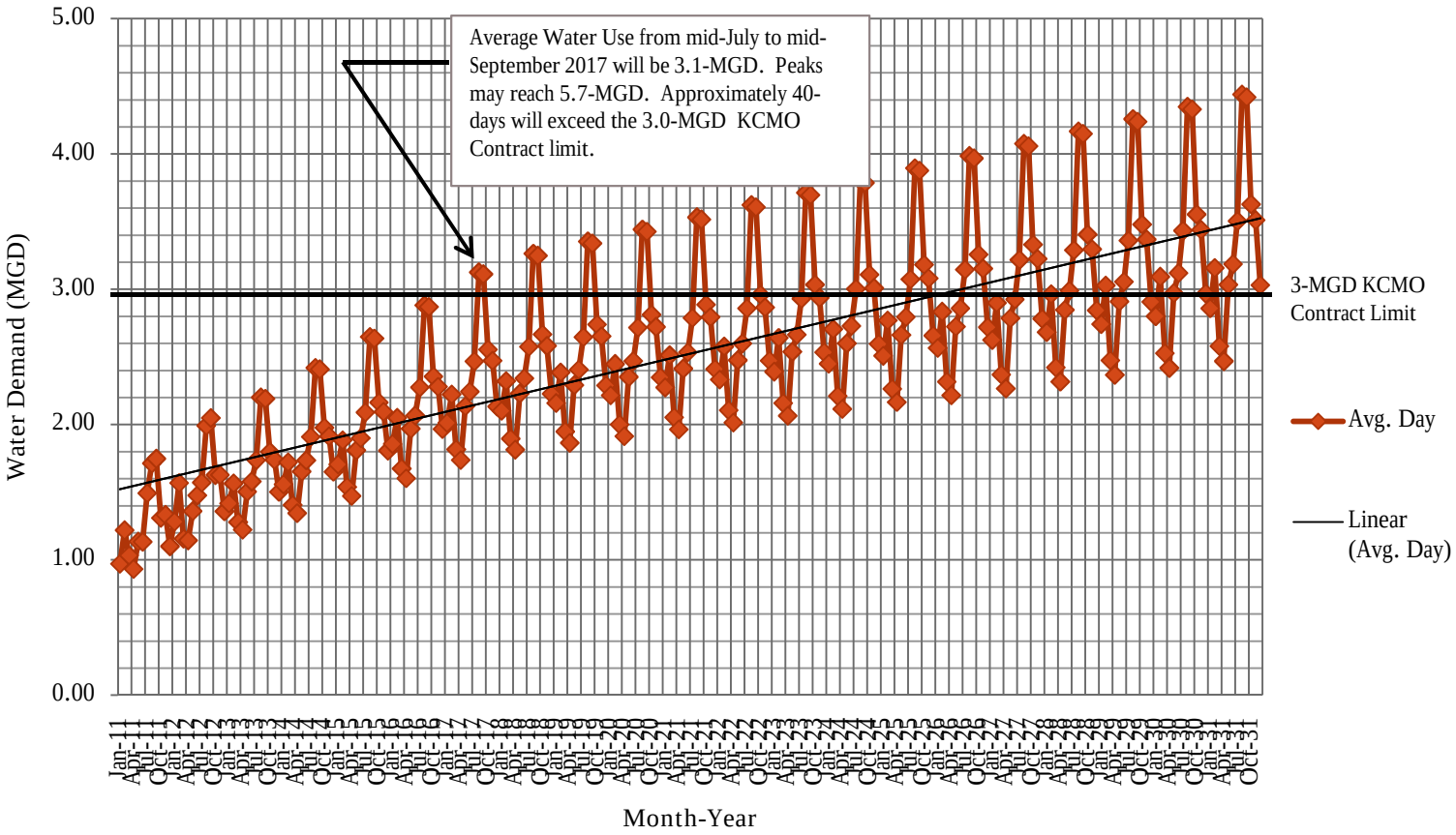
The projections presented in Table 3-4 use the historical average of people per meter and the historical maximum day to average day ratio per the 2009 Water Master Plan. These projections give an average daily water demand of 3.3-million gallons be needed in the year 2030. The maximum day demand in 2030 will equal 8.62-MGD.

Figure 3-1 is a graphical representation of the proposed monthly average water use projections over the next 20-years. The figure and attached table represent a compilation of the existing water use projections and the Missouri Department of Natural Resources planning projections as agreed to with City staff.

The graph indicates the City will exceed the contractual average day water limits in the year 2017. The months of July, August, and September will exceed the contractual limit of 3.0-MGD. The yearly average day water usage will be exceeded in the year 2026. Peak daily flows in the year 2017 are estimated to reach 5.7-MGD.

The graph and chart indicates Raymore will need to contract for an additional supply of 5.79-MGD to meet maximum day demands in the year 2031.

Figure 3-1
Water Demand Projection



YearlyWater Use

Year	Avg. Day	Max. Day
2010	1.31	3.41
2011	1.36	3.54
2012	1.52	3.95
2013	1.68	4.36
2014	1.84	4.79
2015	2.02	5.25
2016	2.20	5.71
2017	2.38	6.19
2018	2.49	6.46
2019	2.56	6.64
2020	2.62	6.82
2021	2.69	7.00
2022	2.76	7.18
2023	2.83	7.36
2024	2.90	7.54
2025	2.97	7.72
2026	3.04	7.90
2027	3.11	8.08
2028	3.18	8.26
2029	3.24	8.44
2030	3.31	8.62
2031	3.38	8.79

Additional storage and or pumping facilities will need to be designed to deliver the peak hour flow and be capable of delivering the maximum daily flow over several days in summer months. This is discussed further in Section 3.2.

These projections are less conservative than the 2009 Water Master Plan numbers, but they better reflect the current historical trend of water conservation and Raymore's reduction in per capita water use. The City will need to monitor water use and compare actual versus projected water usage to adjust the projections over coming years.

3.2 Existing Facilities

Raymore's current water facilities are listed in Table 3-5

Table 3-5, Existing Facilities and Capacities

Facility	Location	Capacity
Ground Storage Tank	155th & Kentucky Road P.S.	750,000- gallons
Elevated Storage Tank	W. Long Blvd., North of Mott Dr.	500,000-gallons
Elevated Storage Tank	Missouri Route J, South of Hubach Hill Road	2,000,000-gallons
Pump Station (3-pumps)	155th & Kentucky Road P.S.	1,400-gpm @ 248 ft. of head
Piping (2 to 24 inch diameter)	Distribution System	90-miles of pipe

Raymore currently has 3.25-million gallons of water storage. According to the 2009 Water Master Plan, the City's fire flow storage requirement to meet the maximum fire demand of the Insurance Services Office (ISO) is 630,000-gallons. This equates to providing a fire flow of 3,500-gallons per minute (gpm) for 3-hours with only elevated storage.

Raymore's contract with the City of Kansas City, Missouri requires Raymore to maintain "Equalization Storage" equal to 1/4th of a maximum day's water use and "Emergency Storage" equal to an average day's water use. Based upon water use in 2010, Raymore is required to have 1.26-million gallons for Emergency Storage and 0.82-million gallons for Equalization Storage or a total of 2.08-million gallons.

Using the recommended water use projections in Figure 3-1; Raymore will need a new water storage facility in 2015 or when the population reaches 22,798 to meet Kansas City's minimum contractual requirements.

The Missouri Department of Natural Resources (MDNR) *Design Guide for Community Water Systems* dated August 29, 2003, recommends a community have "sufficient capacity to provide minimum design needed fire flow for the length of fire duration and shall provide adequate storage to meet diurnal peak flow with fire flow being considered". The suggested fire flow storage based upon a population greater than 10,000 people is 3,500-gpm for 3-hours or 630,000-gallons. Generally storage of one average day with fire flow is recommended. With backup generators at the Kansas City facilities that provide water to Raymore, and having two separate sources of supply, reduce the odds of system failure. Too much storage can lead to water stagnation issues and thus MDNR has stated the primary concern for storage systems is public health. The generally accepted guide for the amount of storage needed is an average day of storage and fire flow. With multiple sources of supply, the minimum storage requirement is an average day's water demand plus fire flow. Using this standard Raymore would need additional storage in the year 2021 or when Raymore's population reaches 26,914.

4 Current Water Contract with Kansas City

The City of Raymore has purchased water from Kansas City, Missouri since the 1970's. In May of 2001, Raymore adopted City Ordinance 21030 allowing the Mayor to sign an agreement with Kansas City, Missouri to increase contractual water limits, construct a new water tower, and install a new water meter connection on the east side of the City. Table 4-1 lists the contractual obligations.

Table 4-1, Contractual Capacity

Facilities	Capacity	Raymore's Pro-Rata Share	Raymore's Reserved Capacity
Water Main	9-MGD	22.22%	2.0-MGD
Elevated Tank	1.5-MG – Revised to 2.5-MG	66.67%	1.0 MG – Revised to 2.0 MG
Pump Station	20-MG	10%	2.0-MG

Table 4-2 lists the points of delivery and quantities to be delivered per the water purchase agreement.

Table 4-2, Contractual Delivery Points and Quantities

Delivery Point	**Maximum Quantity**	**Maximum Instantaneous Rate**	**Minimum Pressure**
Kentucky Road & 155th St.	1.0-MGD	1.75 MGD	50-psi
Lucy Webb Road & Missouri Route J	2.0-MGD with 1.0-MGD for Emergency	5.0-MGD	Same as Overflow of Tank

Other important points in the Agreement include the following:

- Agreement Date is June 11, 2001
- The term of the contract is 20-years
- Agreement Expires on June 1, 2021
- Maximum rate of consumption is 3.0-million gallons per day, with an extra 1-million gallons for emergencies.
- Kansas City, Missouri owns the new tank, pump station, and water main.
- Kansas City's "obligation to deliver water to BUYER (Raymore) shall not exceed the capacity of the facilities of CITY (Kansas City) at any point of purchase…"
- Kansas City may proportion the distribution of water among its customers during any water shortage.
- Raymore is responsible for constructing and maintaining emergency storage equal to an "average days consumption". 1.26-MGD in 2010 according to records.
- Raymore must maintain 1/4th of a maximum days consumption for equalization storage. Estimated to be 0.82-MGD in 2010.
- Raymore's water rate category classification is 'Suburban Meter Rate/Wholesale Customer/Restricted.
- Raymore may terminate the agreement after 5-years, with written notification to the Director of Kansas City, Missouri Water Services. Any remaining obligation of the contract must be paid within 180-days.

- Kansas City may terminate the contract for violation of paragraphs 1-9 of the agreement 60-days after giving written notice to the City of Raymore if the violation is not corrected to the satisfaction of Kansas City.
- Upon "exceedance" of the contract maximums, Raymore and Kansas City "will negotiate with the intent of entering into a new Water Purchase Agreement."
- Raymore must provide Kansas City with "a one (1) year prior written notice before connecting its distribution system to any source other than Kansas City". The classification will change from "soul source" to "dual source" and the water rate (if connecting to another source) would change to Suburban Meter Rate/Wholesale Customer/ Unrestricted with minimum purchase requirements equal to an average day's consumption, based upon the previous 12-months.

According to the contract Raymore must maintain a minimum amount of storage capacity to comply with the KCMO water purchase agreement that is based upon fluctuating demands. Currently, Raymore has 3.25-million gallons in storage capacity. Using historical water use projections in Figure 3-1, Raymore would not need to add storage until the average day demand reaches 2.02-MGD and the maximum day demand reaches 5.25- MGD which is projected to occur in the year 2015, or when the population reaches 22,798.

Another concern is the maximum delivery rate of 3-MGD. In 2010, the City used 1.26-million gallons per day on average, based on water records provided by the City. The calculated maximum day demand for 2010, indicate the City used more than the contract limit of 3-million gallons per day. Actual maximum day water use data is unavailable at this time. Using a 2.60 maximum day to average day demand ratio the City would have used approximately 3.3-million gallons per day on several occasions in the last three or four years, thus exceeding the limits in the Kansas City Water Agreement.

Based on this information, the conclusion from this review is that the City of Raymore needs to increase their contractual limits with Kansas City or another provider, to receive the water needed to meet Raymore's growing demand. We would also recommend that the City determine their actual maximum day demand to obtain an actual peaking factor for future projections. This maybe accomplished with modifications of the City's existing supervisory control and data acquisition (SCADA) system. HDR discussed the possibility of obtaining this data with Micro-Comm, the City's SCADA provider. Micro-Comm representatives stated they believed Raymore could receive the data with some improvements in the existing facilities but the Micro-Comm representatives would need to visit the sites.

5 Water Supply Sources

Several water supply options should be considered for the City of Raymore's source of drinking water. The options considered include:

- Water from Reservoir
- Well Water
- Water from Kansas City, Missouri
- Water from Water One of Johnson County, Kansas
- Water from Tri-County Water Authority, Independence, Missouri
- Water from Independence, Missouri

5.1 Reservoirs

The amount of water storage needed by Raymore means the size of reservoir would be significant. As an example, Harrisonville Lake supplies the City of Harrisonville with drinking water. The Missouri Department of Conservation lists the size of the lake as 52 acres. The lake provides water to a 2.6-million gallon per day treatment plant. Raymore would need a similar size reservoir as a minimum.

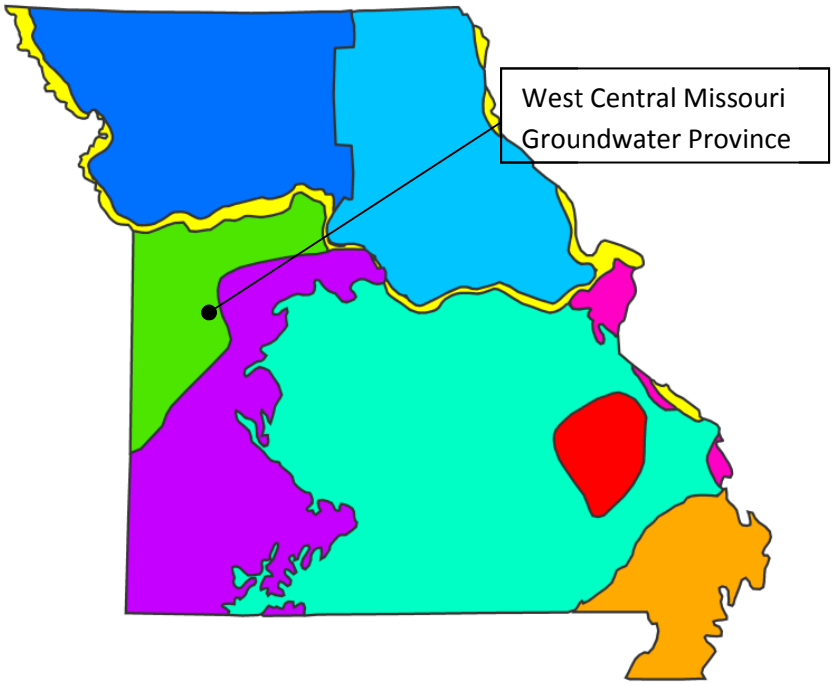
To construct a reservoir would require permits from the Corps of Engineers and the Missouri Dam Reservoir Safety council. The owner of the dam would need to consider insurance requirements and the safety of downstream land owners in the event the dam would rupture. Obtaining water from a new manmade lake was ruled out due to the extreme capital costs and timing required to construct a man made reservoir.

Another option briefly considered was obtaining water from the Harry S. Truman Reservoir near Clinton, Missouri. This option would also require construction of a treatment plant or partnering with an existing entity and expanding an existing treatment plant. Approximately 60 miles of pipe would be needed along with easements to deliver the water to Raymore. The capital cost to construct the pipe needed to provide Raymore with 7-million gallons per day would be approximately $50-million.

Constructing a reservoir or obtaining water from Truman Lake would require purchase of land, construction of a treatment plant, construction of long pipelines, obtaining easements, and obtaining approval from regulators such as Corps of Engineers. Raymore would need to find a continually flowing stream and a large amount of land in which to construct a reservoir. The process would take several years and a large sum of money making it impractical for further consideration.

5.2 Well Water

The drilling of a well or wells in the State of Missouri is regulated by The Missouri Department of Natural Resources (MDNR). The MDNR Water Resources Center website has an interactive map that discusses Missouri's ground water and aquifer characteristics. A copy of this map is located in Figure 5-1.



and Aquifer

The City of Raymore is situated in an area identified by the site as the "West Central Missouri Groundwater Province". "Water with less than 1,000-mg/L total dissolved solids is generally considered fresh water while that containing between 1,000-mg/L and 10,000mg/L total dissolved solids is termed brackish." Water in the West Central Missouri Groundwater Province is considered brackish and too mineralized for domestic use.

In addition, shallow wells around Raymore will barely yield enough water to supply a single residence and will be of marginal quality.

Because drilling water wells in or around the City of Raymore will not provide sufficient quantity or quality of water to serve a significant portion of the City's population for potable use, this option was not evaluated.

5.3 Contracting for Water

The major water producers that have sufficient water resources to contractually supply the City of Raymore with water are:

- Kansas City, Missouri, Water Services Department
- Tri-County Water Authority, Independence, Missouri
- WaterOne of Johnson County, Kansas

Water suppliers in the area that provide wholesale water are:

- Independence, Missouri, Water Department
- Harrisonville, Missouri, Water Department
- Public Water Supply District No. 7 of Cass County, Missouri
- Kansas City, Missouri, Water Services Department
- Tri-County Water Authority, Independence, Missouri

- WaterOne of Johnson County, Kansas

The City of Independence, like Kansas City, WaterOne, and Tri-County, obtains its water from the Missouri River and treats it in the same manner as the other three. Like Kansas City, Independence provides wholesale water to the City's of Blue Springs and Lee's Summit. Independence also supplies water to public water supply districts and municipalities along I-70 into Lafayette County, Missouri.

In discussions with Dan Montgomery, Independence Water Department Director, we were informed the City of Independence is not looking to expand wholesale operations beyond current customers and capacities. The City is improving its internal infrastructure and has informed other customers like Blue Springs, Grain Valley, and Lee's Summit that they need to look elsewhere for future supplies. Blue Springs and Grain Valley joined Tri-County Water Authority when they were unable to obtain additional supplies from Independence or Kansas City in 2004.

Neither Harrisonville nor PWSD No. 7 has the capacity to supply Raymore with water. Both communities obtain their water from streams and impound the water in a reservoir. The Harrisonville Treatment Plant has a design capacity of 2.6-million gallons per day. PWSD No 7 treatment plant has a 1-million gallon per day treatment capacity. Both communities are evaluating their options for future water supplies and alternative sources of supply or emergency interconnects.

The first three water producers listed above cannot provide sufficient capacity to meet Raymore's water demand, and were not considered further. Each of the remaining three utilities; Kansas City, Tri-County, and WaterOne obtains water from alluvial wells and/or direct water intakes from the Missouri River. Each operates a water treatment plant with similar processes and final disinfection methods. Each utility is willing to, or currently does provide water to municipalities or water districts outside of their corporate boundaries and has treatment capacity to supply additional water to Raymore. Each of these providers will be evaluated further in the following sections.

5.4 Kansas City

Raymore currently receives water from the City of Kansas City, Missouri. Two separate connections provide water to the City. The locations for receiving water from the City of Kansas City, Missouri are Kentucky Road and East 155th Street, and East Lucy Webb Road and Lincoln Road or J-Highway.

5.4.1 155th and Kentucky Road Meter

The meter connection at 155th Street and Kentucky Road is fed from an 8-inch diameter water main and is operated by Kansas City, Missouri. This connection is limited to 45-psi pressure and a maximum flow of 923-gallons per minute or 1-million gallons per day. Water for the connection comes from a transmission main installed along 150-Highway and the Prospect Pumping Station at 131st Street and Prospect Avenue.

5.4.2 Lucy Webb and Lincoln Road Meter

The meter connection at Lucy Webb Road and Lincoln Road is fed from a 24-inch water main. This meter connection was designed to meet Raymore's hydraulic grade of 1,240-feet above sea level or 80-pounds per square inch. Control valves in the meter vault limit the maximum quantity of water that can be received at this point to 1,400-gallons per minute or 2-MGD.
The 24-inch main and meter receives water from the South Terminal Pump Station operated by Kansas City, Missouri and located at the intersection of SW Ward Road and SW Persels Road in

Lee's Summit, Missouri. The 24-inch water main has a capacity of 9-MGD, which is sufficient to supply Raymore with its water demands for the next 20-years; Kansas City however has committed all of its available water from the South Terminal to its other customers. Kansas City is currently constructing improvements to one segment of the transmission main that supplies water to the South Terminal Pump Station. Unfortunately, improvements to other portions of the transmission main are not under design and it maybe several years before improvements are made that would increase Kansas City's delivery capacity to the South Terminal.

5.4.3 Harrisonville Connection

In previous meetings with Kansas City Water Services, Raymore was informed they could construct a new pipe to the connection on BB-Highway that was previously dedicated to the City of Harrisonville. This connection point is on the Jackson-Cass County Transmission main on BB-Highway at approximately 172nd Street. See Appendix F, Kansas City Harrisonville Connection Map for the location of the proposed connection. The Jackson-Cass Transmission main constructed by Kansas City in the mid 1990's supplies water to Pleasant Hill and the MEP Aries Power Plant just west of Pleasant Hill.

The Harrisonville connection point was originally installed for Tri-County Water Authority in the late 1990's, which has a pump station and elevated storage tank one mile south of the connection point. Tri-County was unable to finalize a contract with Kansas City and so the connection point was passed on to Harrisonville.

The Harrisonville connection point also receives water from the South Terminal Pump Station. Pleasant Hill has informed us they could not receive their contractual limits from Kansas City in the past due to operation of the Aries Power Plant.

According to information obtained from Mr. Ted Martin, Harrisonville City Engineer, Harrisonville is paying Kansas City a fee for this connection point. The fee is reserving 5-million gallons per day for the City of Harrisonville. The City began design of construction plans to build a water main to the Kansas City connection point on BB-Highway. Midway through design, a newly elected city council voted to stop the design work due to budgetary issues. Mr. Martin stated the design is still on hold. When asked if Harrisonville may sell their connection point or a share of the 5-million gallons, Mr. Martin stated he could not speak for the council but the staff recommendation would be to keep the connection.

To connect to the Jackson-Cass Transmission main at the Harrisonville connection, Raymore would need to formally petition the City of Harrisonville for a portion of their Kansas City water allocation and construct a water line, metering facilities, and a pump station to receive the water.

5.4.4 Available Capacity

In meetings held between the Suburban Water Coalition and Terry Leeds the Acting Water Services Department Director for Kansas City; Mr. Leeds stated the Water Services Department needs to update their 1998 Master Plan before they could determine when more water would be available to the southern suburbs. He indicated it will take about two years before a new master plan is completed. Timing of development would depend on the capital improvement prioritization and funding. Work on the water master plan is to begin in 2012 according to Mr. Sean Hennessy, Chief Financial Officer for Kansas City Water Services.

Our understanding is that Kansas City currently lacks transmission main capacity between the Water Treatment Plant and the South Terminal Water Station. In recent discussions Kansas City

has informed HDR, Belton and other entities that they have about 1-million gallons of additional water available at the south terminal. It may take 5 to 10 years before Kansas City can increase the capacity to provide Raymore an additional 5-million gallons of water and this is dependent upon the completion of the new water master plan.

5.4.5 Kansas City Contract

The City of Raymore entered into an agreement with Kansas City to obtain water under City Ordinance 21030. The water purchase agreement was approved on June 11, 2001 and expires on June 1, 2011. The agreement has the following key conditions:

- Maximum Consumption Rate 3.0-MGD
- Maximum Quantity Delivered at Kentucky Road and 115th Street 1.0-MGD
- Maximum Instantaneous Delivery Rate at Kentucky Road 1.33-MGD
- Maximum Quantity Delivered at Lucy Webb Road 2.0-MGD
- Additional Emergency Only Quantity to be delivered at Lucy Webb 1.0-MGD
- Maximum Instantaneous Delivery Rate at Lucy Webb Road 5.0-MGD

- Raymore's Minimum Storage Requirements
  - Average Days Consumption for Emergency Storage 1.25-MGD
  - 1/4th of the Maximum Days Consumption for Equalization Storage 0.81-MGD
  - Total based upon 2010 Numbers 2.06-MGD

- Upon "Quantity Exceedance" parties will negotiate a new Water Purchase Agreement

- Currently Sole Source Water Purchase from KCMO – Raymore must provide
  - 1-Year Written Notice prior to connecting to another supplier of water
  - Water Rate would change to **Unrestricted** Classification with a minimum purchase requirement

- Water Rate Classification is Suburban Meter Rate/Wholesale Customer/**Restricted**
  - Current "Restricted Rate" $1.69/100-cubic feet or $2.26/1,000-gallons
  - 1st Re-pump Rate $0.16/100-cubic feet or $0.21/1,000-gallons
  - 2nd Re-pump Rate $0.23/100-cubic feet or $0.31/1,000-gallons
  - Current "Unrestricted Rate" $1.74/100-cubic feet or $2.33/1,000-gallons

In February 2012, Kansas City announced increases of 12% beginning in May 2012. The increases are as follows:

  - Current "Restricted Rate" $1.89/100-cubic feet or $2.53/1,000-gallons
  - 1st Re-pump Rate $0.18/100-cubic feet or $0.24/1,000-gallons
  - 2nd Re-pump Rate $0.25/100-cubic feet or $0.33/1,000-gallons
  - Current "Unrestricted Rate" $1.95/100-cubic feet or $2.61/1,000-gallons

Raymore is considered a "Restricted" customer. If Raymore chooses to connect to another water provider, they would become an "Unrestricted" customer of Kansas City and pay an additional seven cents more per thousand gallons used.

5.4.6 Summary of Contracting with Kansas City

Kansas City needs to make transmission main improvements before they can provide additional water to the southern wholesale water customers. The improvements are not currently planned and it will take approximately 5 to 10 years before Raymore could receive additional supply capacity from Kansas City. The existing 24-inch water main serving the Lucy Webb meter and the Raymore elevated water storage tank south of Hubach Hill Road has capacity for 9-million gallons per day. This portion of the Kansas City water transmission system does not need to be upsized.

Kansas City informed HDR after our draft report was delivered to Raymore, that additional capacity is available at the South Terminal. Raymore would need to send a letter to the Water Services Acting Director requesting an increase in the contractual limits. The actual quantity that is available from Kansas City is less than Raymore's projected 20-year demands.

5.5 WaterOne of Johnson County, Kansas

WaterOne operates two water treatment plants, has 3,000 miles of transmission and distribution mains and provides water to 16 cities and 135,000 customers in Johnson County, Kansas. WaterOne's treatment capacity is 200-million gallons per day. WaterOne is governed by a seven member board, elected at large, to serve four-year teams.

5.5.1 Availability of Water

The Board of Directors for WaterOne of Johnson County, Kansas approved reduced rates for wholesale customers in April of 2011, in an effort to attract potential wholesale customers. The water is available due to decreasing water demands and excess capacity according to Ron Appletoft the Director of Finance. The decision by the WaterOne Board was prompted by inquiries by HDR on the behalf of Raymore, and by DRG on the behalf of the City of Belton.

At a March 29, 2011 board meeting, Mr. Appletoft stated the reason staff was recommending a decrease in rates was because WaterOne had excess capacity. The base consumption rate per customer had decreased from 194 gallons per day per customer between 1994 and 2003 to 154 gallons per day in 2010, and through the first part of 2011, the trend is still downward. Mr. Appletoft stated approximately 3.2-million gallons per day was available for wholesale customers based on planned water use versus actual use.

The new rates adopted by the Board in April, 2011 are estimated as follows:

- The System Development Charge (SDC) will be on a "Rate of Flow Basis" in million gallons per day based upon engineering projections for a 5-year period of average, maximum, and peak hour demands.

  Contract Limit
  - One Million Gallons per Day $2,465,000
  - Two Million Gallons per Day $4,931,000
  - Four Million Gallons per Day $9,862,000

- The Wholesale customer will pay for the cost of a metering facility and any pipelines needed to connect to the district's existing facilities.
- An increase in capacity will require an additional system Development Charge (SDC) for the additional volume only.
- Monthly Wholesale Service Charge $111.20

- Volume Charge $2.53/1,000-gallons
- The Volume Charge can vary based upon WaterOnes cost of service audit. The Volume Charge can increase or even decrease each year based upon costs incurred by WaterOne.

Questions raised by board members at the March meeting concerned the ability of WaterOne to provide water to Missouri customers since Kansas is a water rights state. Mr. Appletoft stated they had talked with the Kansas Water Authority and the Missouri Department of Natural Resources and were informed by both state agencies that several communities receive and supply water across the state lines in both states and that WaterOne would be allowed to do the same assuming state quality standards were met.

5.5.2 Connecting to WaterOne

In general, contracting with WaterOne will be similar to contracting for water from Kansas City, Missouri. In order to connect to WaterOne, Raymore will need to pay for the construction of new facilities from WaterOne's connection point in addition to Water One's System Development Charge. WaterOne will pay for the water main and metering facilities to the state line at approximately 150-Highway and Kenneth Road, but Raymore will need to pay for the facilities that deliver water from the state line to Raymore. This could be performed in conjunction with or without Belton, depending upon whether Belton chooses to contract with WaterOne for additional water.

If Belton and Raymore both, were to contract for water from WaterOne, Belton and Raymore would each pay their proportional share of the new facilities. Belton may be able to use its existing distribution system capacity to "wheel" water to Raymore without Raymore paying for a separate pipeline. In this situation Raymore would need to pay for a new meter connection to Belton and Raymore's proportional share of the WaterOne facilities.

As mentioned before the capacity WaterOne currently has available at the Nall Avenue and 146th Street location is 3.2-MGD. This location is the site of a new 10-million gallon ground storage tank and peak flow pumping station that is currently under construction. (See Appendix E, WaterOne Information for a map of the connection location.) In a separate meeting with Mr. Dan Smith, Director of Distribution, we were informed that if wholesale customers needed more than 3.2-MGD per day then WaterOne would have to make improvements in their distribution system. The extent of the improvements is unknown at this time.

The potential customers that have shown interest in purchasing additional water from WaterOne include Belton, Public Water Supply District Number 2 of Cass County (Cass 2) and Public Water Supply District Number 1 of Jackson County (Jackson 1). Belton and Cass 2 have a connection point with Kansas City at 164th Street and Holmes Road. The distance to the WaterOne connection to 164th and Holmes Road is approximately 3-miles. For Raymore and Jackson 1 the connection point is approximately 5 more miles to the east.

5.5.3 Summary of Contracting with WaterOne

WaterOne has approximately 3.2-million gallons per day capacity available for wholesale customers. To connect to WaterOne, Raymore would need to pay the System Development Charge of approximately $2.5 million dollars per million gallons, and their proportional share of pipe and metering facilities from 146th Street and Nall Avenue to the Raymore connection point. Depending upon how much water is contracted for by other entities such as Belton or Cass 2; WaterOne may only provide Raymore with a limited supply of water in the short term without making improvements in their distribution system.

5.6 Tri-County Water Authority

Tri-County Water Authority (Tri-County) is a not for profit corporation that produces potable water on a wholesale basis. Tri-County operates a 10-million gallon per day water treatment plant located on the Missouri River, just west of Sibley, Missouri. The transmission main extends 70-miles south from the Missouri River to Harrisonville, Missouri. Tri-County is governed by a Board of Directors consisting of one representative from each of its participating members. The participating members consist of the City of Grain Valley, Lake Winnebago, Pleasant Hill, East Lynn, and nine water districts located in Jackson, Cass and Bates Counties of Missouri. Tri-County also provides water to the City of Blue Springs.

5.6.1 Available Capacity

Tri-County has been approached by representatives of Jackson 1, Cass 2, and Belton inquiring about the availability of providing a future water supply. On April 13, 2011, Tri-County Water Authority provided information to representatives of this group concerning availability and pricing. That information is summarized below.

- Tri-County's existing treatment capacity is committed by contract to its current customers.
- Transmission mains from the treatment plant to Interstate-70 have excess capacity.
- Adding additional customers will require Tri-County to increase treatment and transmission capacity.
- Transmission mains and booster pump stations south of Interstate-70 will require capacity increases.
- The closest transmission mains to those attending the meeting on April 13th are a parallel 16-inch and 12-inch main running north and south along BB-Highway and Smart Road.
- Tri-County will design, construct, own, and operate the facilities to the potential customer's connection point.
- Tri-County will meet the customer's hydraulic gradient at the point of connection.
- Customers must purchase a minimum of 50,000-gallons per month or 10% of their average day requirements or they can pay a flat fee for their proportional share (based on capacity) of the debt (similar to a house mortgage payment).
- Customers pay a one time impact fee of $50,000 to cover legal costs to become a voting member of the Board of Directors.
- All costs except the impact fee are included in the price of water.
- The estimated commodity charge (cost to produce and deliver water) is $1.75/1,000-gallons. The remainder of the water rate is to cover the projects debt service.
- The total estimated water rate including the commodity charge for Raymore is estimated to be $5.44/1,000-gallons initially and with phased improvements to the TCWA system, increase to $5.94/1,000-gallons in the final years of the SRF loan. These rates assume a maximum day demand of 6-MGD in capacity.
- Because Tri-County is a not for profit corporation, Raymore would need to hold a public election to join Tri-County according to state law.

5.6.2 Connecting with Tri-County

The advantage of joining Tri-County over WaterOne is the cost of facilities needed to connect to Tri-County are born by Tri-County and do not count against Raymore's debt. The debt costs are in the water purchase rate. Raymore would not need to make a multi-million dollar up front payment as they would with Water One. If Raymore contracts with Tri-County to provide a wholesale supply of water, it is estimated that it will take Tri-County three to four years to complete design and construction of the facilities needed to deliver water to Raymore.

5.6.3 Summary of Contracting with Tri-County

Currently Tri-county does not have excess capacity to supply Raymore with water if it chooses to contract with Tri-County as an additional source of supply. Tri-County would likely need to increase treatment plant capacity and upsize transmission mains and booster pump stations depending upon the amount contracted. Tri-County will incur the debt for these facilities and the transmission main to Raymore. Tri-County will also meet Raymore's hydraulic pressure gradient at the point of connection. The debt service for Raymore's proportional share of the facility improvements will be paid back to Tri-County in the water rate. Once the debt service is paid off the rate will decrease to the operational and maintenance costs incurred by Tri-County. Appendix D, Tri-County Water Authority, Maps and Cost Estimates, contains maps and estimated cost of service information for the Tri-County connection.

5.7 Cost Comparison of Potential Sources

Table 5-1 compares potential contracts and pricing in a side by side format for the three water suppliers providing an additional 6-MGD maximum day flow over a 20-year period. It is assumed for Kansas City and WaterOne, Raymore would need to pay for design and construction of the water main to the connection point. Tri-County rates include design and construction costs for treatment, transmission and pumping in the water rate.

Table 5-1, Comparison of Water Rates

Description	Kansas City Water Services - Harrisonville	WaterOne of Johnson County	Tri-County Water Authority
Water Rate per 1,000-gallons	$2.78	$2.53	$1.75
Length of Water Main Needed	41,000 ft.	51,300-ft	36,400-ft
Raymore's Estimated Capital Cost	$8.2 Million	$10.3 Million	$0
System Development Charge for 6-MGD	$0	$16.8 Million	$0
Membership Fee	$0	$0	$50,000
Estimated Debt/1,000-gallons @ 5% over 20-years	$1.01	$3.07	$3.81
Total Rate per 1,000-gallons (Not Including Raymore's Cost of Service)	$3.79	$5.60	$5.44 to $5.96

Kansas City has the least expensive overall rate of the three providers assuming the capital costs for the improvements needed to deliver the water are accounted for. The Kansas City rate assumes Raymore would need to construct facilities to the Harrisonville connection point and incur the construction debt that is estimated to be $1.01 per 1,000-gallons.

It is estimated Tri-County will have the lowest rate after 20-years when the debt is paid off because the cost to produce water is the cheapest at $1.75 per 1,000-gallons. WaterOne would have the most up front costs to construct a main from the state line to Raymore and would require a debt payment estimated to be $3.07 per 1,000-gallons.

Because WaterOne would require a significant up front cost, that Raymore would need to finance, and because Tri-County incurs the debt for the improvements needed to deliver water to Raymore; Raymore's best option for an alternate source of water supply is Tri-County. WaterOne was no longer considered in the analysis that follows due to the additional burden WaterOne would impose on Raymore.

5.8 Cost Comparison of Tri-County and Kansas City

A July 28, 2011 , Kansas City Star newspaper article stated Kansas City would be increasing their water rates by 10% annually, to provide funds for infrastructure improvements needed within their system. The Kansas City Star newspaper article is included in Appendix B. In phone conversations between HDR and Mr. Sean Hennesy, Water Services Chief Financial Offfice, Mr. Hennesy expected a 6% rate increase in 2012 and 2013 and then rates would only increase annually therafter as Kansas City's expenses increased. In February, Raymore was informed rates will increase 12% in 2012 and are expected to increase 10% in 2013. A copy of the letter is included in Appendix B.

The Tri-County base rate is approximately $1.75 per 1,000-gallons; assuming annual inflation of 3%, the base rate for 1,000-gallons in twenty years would be $3.26.
Table 5-2, compares the cost of what Raymore might pay if they contracted with Tri-County or Kansas City as a sole source provider over the next twenty years.

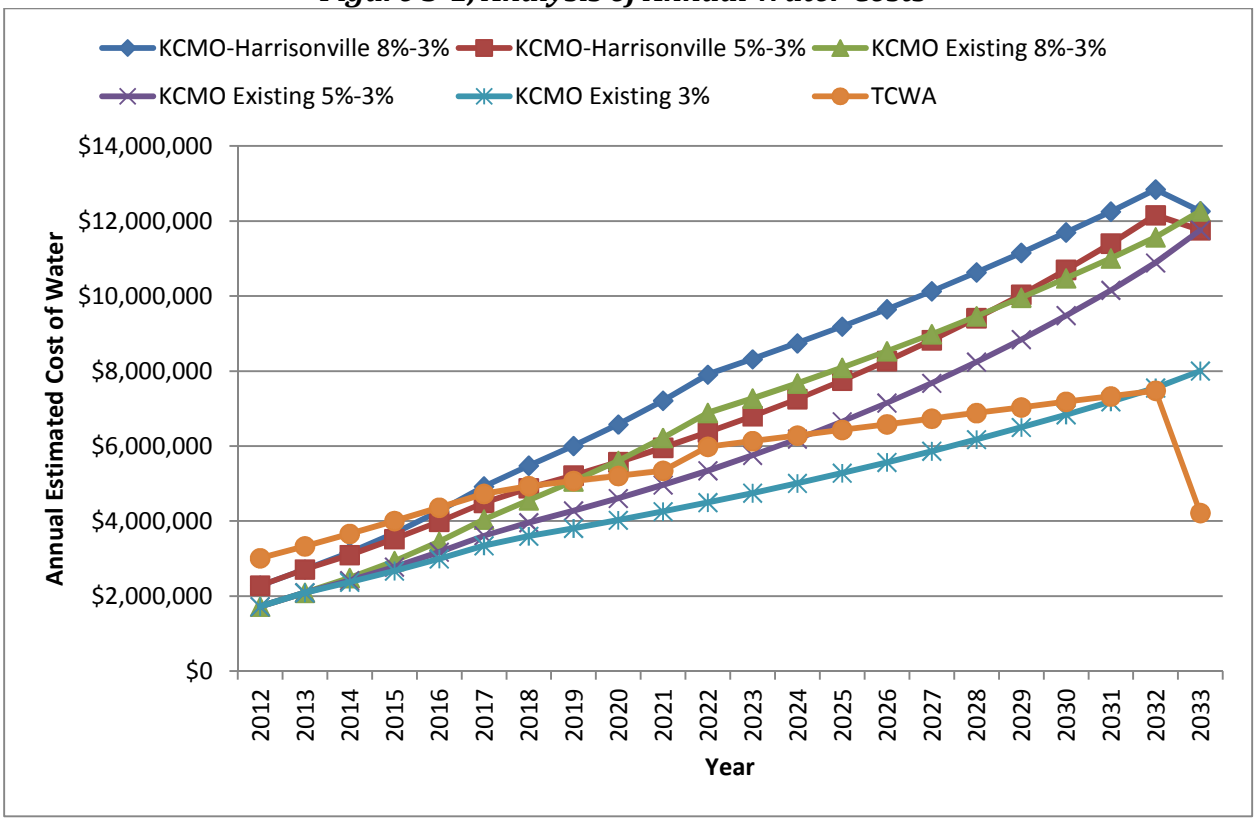
Table 5-2, Cost Comparison of Annual Water Costs

	Avg. Day	KCMO - Harrisonville Connection		KCMO Existing Connection			TCWA
Year	(MGD)	8% - 3% Rate	5% to 3% Rate	8% - 3% Rate	5% to 3% Rate	3% Rate	Sole Source
2012	1.52	$2,281,856	$2,281,856	$1,722,469	$1,722,469	$1,722,469	$3,012,936
2013	1.68	$2,712,195	$2,712,195	$2,093,978	$2,093,978	$2,093,978	$3,329,799
2014	1.84	$3,166,075	$3,097,009	$2,486,382	$2,417,316	$2,371,272	$3,660,918
2015	2.02	$3,682,765	$3,521,762	$2,938,885	$2,777,881	$2,673,065	$4,006,645
2016	2.20	$4,264,295	$3,984,331	$3,454,640	$3,174,676	$2,996,700	$4,360,912
2017	2.38	$4,923,781	$4,492,632	$4,045,812	$3,614,664	$3,347,030	$4,728,861
2018	2.49	$5,478,626	$4,879,254	$4,561,978	$3,962,606	$3,599,321	$4,937,194
2019	2.56	$6,005,508	$5,218,077	$5,063,460	$4,276,029	$3,810,028	$5,074,002
2020	2.62	$6,578,664	$5,574,297	$5,611,916	$4,607,549	$4,027,221	$5,207,037
2021	2.69	$7,212,526	$5,957,406	$6,220,342	$4,965,221	$4,257,180	$5,344,044
2022	2.76	$7,907,820	$6,364,763	$6,890,199	$5,347,141	$4,497,312	$5,984,823
2023	2.83	$8,317,360	$6,797,899	$7,274,302	$5,754,840	$4,748,020	$6,134,422
2024	2.90	$8,743,745	$7,258,437	$7,675,250	$6,189,942	$5,009,723	$6,284,021
2025	2.97	$9,188,259	$7,748,620	$8,094,253	$6,654,614	$5,283,212	$6,434,054
2026	3.04	$9,651,005	$8,269,796	$8,531,489	$7,150,279	$5,568,600	$6,584,086
2027	3.11	$10,132,701	$8,823,902	$8,987,674	$7,678,875	$5,866,358	$6,734,119
2028	3.18	$10,634,089	$9,412,991	$9,463,552	$8,242,454	$6,176,969	$6,884,151
2029	3.24	$11,155,942	$10,039,241	$9,959,894	$8,843,193	$6,500,937	$7,034,184
2030	3.31	$11,699,410	$10,705,282	$10,477,815	$9,483,687	$6,838,990	$7,184,433
2031	3.38	$12,254,114	$11,403,144	$11,008,077	$10,157,107	$7,185,098	$7,328,178
2032	3.45	$12,844,979	$12,157,677	$11,573,137	$10,885,834	$7,553,919	$7,479,945
2033	3.55	$12,265,848	$11,761,434	$12,265,848	$11,761,434	$8,006,059	$4,218,334
Total	59.7	$171,101,563	$152,462,003	$150,401,350	$131,761,790	$104,133,457	$121,947,099

The "KCMO – Harrisonville Connection" costs in Table 5-2, include Raymore's estimated cost to construct a water line to the Harrisonville connection point and the related debt of $1.01/1,000-gallons. The "KCMO Existing Connection" costs in Table 5-2 assume all the water can be provided to Raymore at the existing Kansas City connection points and new facilities are not required. The rates for KCMO assumed a 12% increase in 2012, a 10% increase in 2013. The "8% - 3% Rate" includes an annual increase of 8% each year between the years 2014 and 2022; after 2022 the costs include a annual rate increase of 3%. The "5% - 3% Rate" includes an annual increase of 5% each year between the years 2014 and 2022; after 2022 the costs include a annual rate increase of 3%. The "3% Rate" column assumes an annual rate increase of 3" between 2014 and 2033. The Tri-County costs assume a rate of $5.44-1,000-gallons between 2012 and 2022 and $5.94 between 2023 and 2032. After 2032 the TCWA rate per 1,000-gallons is expected to decrease to $3.26 per 1,000-gallons assuming a 3% annual rate increase on the base rate.

As can be seen from Table 5-2, Tri-County is the least expensive water source unless Kansas City can keep their annual rate increase below 4% and Raymore does not have to construct a water main to the Harrisonville connection point. Figure 5-1 illustrates Table 5-2 graphically.

Figure 5-1, Analysis of Annual Water Costs



There are various dual source options available to Raymore that are not represented in the table or the graph. Generally it is believed Kansas City will continue to increase rates in order to pay for infrastructure improvements. Kansas City began their Master Plan process to identify future flows and improvements needed within and outside of their system in 2012. The improvements and associated costs needed to provide more than 1-million gallons per year of water to Raymore are at

the present unknown. Therefore it can be assumed Kansas City's rates will continue to increase. If the rates increase more than 3% per year Tri-County will be the least expensive source of supply.

Having two independent water providers, able to deliver the City's average daily demand, provides Raymore additional security in the event either source has to be interrupted due to an emergency such as an act of terrorism or a major system failure. As Figure 5-1 shows it also allows Raymore more flexibility in controlling costs.

Joining Tri-County will initially cost Raymore more money, but it has the potential to save Raymore money in the future if Kansas City's rates continue to increase above 3% over twenty years as is currently expected. Tri-County's base rate would be cheaper after the 20-year construction loan is paid off. Assuming a 3% annual increase the Tri-County rate would be $3.26 per 1,000-gallons purchased. The Kansas City rates are estimated to be between $9.50 and $6.00 per 1,000-gallons in 20-years.

6 Conclusion and Recommendation Water Supply

Average water use per customer has decreased across the United States over the last decade due to government mandated modifications to dishwashers, washing machines and plumbing fixtures and due to poor economic conditions and due to water conservation education. Raymore's average water use per customer has also decreased over the last seven years following the national trend. In 2003, Raymore's average daily water demand was 1.26-million gallons per day. In 2010, Raymore's average daily water demand was 1.26-million gallons per day even though the City added approximately 1,200 new customers. It could be argued that these low numbers are in part due to three very wet and cool years between 2007 and 2010; however the decrease is also a local and national trend as pointed out in the Opflow article in Appendix C.

Using population projections provided by Raymore staff and water use records, it is estimated that Raymore will require between 2.54 and 3.45-MGD on average in the year 2032. On maximum demand days, it is estimated Raymore will require between 5.68 and 8.97-MGD in the year 2032. Raymore's contract with Kansas City limits Raymore's water usage to 3-million gallons per day, with an extra 1-million gallons during emergencies. During extended dry periods and hot summer days Raymore could exceed the contract limits in the year 2013 on peak summer days based upon historical water usage data.

Kansas City's contract with Raymore will expire in the year 2021. The contract allows for Raymore and Kansas City to negotiate new limits and to develop a new contract based upon the mutually agreeable limits. If Raymore decides not to add an additional source of water supply, the City needs to negotiate a new contract with Kansas City for a maximum day limit of 9-million gallons per day. This request should be in the form of a letter directed to the Acting Director of Water Services.

A July 29, 2011 Kansas City Star article quoted Kansas City's City Manager, Troy Schulte, as telling the City Council that water rates are increasing 10 percent annually...to pay for the $2 billion in improvements over time." Other information provided to the Suburban Water Coalition indicated rates would increase between 6% and 10% annually for at least ten years. Kansas City increased rates 12% this year and last year and may increase rates 10 to 12% next year.

Two alternative options are available to Raymore as an additional source of supply to supplement the water currently contracted by Raymore from Kansas City. The two sources are WaterOne and Tri-County Water Authority. The least expensive base rate per 1,000-gallons of water between the two options is WaterOne; however this will require Raymore to pay an estimated $27-million in up front costs to cover the System Development Charge and new transmission mains for 6-MGD of additional capacity. Connecting to Tri-County is estimated to be the least expensive option for Raymore. Tri-County incurs the debt for new facilities instead of Raymore, which allows Raymore bonding capacity for other projects. Raymore could also become a voting member of the Tri-County Board of Directors. This would give Raymore a little more control over its water supply future than it might have with either Kansas City or WaterOne and thus, Tri-County is the recommended secondary or dual source of supply.

Assuming Kansas City will need to increase rates more than 3% annually, HDR recommends Raymore contract with Tri-County to secure an additional 6-MGD of water supply. This will give Raymore more flexibility in controlling costs and also provides a back up in the event of an emergency. Raymore should also renegotiate and extend its contract with Kansas City to maintain its existing capacity.

7 Water Storage Analysis

The City of Raymore, Missouri is evaluating sources of supply to accommodate future growth. As part of that study, the City is looking to see how their existing capital improvement plan for a 2.5 MG (Million Gallon) storage tank are affected by the source of additional supply and the location at which that supply is taken. This planning-level study to evaluate the required infrastructure for the new storage based on the source of supply and location. Preliminary costs for a new elevated storage tank are developed and compared to that of a ground storage tank and booster pumping station for different source of supply alternatives.

7.1 Existing Infrastructure

7.1.1 Existing Connection Points

Raymore has two existing water supply connections with Kansas City, Missouri. Their locations and details are presented below:

- Northwest Connection (155th St and Kentucky Rd)
  - 923-gpm capacity through an 8-inch main at 45-psi

- Northeast Connection (Lucy Webb Rd and Highway J)
  - 1,400-gpm through two 6-inch control valves

7.1.2 Existing Storage and Conveyance

Raymore's system consists of facilities that are owned by the City as well as storage in Kansas City's "Raymore" elevated storage tank. A listing and description of the major system facilities follows:

- 155th St and Kentucky Road Ground Storage Tank and Booster Pump Station
  - 0.75 MG steel bolted ground storage tank with overflow elevation of 1,070 feet. The tank was recently rehabilitated.
  - High service pump station with three pumps and firm capacity (two pumps running) of 1,400-gpm at 248 feet of total dynamic head (TDH).

- Foxwood Elevated Tank (Harold Drive)
  - 0.50 MG with head range of 30 ft. and overflow elevation of 1,231 ft.
  - Tank has no altitude valve.

- Kansas City's Raymore Elevated Tank (Highway J, approximately 1,000 ft south of E. Hubach Hill Rd.)
  - 2.5 MG (of which Raymore owns 2.0 MG of capacity) with head range of 45 ft. and an overflow elevation of 1,241 ft.
  - Tank is composite (concrete pedestal with steel tank) and was completed in late 2006 or early 2007 as a cooperative project with Kansas City, Missouri.

- Distribution System Piping
  - System consists of 2-inch to 16-inch diameter pipe.
  - System is primarily ductile iron or PVC pipe.

7.1.3 Existing Controls

Kansas City monitors the Raymore system through their supervisory control and data acquisition system (SCADA). SCADA monitors flow at the Lucy Webb meter and the tank level in the Raymore

elevated tank on J-Highway. The facilities at 155th St and Kentucky Road and the Foxwood Elevated Tank are not monitored by SCADA. Kansas City will turn on their South Terminal Facility pumps when the level in the Raymore Tank drops. The pumps are on at 1,225 ft. and off at 1,239 ft.

7.2 Flow Projections

This study will use the "HDR 2011 Recommended" flows which appears to reflect a growth rate and demand that most closely resembles what the City is experiencing at this time. Detailed information is provided in Section 3 of this report. It will be assumed that the 2031 maximum day will be 9-MGD.

7.3 Possible Tank Locations

7.3.1 Previous Studies

Previous Reports have examined several locations for the proposed 2.5 MG Elevated Tank:

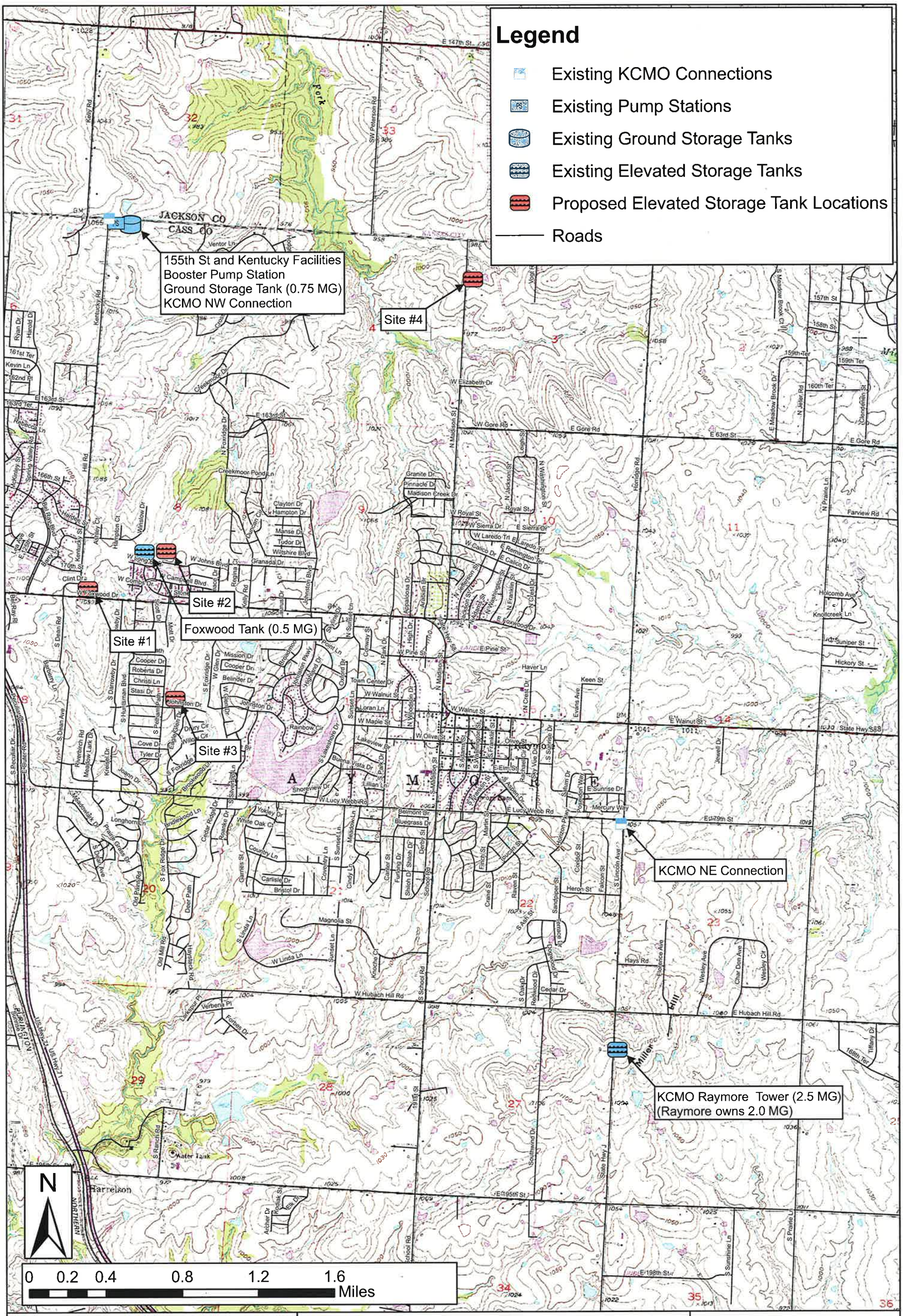
- The Raymore 2004 Water Master Plan recommended the new elevated storage tank be located just north of the intersection of Hwy 58 and Kentucky Rd., to address low pressures along Hwy 58 during peak flows.
- The Water Master Plan letter report update, dated July 24, 2009, examined four possible locations for the proposed elevated tank (Refer to Figure 7-1 for site locations):

    - *Site 1 - East of Kentucky Road and North of Hwy 58 (2004 Master Plan Location)*
        - Site may not be available, due to planned development.
        - Site is at elevation 1100 ft., and thus the tank would need to be 131 feet to the overflow.
        - Additional water line upgrades would be required.

    - *Site 2 - Harold Drive (Location of Foxwood Elevated Tank)*
        - Site is owned by the City, and would require dismantling the existing 0.5 MG tank or purchasing adjacent land for the proposed elevated tank.
        - Site elevation is at 1,190 ft., and thus the tank would need to be 141 ft. to the overflow.
        - Additional water line upgrades would be required.

    - *Site 3 - Johnston Drive (Hawk Ridge Park)*
        - Site is owned by the City and located on a ridge line.
        - Site elevation is at 1080 ft., and thus the tank would need to be 151 ft. to the overflow.
        - Additional water line upgrades would be required.

    - *Site 4 - N. Madison Rd. (1,000 ft. south of 155th St)*
        - Site is undeveloped and could be reserved in development planning.
        - Site elevation is at 1,010 ft., and thus the tank would need to be 221 ft. to the overflow.
        - The tank would need to be connected with mains extending west to a planned local development, north to 155th Street, and south to 163rd Street. Additional mains may be necessary to distribute the storage to the peak demand locations.
        - Additional water line upgrades would be required.



City of Raymore
Sources of Supply Study

Figure 7-1
Proposed Elevated Storage Tank Locations

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7.4 Storage Tank Styles

7.4.1 Elevated Storage Tanks

The elevated storage tank would have the following design parameters:

Overflow Elevation: 1,231 feet
Tank Fill and Drain Rates: Based on modeling in the 2009 Water Master Plan letter report (pg 11), the tank will drain to approximately 5% full and fill to approximately 75% full in approximately an 8-hour period each day. 24-inch pipeline should be included to and from the tank.
Tank Operating Ranges: The tank only filled to 80% of its capacity in the model simulation (2009 Water Master Plan). It was indicated that this could be corrected based on the design of the meter station. This would need to be modeled to confirm the operating range.
Additional Improvements: Piping improvements are required for all alternatives at Site 1, as described in Section 7.3.1 (Site 1). This piping is included in Table 7-4.

There are generally four styles of elevated water storage tanks: multi-legged/multi-column, pedesphere, fluted column, and composite. Pedesphere tanks are not manufactured above 2.0 MG and are not considered further. Multi-Legged tanks are only manufactured by Phoenix at the 2.5 MG size. Due to the limited competition in bidding, multi-legged tanks are not considered further. Thus, the fluted column tank will be compared to the composite tank. Kansas City's Raymore tank is a composite tank. Table 7-1 outlines the manufacturers, features, and advantages and disadvantages of each style. Figure 7-2 shows examples of each tank style.

Table 7-1, Comparison of Tank Styles

Style	Manufacturers	Features	Advantages	Disadvantages
Fluted Column	Caldwell CB&I Phoenix Pittsburgh	Welded steel structure Large diameter fluted steel support column Interior of support column can be used for multiple purposes Interior access ladders	Aesthetically pleasing appearance Riser pipe located inside support column provides insulation from freezing Interior of support column can be used for multiple purposes Interior ladders limit unauthorized access Plenty of competition among manufacturers Proven tank technology	Increased O&M costs for painting steel
Composite	Caldwell	Similar in style to	Aesthetically pleasing	Varying

	CB&I Landmark Phoenix Pittsburgh	the fluted column tank except the support column is made of reinforced concrete Interior of support column can be used for multiple purposes Interior access ladders	appearance; style would match the KCMO Raymore Tank Riser pipe located inside support column provides insulation from freezing Interior of support column can be used for multiple purposes Interior ladders limit unauthorized access Plenty of competition among manufacturers Maintenance-free column exterior Steel requiring painting maintenance is reduced to the bowl of the tank to reduce O&M costs	methods of concrete pillar construction requires careful quality control Has not been in use as long as other styles

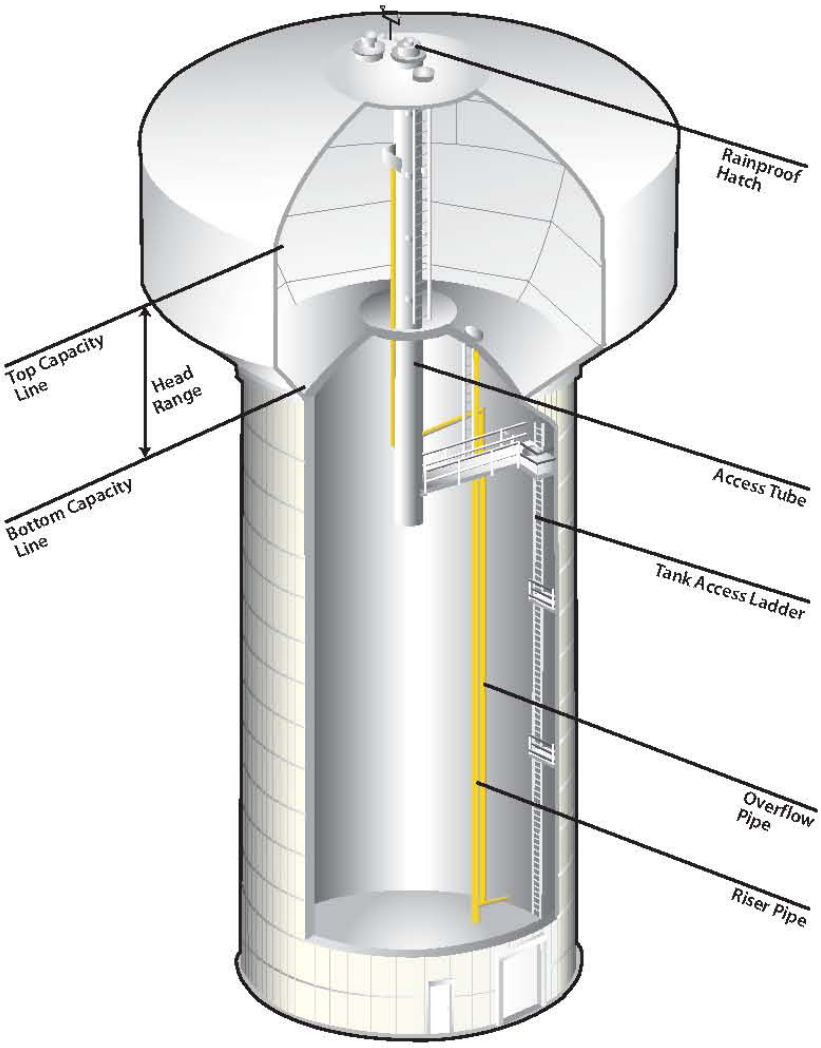
Figure 7-2, Examples of a Fluted Column Elevated Tank (left) and Composite Elevated Tank (Right)

Table 7-2 shows the possible dimensions of fluted column and composite elevated storage tanks for 2.5-MG. Dimensions vary slightly by manufacturer, but are relatively consistent. Figure 7-3 shows a cutaway of a composite style tank which shows the head range.

Table 7-2, Fluted Column and Composite Tank Dimension

Tank Style	Manufacturer	Bowl Dia. (ft)	Base Dia. (ft)	Head Range (ft)
Fluted Column	CB&I	108	78	44
	Caldwell	104	78	44.5
Composite	Phoenix	107	52	43.5
	CB&I	105	60	45
	Landmark	102-112	54	40-45
	Caldwell	104	56	45

Figure 7-3, Cutaway of a Composite Style Tank



Construction Considerations – Composite Tanks:

There are slight differences among the manufacturers of composite tanks in terms of the construction of the concrete column.

- Landmark and CB&I utilize a 7-foot concrete form section with segmented wall construction. Caldwell Tanks and Pittsburg Tank and Tower utilize a 4-foot form system. The difference between the 7-foot form and the 4-foot form is aesthetics. The 7-foot form section with segmented wall construction attempts to minimize the appearance of pour lines by utilizing a single load of concrete in each section. In order to control their costs, the contractors that utilize the 4-foot form system like to place two to three sections a day. When more than one section is placed in one day, the lower section hasn't had 24 hours to cure which may cause bulging of the concrete on the lower pour as well as create pour lines in the concrete. While this does not cause a structural issue, in some instances it has not been aesthetically pleasing.

- In HDR's experience, we have allowed the 4-foot form system as well as the 7-foot form system when bidding composite elevated water tanks; however, HDR typically does not allow the contractors to place more than one section a day and has strict concrete requirements in order to minimize aesthetic issues. This requirement may increase the price of the composite elevated tank among the manufacturers that utilize the 4-foot form system; however, there is sufficient competition in the composite elevated tank market so this is not an issue.

Regardless of construction type, both types of tanks would be required to adhere to the 2006 International Building Code (IBC), the 2005 ASCE/SEI 7-05, the 2005 ACI318-05 (for the concrete pedestal), and the 2005 American Water Works Association (AWWA) D100-05.

7.5 Ground Storage Tank Styles and Booster Pump Stations

7.5.1 Ground Storage Tank Styles

There are two types of ground storage tanks that HDR would recommend – prestressed concrete and glass-fused steel.

- Concrete tanks are constructed by placing precast concrete panels, wrapping them with wire to maintain compression, and spraying a coat of gunite to protect the wires. No painting of the tank is required for the interior or exterior, although the exterior may be painted for aesthetic reasons if desired.

- Steel tanks are constructed of fabricated steel panels that are either welded or bolted together to provide a water-tight tank on an adequate foundation. The steel must be protected from corrosion by the use of a surface coating (interior and exterior) and cathodic protection. Typically the surface coating is provided by a high quality paint system that will last approximately 15 years or by using glass-fused steel, which has a longer life expectancy. Painted steel tanks need to be taken out of service for repainting and because of the issues with down time for maintenance; painted steel tanks are not considered in the remainder of this evaluation.

A comparison of the two ground storage tank types is given in Table 7-3. In general, the two tank types are equivalent, with concrete being chosen as the more reliable material (no cathodic protection) and glass-fused steel being selected when the cost difference warrants its selection.

Table 7-3, Ground Storage Material Comparison

Glass-Fused Steel	Prestressed Concrete
Advantages	
• Generally lower construction costs, diminishing factor as size increases • Water tight • Reservoir accessories readily available • Good contractor competition	• Water tight • Low Maintenance • No cathodic protection needed • Fair contractor competition • Better freeze protection
Disadvantages	
• Vulnerable to corrosion • Cathodic protection required	• Higher initial cost, diminishing factor as size increases

7.5.2 Booster Pump Station

The pump station assumed in this report is a prefabricated, skid mounted pump station that would include the pumps, piping, control valves, instrumentation and controls, and a premanufactured structure.

A booster pump station would be required to pump from the ground storage tank and up to Raymore's pressure zone. As previously stated, the booster pump station was sized to be able to provide flow and pressure to Site 1 equivalent to that of an elevated storage tank at that location (4,500-gpm at 131 feet of head). The 4,500-gpm is a 2030 condition, and thus initially the booster pump station would consist of 3 pumps that could each pump 1,500-gpm at 250 feet of total dynamic head (TDH) (the fourth pump could be added when required). Thus, the pump station would have an initial firm capacity of 3,000-gpm or 4.3-MGD. Two smaller booster pumps that would be capable of 750-gpm at 250 feet TDH would also be required to pump flows at low-demand periods.

7.5.3 Water Main Connection

A new water main will be required to connect the elevated tank or ground storage tank and booster pump station to the system. In the case of an elevated tank, one line could be used as both an inlet and an outlet line into the system. If a different source of supply is used, an inlet line from the new source could enter the tank, with the required inlet valves, meters, backflow preventers, etc. housed inside of the tank column. The outlet of the tank would connect to the City's system.

If a ground storage tank and booster pump station is used, two lines would be required. The first would be a fill line into the ground storage tank from the proposed water source. The line would likely be routed through the booster pump station so that the inlet valves, meters, backflow preventers, etc. can be housed above ground without the need for a vault. The booster pump station would draw from the tank and would connect into the City's system.

The new line(s) will be 24-inch diameter ductile iron pipe. Isolation butterfly valves should be provided at the tank and at the connection to the City's system so the water storage can be isolated from the system, if necessary. The length of the pipeline, joint restraint, fire hydrant requirements, air relief valve requirements as well as easement requirements will be site-specific based on the alignment and profile.

7.6 Proposed Alternatives

The location of the proposed storage tank must be evaluated relative to the potential sources of supply. The location also must be considered in conjunction with the existing Water Master Plan and modeling work that has already been completed for the City. Raymore will need to construct the necessary transmission mains inside the City to properly distribute the supply of water. Costs are significantly impacted by where Raymore receives water and constructs a storage tank. Tank locations are discussed below for each of the three sources of supply options based on the information available at the time of this report.

7.6.1 Assumptions

The following assumptions were made in selecting sites for the storage tank and sizing the required facilities to make a fair comparison:

Water storage capacity will be 2.5 MG for either ground storage or elevated storage.

In all of the alternatives the elevated storage tank will be located at Site 1, which is the site location with the lowest cost. The tank will be 131 feet to the overflow (elevation 1,231 feet) to match Foxwood Tank overflow.

Ground storage and booster pumping station alternatives will be sized to provide flow and pressure at Site 1 that would be identical to that of an elevated storage tank placed at Site 1 (described in Assumption #1). This assumption keeps the Water Master Plan assumptions valid.

The booster pump station will be capable of 4,500-gpm peak flow. The 4,500-gpm peak flow assumes that 3.0-MGD will be provided by Kansas City from a different connection point and that a peaking factor of 2.0 is appropriate for the peak hour. The booster pump station will be able to provide a head that will equate to 131 feet at Site 1. The head requirement of the pump station is assumed to be 250 feet but will vary depending on the elevation at the connection point and the linear feet of pipe required, to connect to the proposed Site 1.

All alternatives will contain 24-inch ductile iron pipe from the proposed connection point to Site 1. The distribution main upgrades described in the 2009 Water Master Plan letter, (pg. 18) necessary for Site 1, will also be included.

Any new sources of supply will be in addition to the 3.0-MGD that Kansas City, Missouri will continue to provide Raymore.

7.6.2 Alternative Sources and Sites

Alternative 1 - Obtain Water from Kansas City, Missouri.

The first priority is to obtain more water from Kansas City. The same connection and metering points would be utilized and the 2.0-MG of water in the Raymore Elevated Tank would be available to the City. The 2009 Water Master Plan letter report, recommended the site at Kentucky and Highway 58 as the lowest cost option to place an elevated tank (Refer to Figure 7-1 for the locations of the four sites in the letter). That study was written with the assumption that Kansas City would provide water, and thus the letter's sighting recommendations remain relevant in this alternative. For comparison, a ground storage tank and booster pump station will be evaluated assuming they are placed at the northeast connection point.

Alternative 1A: Kansas City Supply with Elevated Storage – Place an elevated storage tank at Site 1 with additional supply from the northeast connection point (155th and Kentucky Road).
Alternative 1B: Kansas City Supply with Ground Storage and a Booster Pump Station – Place a ground storage tank and booster pump station at the northeast connection point. Install 24-inch line as necessary to provide the equivalent flow and pressure at Site 1 as provided in Alternative 1A.

Alternative 2 - Obtain Water from Kansas City, Missouri and additional water from WaterOne, via Belton

The second alternative is to obtain 3.0-MGD from Kansas City with the remainder coming from WaterOne via Belton through a minimum purchase agreement. This would allow Raymore to use the existing 2.0-MG of storage in Kansas City's Raymore Tank. Raymore could receive water from Water One at two locations: 1) Near the Intersection of 155th St. and Kentucky Rd. and 2) Near the intersection of Highway 71 and Lucy Webb Rd. Two alternatives were evaluated for each connection point – one elevated storage alternative and one ground storage and booster pump station alternative:

Alternative 2A: WaterOne Supply at 155th St. and Kentucky Rd. with Elevated Storage – Place an elevated storage tank at Site 1 with a connection point at 155th St and Kentucky Rd. Install 24-inch line as necessary to provide flow from the connection point to Site 1.
Alternative 2B: WaterOne Supply at 155th St. and Kentucky Rd. with Ground Storage Tank and Booster Pump Station – Place a ground storage tank and booster pump station at 155th St. and Kentucky Road. Install a 24-inch line as necessary to provide the equivalent flow and pressure as would be attained by the elevated storage tank in Alternative 2A at Site 1.
Alternative 2C: WaterOne Supply at Hwy 71 and Lucy Webb Rd. with Elevated Storage – Place an elevated storage tank at Site 1 with a connection point at Hwy 71 and Lucy Webb Rd. Install 24-inch line as necessary to provide flow from the connection point to Site 1.
Alternative 2D: WaterOne Supply at Hwy 71 and Lucy Webb Rd. with Ground Storage Tank and Booster Pump Station – Place a ground storage tank and booster pump station at the Hwy 71 and Lucy Webb Rd. Install 24-inch line as necessary to provide the equivalent flow and pressure as would be attained by the elevated storage tank in Alternatives 2A and 2C.

Alternative 3 - Obtain Water from Kansas City, Missouri and additional water from Tri-County Water Authority

The third alternative is to obtain 3.0-MGD from Kansas City with the remainder coming from Tri-County Water Authority through a minimum purchase agreement. The 2.0-MG in KCMO's Raymore Tank would still be available to the City. Raymore could receive water from Tri-County's system if Tri-County extended their system east. The two likely locations for Tri-County to connect to Raymore's system are as follows: 1) At the intersection of Highway 58 and Highway J, and 2) at 155th Street, possibly up to Kentucky Road. Two alternatives; an elevated storage tank alternative, and a ground storage tank and booster pump station alternative, were evaluated for each connection point location and are described below:

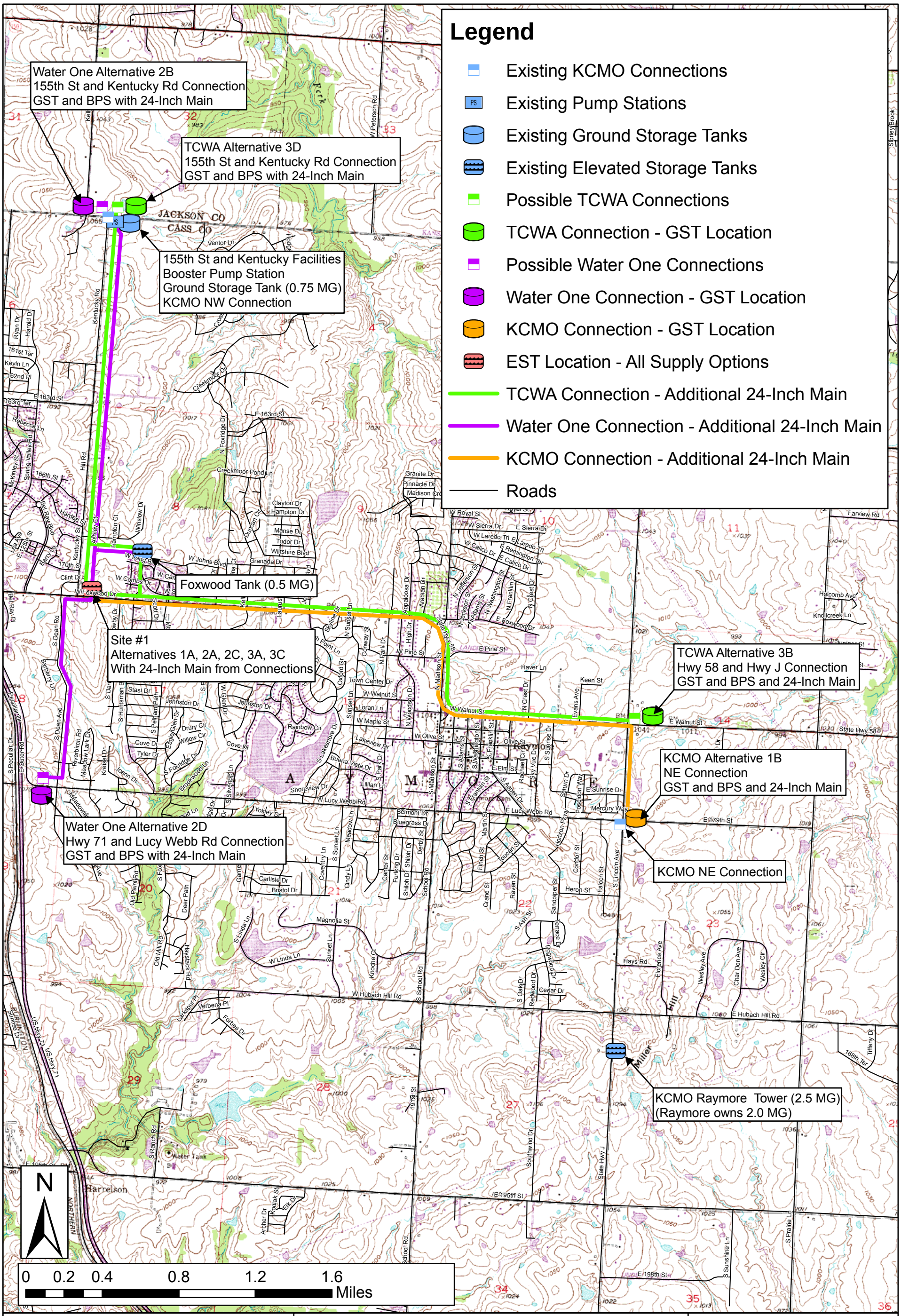
Alternative 3A: Tri-County Supply at Hwy 58 and Hwy J with Elevated Storage – Place an elevated storage tank at Site 1 with a connection point at Hwy 58 and Hwy J. Install 24-inch line as necessary to provide flow from the connection point to Site 1.
Alternative 3B: Tri-County at Hwy 58 and Hwy J with Ground Storage Tank and Booster Pump Station – Place a ground storage tank and booster pump station at the Hwy 58 and Hwy J. Install 24-inch line as necessary to provide the equivalent flow and pressure as would be attained by the elevated storage tank in Alternative 3A.
Alternative 3C: Tri-County at 155th St. and Kentucky Rd. with Elevated Storage – Place an elevated storage tank at Site 1 with a connection point at 155th St and Kentucky Rd. Install 24-inch line as necessary to provide flow from the connection point to Site 1.
Alternative 3D: Tri-County at 155th St. and Kentucky Rd. with Ground Storage Tank and Booster Pump Station – Place a ground storage tank and booster pump station at the 155th St. and Kentucky Road. Install 24-inch line as necessary to provide the equivalent flow and pressure as would be attained by the elevated storage tank in Alternatives 3A and 3C.

7.6.3 Required Infrastructure

The infrastructure necessary to provide 131 ft. of head at Site 1 was determined. Figure 7-4 depicts each of the alternatives on a site map. Table 7-4 describes the main components of each alternative. It is assumed that all alternatives will require altitude valves, site grading, site piping and electrical and instrumentation and controls.

Table 7-4, Summary of Required Infrastructure for each Alternative

Alternative	Tank Type	Connection Location	Linear Ft of 24" Pipe Required
1A (Kansas City)	Elevated Storage	155th & Kentucky	16,200
1B (Kansas City)	Ground Storage/Booster Pumping	J-Hwy & Lucy Webb	26,300
2A (Water One)	Elevated Storage	155th & Kentucky	16,200
2B (Water One)	Ground Storage/Booster Pumping	155th & Kentucky	16,200
2C (Water One)	Elevated Storage	Lucy Webb & 71-Hwy	13,500
2D (Water One)	Ground Storage/Booster Pumping	Lucy Webb & 71-Hwy	13,500
3A (Tri-County)	Elevated Storage	J-Hwy & 58-Hwy	22,900
3B (Tri-County)	Ground Storage/Booster Pumping	J-Hwy & 58-Hwy	22,900
3C (Tri-County)	Elevated Storage	155th & Kentucky	16,200
3D (Tri-County)	Ground Storage/Booster Pumping	155th & Kentucky	16,200



City of Raymore
Sources of Supply Study

Figure 7-4
Alternative Ground Storage Tank & Elevated Storage Tank Locations

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7.7 Cost Estimates

7.7.1 Elevated Storage Tanks

Elevated storage tank manufacturers were contacted to obtain budgetary estimates for both fluted column and composite elevated tanks. Table 7-5 lists the average price for each style of elevated tank with an assumed shallow foundation.

In addition to capital costs, the operation and maintenance (O&M) of the tanks was taken into consideration. The major cost item when evaluating operation and maintenance is the cleaning and repainting of the tanks periodically (approximately every 15 years). The composite tank has less O&M cost because the concrete pedestal does not need repainting. O&M costs also account for an inspection, as recommended by the American Water Works Association (AWWA), every ten years. Appendix A contains the O&M present worth calculations.

The capital and operations and maintenance costs are compared based on a present worth analysis over 20 years. The analysis shows that the tank styles are comparable in price at the planning level. The composite tank will be selected for the cost comparison in this report. If an elevated storage tank is selected, it would be recommended that a composite tank be base bid with a fluted column style tank as an alternate for optimum competition and cost savings.

Table 7-5, Elevated Tank Capital, O&M, and Present Worth Costs

Item Description	Fluted Column	Composite
Elevated Tank Capital Cost[1,2]	$3,520,000	$3,660,000
Accessories	$330,000	$330,000
Telemetry	$50,000	$50,000
Mixing System	$50,000	$50,000
Elevated Tank O&M Cost		
Painting	$506,500	$274,500
Inspections	$37,500	$37,500
Total Present Worth	$4,494,000	$4,402,000

Notes:

1. Cost assumes a soil bearing load of 4,000 lbs/square foot, which allows a spread foundation to be used. A geotechnical investigation would need to be conducted in the preliminary design phase at the selected site location to determine the validity of the assumption.
2. Cost of the elevated tank is for shallow foundation and tank as quoted by the manufacturer only and does not include cost of land, site work or engineering.

7.7.2 Ground Storage Tanks and Booster Pump Station

Ground storage tank (GST) and booster pump station manufacturers were contacted to obtain budgetary estimates for concrete and glass fused to steel tanks and booster pump stations. Table 7-6, lists the budgetary price for each style of ground storage tank (with an assumed shallow foundation) and a booster pump station. The booster pump station costs include the pump station and appurtenances, prefabricated building, and backup generator.

In addition to capital costs, the operation and maintenance (O&M) of the tanks must be taken into consideration. The major cost item when evaluating operation and maintenance of the tanks is the cleaning of the tanks periodically (approximately every 10 years). The major O&M costs in regards to the booster pump station are the electrical costs to run the station (Refer to Appendix A for

calculations). The O&M values also include provision to replace 3 of the 4 large pumps and both small pumps at the 20 years (2031). The capital and operations and maintenance costs are compared based on a present worth analysis over 20 years. The analysis shows that the final price for the concrete and glass fused to steel alternatives are within 10% of each other. At the time of this report, high steel prices are influencing the cost of the glass fused to steel tank. It is common to have a base bid on one style of ground storage tank with an alternative bid on the other style, acceptable at the Owner's discretion. For the purposes of this report, the booster pump station with concrete ground storage tank alternative will be carried forward. A large portion of the present worth costs come from the electrical usage by the pumps, and thus premium efficiency motors are recommended.

Table 7-6, Ground Storage Tank and Booster Pump Station Capital, O&M, and Present Worth Costs

Item Description	Booster Pump Station with Concrete GST	Booster Pump Station with Glass Fused to Steel GST
Ground Storage Tank Capital Cost[1,2]	$1,220,000	$1,675,000
Ground Storage Tank O&M Cost	$37,500	$37,500
Booster Pump Station Capital Cost	$1,705,000	$1,705,000
Telemetry	$50,000	$50,000
Booster Pump Station O&M Cost		
Electrical	$2,011,000	$2,011,000
Pump Replacement at 20 Years	$252,000	$252,000
Total Present Worth	$5,276,000	5,731,000

Notes:

1. Cost assumes a soil bearing load of 4,000 lbs/square foot, which allows a spread foundation to be used. A geotechnical investigation would need to be conducted in the preliminary design phase at the selected site location to determine the validity of the assumption.
2. Cost of the elevated tank is for shallow foundation and tank as quoted by the manufacturer only and does not include cost of land, site work or engineering.

7.7.3 Alternative Cost Comparisons

Cost estimates for were developed for a composite elevated storage tank and a booster pump station with a concrete ground storage tank. Included in this comparison are costs to develop the site, including grading, stormwater management, fencing, and street access. Cost comparisons also include the required piping infrastructure based on the location of the facilities as well as electrical service and the Instrumentation and Controls required. Finally, the contractor's markup, engineering costs, and a 20% contingency factor were added to account for the uncertainty in site design and project scope. Table 7-7 shows the cost comparison.

Table 7-7, Alternative Cost Analysis

Item	Cost
Water Storage	
2.5 MG Elevated Storage Tank	$4,090,000
OR	
2.5 MG Concrete Ground Storage Tank and Booster Pump Station	$2,975,000
Site Electrical Work	$175,000
Sitework and Grading	$433,000
Water Storage Site Piping/Valves	$245,000
Distribution Piping ($180/LF)	
1A (KCMO) (16,200 ft)	$2,916,000
1B (KCMO) (26,300 ft)	$4,734,000
2A, 2B (Water One) (16,200 ft)	$2,916,000
2C, 2D (Water One) (13,500 ft)	$2,430,000
3A, 3B (TCWA) (22,900 ft)	$4,122,000
3C, 3D (TCWA) (16,200 ft)	$2,916,000
Contingency (20%)	Included In Alts
Engineering, Legal, Finance (10%)	Included In Alts
Contractor's Overhead and Profit (10%)	Included In Alts
Totals:	
Alternative 1A - KCMO, Elevated Storage, 16,200 LF	$11,000,000
Alternative 1B - KCMO, Ground Storage & Pumping, 26,300 LF	$11,990,000
Alternative 2A - WaterOne, Elevated Storage, 16,200 LF	$11,000,000
Alternative 2B - WaterOne, Ground Storage & Pumping, 16,200 LF	$9,440,000
Alternative 2C - WaterOne, Elevated Storage, 13,500 LF	$10,320,000
Alternative 2D - WaterOne, Ground Storage & Pumping, 13,500 LF	$8,760,000
Alternative 3A - TCWA, Elevated Storage, 22,900 LF	$12,690,000
Alternative 3B - TCWA, Ground Storage & Pumping, 22,900 LF	$11,130,000
Alternative 3C - TCWA, Elevated Storage, 16,200 LF	$11,000,000
Alternative 3D - TCWA, Ground Storage & Pumping, 16,200 LF	$9,440,000

7.8 Conclusion Water Storage

The total estimated cost to design and construct a 2.5-MG elevated tank is estimated to be $6.8-million. The total estimated cost to design and construct a ground storage tank and booster pump station is estimated to be $5.3-million. The capital cost difference is $1.5-million. When operation and maintenance costs are considered as shown in Tables 7-5 and 7-6 the difference between an elevated storage tank, and a ground storage tank with booster pump station, decreases the difference between the two scenarios to $0.6-million in present day dollars in favor of a ground storage tank and booster pump station.

The lowest cost alternative from Table 7-8 is Alternative 2D, a ground storage and pumping facility located at Lucy Webb Road near 71-Highway,which is connected to the transmission main on 58-Highway and receives water from WaterOne. This alternative has the shortest amount of 24-inch

diameter pipe inside the city limits. Transmission mains outside the city limits were not included in the analysis. Only those improvements required inside the City limits as shown on Figure 7-4 are included. The price of connecting to WaterOne and the transmission main needed to the City limits will need to be added to the cost of Alternative 2D.

For the Tri-County alternatives the lowest cost option is a ground storage and pumping station located at 155th & Kentucky Road due to the shorter length of pipe needed to connect flows to the existing elevated storage at Foxwood Drive.

For Kansas City the lowest cost alternative is Alternative 1A, which includes a new connection at 155th & Kentucky Road and an elevated tank at Site 1.

7.9 Recommendation Water Storage

Ultimately the recommendation depends upon who can supply Raymore with the amount of water that is needed. The recommendation between a ground storage tank and pump station versus an elevated storage tank is dependent upon the location water is received and the hydraulic pressure gradient that can be supplied. Based upon the initial capital cost of the project a ground storage tank and pump station is cheaper than an elevated storage tank. Over several years an elevated storage tank will have less operation and maintenance costs than a ground storage tank and pump station. If the supplier can meet Raymore's hydraulic grade the best recommendation is to construct an elevated storage tank. Using demand projections in Section 3.1 and Kansas City's contract requirements of having an average day plus one-quarter of a maximum day of storage then Raymore will need a new water storage tank in the year 2015 or when the average day water demand reaches 2.02-MGD. This equates to a population of approximately 22,798. If Raymore chooses an alternative source of supply such as Tri-County then a new facility will be needed in the year 2021 when the average day water demand reaches 2.69-MGD and the population is approximately 26,914.

Appendix A, Operations and Maintenance Present Worth Calculations

Operations and Maintenance Calculations – Elevated Storage Tanks

Table Appendix A, O&M Costs Composite Tank

Composite Tank			
Action	Year	F/P at 2%	Present Worth
Inspection/Cleaning	10	1.219	$20,509
Repainting of Bowl	15	1.3459	$275,058
Inspection/Cleaning	20	1.4859	$16,825
			$312,391

Notes:
1) 2% F/P accounts for a 5% interest rate and 3% inflation
2) Composite Tank estimated to have 61,700 SF, $6/sf for Exterior and Interior Wet Coating

Table Appendix A, O&M Costs Fluted Tank

Fluted Column			
Action	Year	F/P at 2%	Present Worth
Inspection/Cleaning	10	1.219	$20,509
Repainting of Bowl	15	1.3459	$506,278
Inspection/Cleaning	20	1.4859	$16,825
			$543,612

Notes:
1) 2% F/P accounts for a 5% interest rate and 3% inflation
2) Fluted Tank estimated to have 92,500 SF, $6/sf for Exterior and Interior Wet Coating and
63,200 of Interior Dry at $2/sf

Operations and Maintenance Calculations – Ground Storage Tanks

Table Appendix A, O&M Costs Ground Storage Tanks

Concrete or Glass Fused to Steel Tank			
Action	Year	F/P at 2%	Present Worth
Inspection/Cleaning	10	1.219	$20,509
Inspection/Cleaning	20	1.4859	$16,825
			$37,333

Notes:
1) 2% F/P accounts for a 5% interest rate and 3% inflation

Operations and Maintenance Calculations – Booster Pump Station

Pump Replacement
Table Appendix A, O&M Costs, Pump Replacements

Booster Pump Station			
Pump #	Cost to Replace	F/P @ 2%&20yrs	Present Worth
Pump 1	$85,000	1.4859	$57,204
Pump 2	$85,000	1.4859	$57,204
Pump 3	$85,000	1.4859	$57,204
Pump 4	$0	1.4859	$0
Pump 5	$60,000	1.4859	$40,380
Pump 6	$60,000	1.4859	$40,380
			$252,372

Notes:
1) 2% F/P accounts for a 5% interest rate and 3% inflation
2) Pump #4 not replaced as it is not expected to be required until 2020

Table Appendix A, Pump Replacement, Electrical Costs

Inflation	1.03
Interest	1.05

Assumptions:

Average Day Flow 9 of 12 months

Maximum Day Flow 3 of 12 months

Average Day Water from KCMO = 2 MGD (1 MGD from additional water source due to minimum purchase agreement)

Maximum Day Water from KCMO = 3 MGD (KCMO will have the least expensive water, use as much as possible on peak days)

Cost per kW/hr is $0.08, inflated 3% per year.

Pump efficiency is 80%

Motor efficiency is 80%

Days per year 365

Present Worth Eqn is from Civil Engineering Reference Manual for the PE Exam, 7th Edition, page 18-8, Table 18.5

Electricity Costs Based on Average Day Flows

Year	Total Demand		Water From KCMO		Other Source		Pump Station Power Req	Daily Cost	9 Month Cost
	(MGD)	(GPM)	(MGD)	(GPM)	(MGD)	(GPM)	(HP)	$	$
2011	2.05	1,423.61	1.05	729.17	1.00	694.44	54.86	$98.14	$26,889.48
2012	2.13	1,479.17	1.13	784.72	1.00	694.44	54.86	$101.08	$27,696.17
2013	2.22	1,541.67	1.22	847.22	1.00	694.44	54.86	$104.11	$28,527.05
2014	2.30	1,597.22	1.30	902.78	1.00	694.44	54.86	$107.24	$29,382.86
2015	2.39	1,659.72	1.39	965.28	1.00	694.44	54.86	$110.45	$30,264.35
2016	2.47	1,715.28	1.47	1,020.83	1.00	694.44	54.86	$113.77	$31,172.28
2017	2.55	1,770.83	1.55	1,076.39	1.00	694.44	54.86	$117.18	$32,107.45
2018	2.63	1,826.39	1.63	1,131.94	1.00	694.44	54.86	$120.70	$33,070.67
2019	2.72	1,888.89	1.72	1,194.44	1.00	694.44	54.86	$124.32	$34,062.79
2020	2.80	1,944.44	1.80	1,250.00	1.00	694.44	54.86	$128.05	$35,084.68
2021	2.88	2,000.00	1.88	1,305.56	1.00	694.44	54.86	$131.89	$36,137.22
2022	2.96	2,055.56	1.96	1,361.11	1.00	694.44	54.86	$135.84	$37,221.33
2023	3.03	2,104.17	2.03	1,409.72	1.00	694.44	54.86	$139.92	$38,337.97
2024	3.11	2,159.72	2.11	1,465.28	1.00	694.44	54.86	$144.12	$39,488.11
2025	3.18	2,208.33	2.18	1,513.89	1.00	694.44	54.86	$148.44	$40,672.75
2026	3.34	2,319.44	2.34	1,625.00	1.00	694.44	54.86	$152.89	$41,892.94
2027	3.40	2,361.11	2.40	1,666.67	1.00	694.44	54.86	$157.48	$43,149.73
2028	3.46	2,402.78	2.46	1,708.33	1.00	694.44	54.86	$162.21	$44,444.22
2029	3.52	2,444.44	2.52	1,750.00	1.00	694.44	54.86	$167.07	$45,777.54
2030	3.58	2,486.11	2.58	1,791.67	1.00	694.44	54.86	$172.08	$47,150.87
2031	3.64	2,527.78	2.64	1,833.33	1.00	694.44	54.86	$177.25	$48,565.40

Electricity Costs Based on Peak Day Flows

Year	Total Demand		Water From KCMO		Other Source		Pump Station Power Req	Daily Cost	3 Month Cost
	(MGD)	(GPM)	(MGD)	(GPM)	(MGD)	(GPM)	(HP)	$	$
2011	6.15	4,270.83	3.00	2,083.33	3.15	2,187.50	172.80	$309.13	$28,130.91
2012	6.20	4,305.56	3.00	2,083.33	3.20	2,222.22	175.54	$323.46	$29,434.76
2013	6.25	4,340.28	3.00	2,083.33	3.25	2,256.94	178.28	$338.37	$30,791.52
2014	6.31	4,381.94	3.00	2,083.33	3.31	2,298.61	181.58	$354.95	$32,300.77
2015	6.36	4,416.67	3.00	2,083.33	3.36	2,333.33	184.32	$371.12	$33,772.36
2016	6.41	4,451.39	3.00	2,083.33	3.41	2,368.06	187.06	$387.95	$35,303.18
2017	6.63	4,604.17	3.00	2,083.33	3.63	2,520.83	199.13	$425.37	$38,708.22
2018	6.84	4,750.00	3.00	2,083.33	3.84	2,666.67	210.65	$463.47	$42,175.97
2019	7.06	4,902.78	3.00	2,083.33	4.06	2,819.44	222.72	$504.73	$45,930.07
2020	7.27	5,048.61	3.00	2,083.33	4.27	2,965.28	234.24	$546.76	$49,754.94
2021	7.49	5,201.39	3.00	2,083.33	4.49	3,118.06	246.31	$592.18	$53,887.97
2022	7.69	5,340.28	3.00	2,083.33	4.69	3,256.94	257.28	$637.11	$57,976.98
2023	7.89	5,479.17	3.00	2,083.33	4.89	3,395.83	268.25	$684.21	$62,262.83
2024	8.08	5,611.11	3.00	2,083.33	5.08	3,527.78	278.67	$732.12	$66,622.50
2025	8.28	5,750.00	3.00	2,083.33	5.28	3,666.67	289.64	$783.77	$71,322.79
2026	8.68	6,027.78	3.00	2,083.33	5.68	3,944.44	311.59	$868.44	$79,027.82
2027	8.84	6,138.89	3.00	2,083.33	5.84	4,055.56	320.36	$919.69	$83,691.57
2028	9.00	6,250.00	3.00	2,083.33	6.00	4,166.67	329.14	$973.23	$88,564.02
2029	9.15	6,354.17	3.00	2,083.33	6.15	4,270.83	337.37	$1,027.49	$93,501.47
2030	9.31	6,465.28	3.00	2,083.33	6.31	4,381.94	346.15	$1,085.85	$98,812.05
2031	9.47	6,576.39	3.00	2,083.33	6.47	4,493.06	354.92	$1,146.78	$104,357.11

Table Appendix A, Annual Electricity Costs

Annual Electricity Costs		
Year	**Total Cost** (Annually)	**Net Present Worth** $
2011	$55,020.39	$55,020.39
2012	$57,130.92	$59,987.47
2013	$59,318.57	$60,783.44
2014	$61,683.64	$62,695.02
2015	$64,036.71	$64,822.59
2016	$66,475.46	$67,127.30
2017	$70,815.67	$71,393.87
2018	$75,246.64	$75,772.94
2019	$79,992.86	$80,482.21
2020	$84,839.61	$85,300.79
2021	$90,025.19	$90,465.50
2022	$95,198.31	$95,621.50
2023	$100,600.80	$101,010.66
2024	$106,110.61	$106,509.60
2025	$111,995.55	$112,386.53
2026	$120,920.75	$121,314.71
2027	$126,841.29	$127,228.67
2028	$133,008.24	$133,390.52
2029	$139,279.01	$139,657.05
2030	$145,962.92	$146,338.22
2031	$152,922.51	$153,296.02
		$2,010,605.00

Appendix B, KCMO Rate Increase Letter and Kansas City Star Article on Water Rates

'The bill is coming home' on KC's water system, city manager tells council

Kansas City Star, The (MO) - Friday, July 29, 2011
Author: *LYNN HORSLEY, The Kansas City Star*

Kansas City's rash of **water** main breaks this year is a symptom of a much bigger problem, City Manager Troy Schulte told the City Council on Thursday.

The city has 2,750 miles of aging, leak-prone pipes, and for decades it has failed to spend enough money to upgrade and maintain that system.

"As the system is aging, it's experiencing failure," Schulte said. "The bill is coming home."

The **water** pipes need a massive investment on a similar scale to what's happening with the sewer system, he said.

Kansas City has just embarked on a 25-year, federally mandated $2.5 billion overhaul of its sewer system, and residents probably will experience double-digit sewer **rate** increases every year for at least 12 years to pay for that.

Schulte said the city should be spending $55 million a year on new **water** pipes, but it's actually spending $24 million this year. **Water rates** are increasing 10 percent annually on top of the sewer **rate** increases and probably would have to continue at that level to pay for $2 billion in improvements over time.

Council members said bonds would have to be sold in the next few years to embark on such a program.

In the meantime, while spending on maintenance lags, pipes will continue to burst, Schulte warned.

Excessive heat doesn't help. The city has seen 170 **water** main breaks so far this month, compared with 97 in July a year ago. It's on pace to have more than 1,400 breaks this year, compared with 1,136 all of last year.

The **Water** Services Department has had a revolving door of directors since 2007, and Schulte said his priority is to hire a new leader for the utility.

Part of the challenge, he said, has been finding someone with expertise in customer service improvements, management of large operations and management of huge sewer overhauls.

Schulte said he's optimistic he will have someone on board within 60 days.

The privately owned Missouri American **Water** Co. has made overtures to council members to consider selling the **water** system.

But Mayor Sly James took pains Thursday to shoot down any rumors that the **water** system is for sale.

"This city is not considering anything except getting a director in place," James said. "The sale of assets is not under consideration."

Find more articles from page A4
Find more from section "News"
Find all articles from July 29, 2011

Section: *News*
Page: *A4*
Provided By: *The McClatchy Company*
Index Terms: *City Council; The Water Services Department; Missouri American Water Co.*
Personal Name(s): *Troy Schulte*
Record Number: *86e624cdad038b42870a312937c11c2f*

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Appendix C, Opflow Magazine Article

PRACTICAL IDEAS FOR WATER OPERATORS

American Water Works Association

Opflow

EMERGENCY RESPONSE
WATER-SECTOR PARTNERSHIPS AID UTILITIES

FIELD OPERATIONS
Crews Gain Independence With Mapping System

OPERATIONS
How Is Declining Water Use Affecting Operations?

DISINFECTION
Study Compares Chlorine Analyzers

ALSO
AMR Technology
Water Reuse
ACE11 Preview

VOLUME 37, NO. 5 MAY 2011

Declining Residential Water Use Presents Challenges, Opportunities

Conservation efforts and use of more efficient appliances are causing residential customers to use less water. How does this affect the way utilities conduct their business and operations?

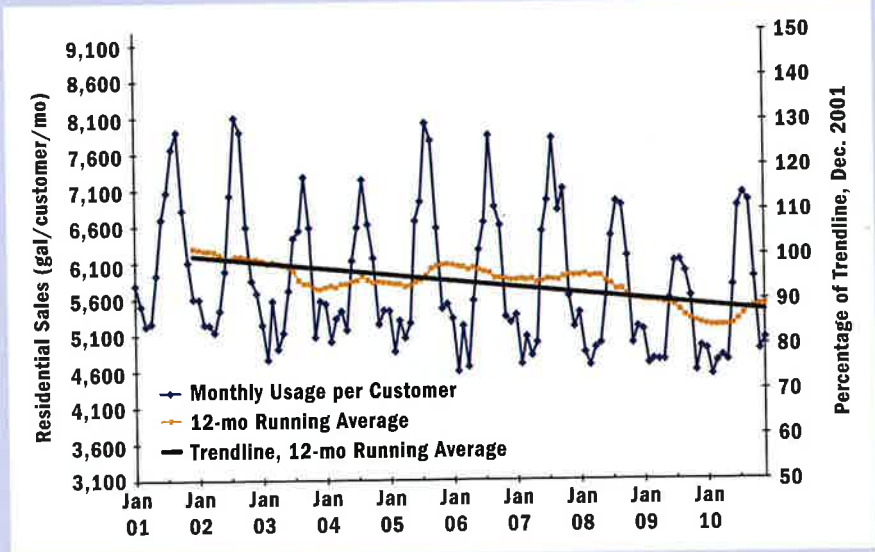
BY MARGARET HUNTER, KELLY DONMOYER, JIM CHELIUS, AND GARY NAUMICK

FOR MANY North American utilities, residential water use has declined steadily for the last 20 years. In many locations, the trend has accelerated in the last decade. The long-term trend could significantly affect utilities.

A utility services company studied historic water usage trends for its US operations during the last 10 years. Figure 1 shows monthly residential use per customer. Overall, residential water use across the company's largest state subsidiaries declined about 1.4 percent/yr/customer between 2001 and 2010. The trend of declining use was consistent across widely ranging geographic locations and demographic characteristics. Similar results were found in a study of winter-only consumption in northern US service areas where there's little or no outdoor water use during winters.

Figure 1. Monthly Residential Sales Per Customer

Residential water use declined between 2001 and 2010 among state subsidiaries of a large utility services company.

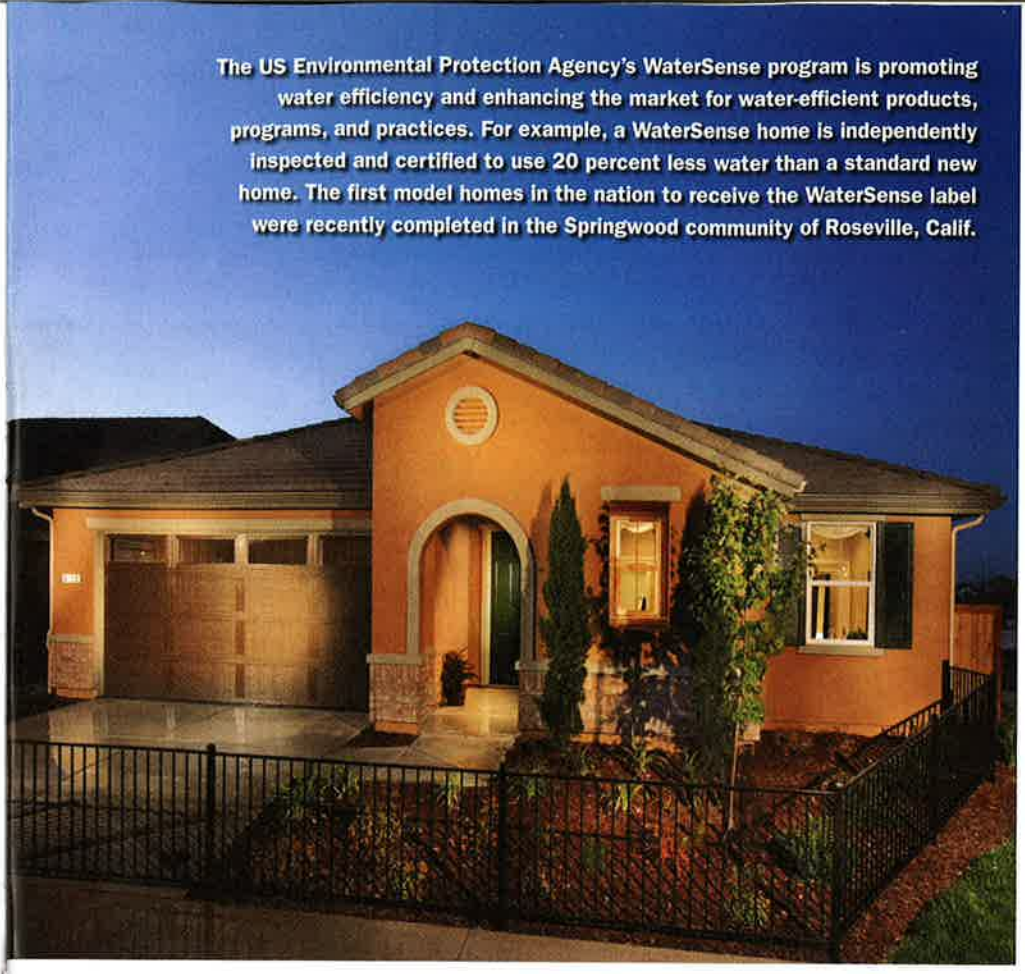


The consistency of the findings indicates strong underlying drivers are affecting indoor residential usage patterns. These findings closely match data published in a 2010 Water Research Foundation Report, North America Residential Water Usage Trends Since 1992.

CAUSES OF DECLINING USE

Several factors appear to contribute to declining household water use, including high-efficiency plumbing fixtures; a decline in persons per household in many locations; utility-led water efficiency programs, such as consumer education, fixture retrofit, and water audit programs; increased conservation practices and awareness; economic conditions; and price elasticity.

The Energy Policy and Conservation Act of 1992 mandated the manufacture of water-efficient toilets, showerheads, and



The US Environmental Protection Agency's WaterSense program is promoting water efficiency and enhancing the market for water-efficient products, programs, and practices. For example, a WaterSense home is independently inspected and certified to use 20 percent less water than a standard new home. The first model homes in the nation to receive the WaterSense label were recently completed in the Springwood community of Roseville, Calif.

PHOTOGRAPH: KB HOMES

Margaret Hunter, Kelly Donmoyer, Jim Chelius, and Gary Naumick are with American Water (www.amwater.com), Voorhees, N.J.

faucet fixtures. For example, a toilet manufactured after 1994 uses 1.6 gal/flush (gpf) or less compared with an older toilet's water use, which was 3.5–7 gpf.

The Energy Independence & Security Act of 2007 established high-efficiency standards for dishwashers and clothes washers. Dishwashers manufactured after 2009 and clothes washers manufactured after 2010 must meet water efficiency requirements that could reduce water used by such fixtures by 54 percent and 30 percent, respectively. Fixtures and appliances that surpass these requirements are increasingly available in the marketplace.

All other factors being equal, typical residents living in a home built in 2011 would use 35 percent less water for indoor purposes than a nonretrofitted home built before 1994. The accompanying table contains more details about regulatory requirements and the typical effect they have had on residential water use. Changing household demographics, such as a decrease in the number of persons per household, have also affected residential water use.

Although indoor water use for consumption and hygiene is considered relatively inelastic, i.e., not affected by economic conditions, it can be affected by water and sewer rate increases. For example, leaks that may be ignored when rates are low tend to be repaired when rates increase. Nonessential residential water use for lawn and garden irrigation, car washing, water features, and swimming pools tends to have more elasticity relative to water and sewer rate increases. In addition, conservation-inducing rate structures have prompted significant elasticity in indoor water use. Price elasticity estimates generally range from -0.05 to -0.50 (percentage change in consumption divided by the percentage change in price). Elasticity estimates the percent change in consumption expected to occur in response to a percent price increase; the negative sign implies that consumption decreases as the price of water increases.

OPERATIONAL IMPLICATIONS

Because the current water use trend is likely to continue, water utility managers and operators must consider the effects of reduced consumption on their systems and rates. In some service areas,

Flow Rates for Typical Household Fixtures and Appliances

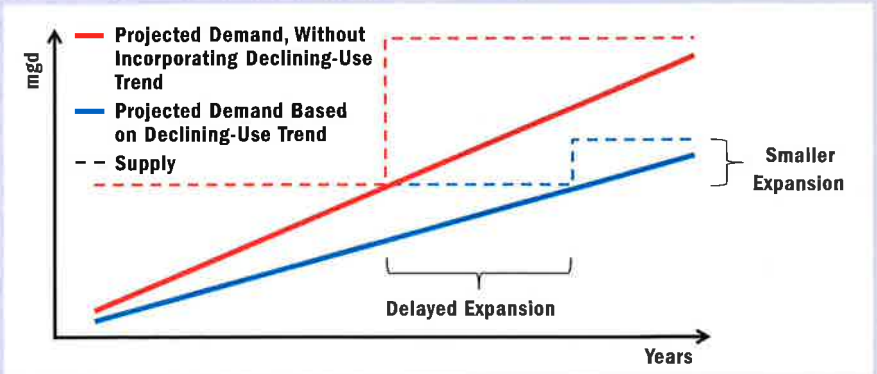
Flow rates vary significantly before and after implementation of various federal standards.

Type of Use	Pre-Regulatory Flow*	Regulatory Standards and Flows			WaterSense/ ENERGY STAR Current Specification+
		Regulatory Standard (maximum)	Federal Law	Year Effective	
Toilets	3.5 gpf	1.6 gpf	US Energy Policy Act	1994	1.28 gpf
Clothes washers**	41 gpl (14.6 WF)	Estimated 26.6 gpl (9.5 WF)	Energy Independence and Security Act of 2007	2011	Estimated 22.4 gpl (8.0 WF)
Showers	2.75 gpm	2.5 gpm at 80 psi	US Energy Policy Act	1994	No specification
Faucets***	2.75 gpm	2.5 gpm at 80 psi (1.5 gpm)	US Energy Policy Act	1994	1.5 gpm at 60 psi
Dishwashers	14 gpc	6.5 gpc for standard; 4.5 gpc for compact	Energy Independence and Security Act of 2007	2010	5.8 gpc for standard; 4.0 gpc for compact

* Source: *Handbook of Water Use and Conservation*, Amy Vickers, May 2001
** Average estimated gallons per load and water factor
*** Regulation maximum of 2.5 gpm at 80 psi, but lavatory faucets available at 1.5 gpm maximum
+ Source: www.epa.gov/watersense and www.energystar.gov websites

Figure 2. Declining Use and Delayed Smaller Expansion

Declining water use may affect long-term capital planning.



population growth has been sufficient to provide an overall increase in total residential use (gal/mo). However, in areas where customer growth is slow or nonexistent, declines in customer use have resulted in lower overall water use. Utilities must address the financial implications of reduced consumption.

Several environmental and operational advantages result from lower water use. Necessary diversions from supply sources are lessened, leaving more water for passing flows or drought reserve. Reductions in power consumption, chemical use, and waste disposal reduce utility operating costs and provide environmental benefits, such as reduced carbon footprints and waste streams.

Declining water use also affects long-term capital planning. Utility planners should ensure that capital projects are based on the most current information. As shown in Figure 2, when anticipated customer demand indicates declining use, a project to develop a supply to meet future demands could be downsized or postponed. However, it's important to note that, although a utility's average daily consumption may decline, its peak day demands may not. Peak day demands typically drive capital infrastructure needs, such as treatment and pumping capacity. Peak day demands are driven by short-term events, such as hot, dry weather or seasonal community events that temporarily increase population or use. Utility managers and operators should understand customer demand patterns to determine peak demand trends and to understand whether those trends are the same as average usage.

Declining usage can also present opportunities to optimize management of water supplies, treatment facilities, and pump stations. Systems that rely on multiple supply sources with significant cost differences for securing, pumping, and treating may be able to save money by minimizing use of higher-cost supplies. Purchase water agreements should be reviewed regularly and given consideration for reducing annual purchases and minimizing take-or-pay limits where continued declining usage is anticipated. This can be particularly advantageous for systems that must purchase water to supplement more economical but limited or stressed supplies.

Reduced demands can present opportunities for more efficient and effective pumping and treatment. For example, lower demands can result in increased system storage capacity that allows more off-peak pumping and reduced electricity demand charges. Scheduled maintenance of certain process equipment, such as granular activated carbon media and membrane replacement, might be extended.

SUSTAINABILITY

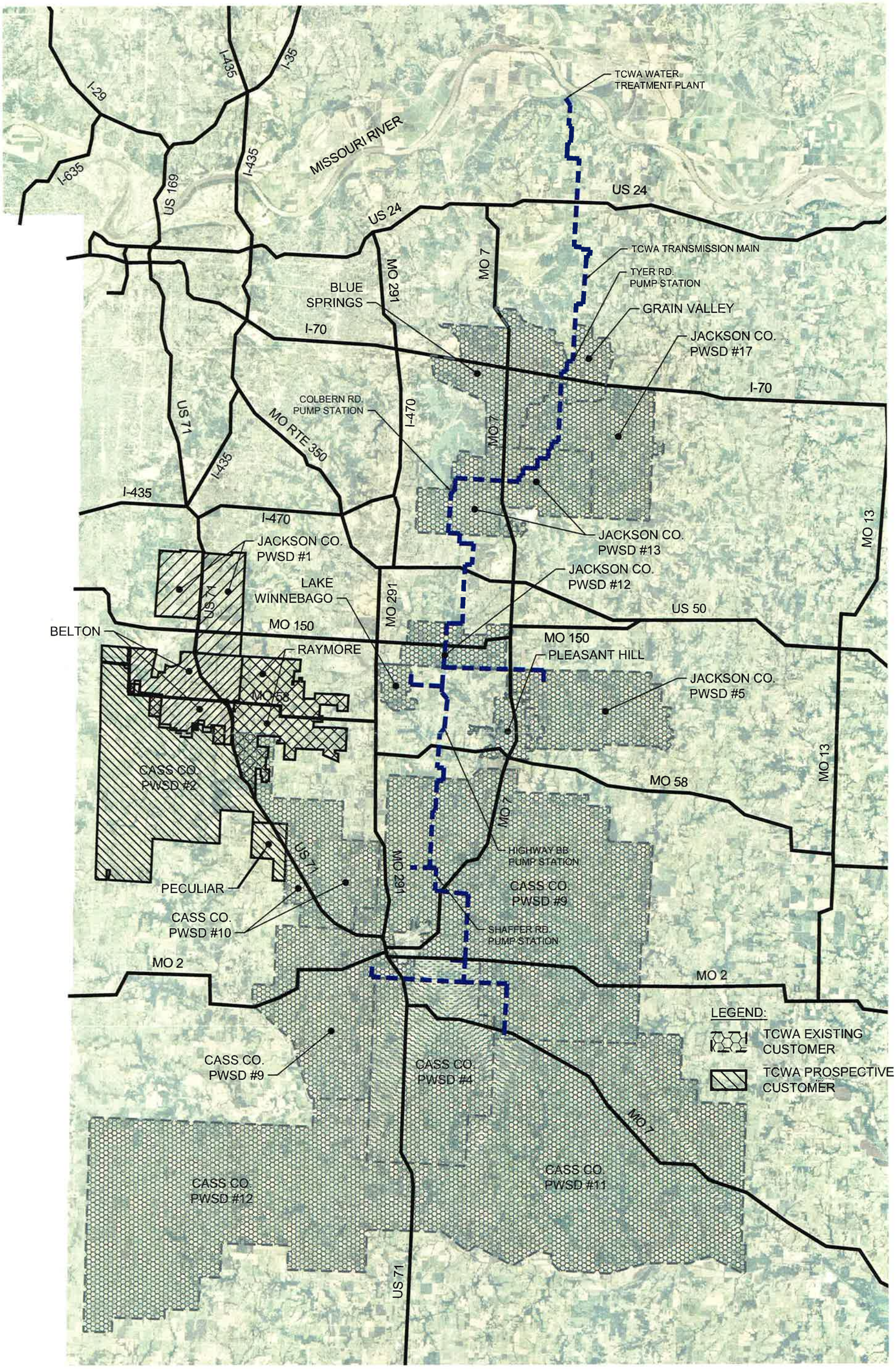
Efficient residential water use has environmental, economic, and energy-efficiency benefits and should be encouraged. It may help utilities optimize asset allocation and reduce costs. However, many water utility capital needs (infrastructure renewal, reliability, regulatory projects, etc.) and operating costs (salaries, plant maintenance, customer services needs, IT support, security, etc.) are unaffected by reduced consumption. Water utilities must, therefore, mitigate the impact of lost revenue. However, reduced demand presents utilities with a significant but surmountable financial challenge: Rising infrastructure costs must be recovered from a declining sales base. Tariff design mechanisms, such as revenue-balancing accounts and increased fixed charges, help to decouple revenue from sales.

In its June 2008 publication—*Effective Utility Management, a Primer for Water and Wastewater Utilities*—the US Environmental Protection Agency described the attributes of an effective utility, which included water resource adequacy, financial viability, and operational optimization. By taking proactive steps to address revenue stability, efficient operations, and customer education, utility operators and managers can ensure that customers, the utility, and the environment benefit.

RESOURCES

- Beecher, Janice A., 2010. The conservation conundrum: How declining demand affects water utilities. *Journal AWWA*, 102:278.
- USEPA, 2006. Expert Workshop on Full Cost Pricing of Water and Wastewater Service.
- Vickers, Amy, 2001. *Handbook of Water Use and Conservation*, WaterPlow Press, Amherst, Mass.
- Water Research Foundation, 2010. North America Residential Water Usage Trends Since 1992.

Appendix D, Tri-County Water Authority, Maps and Cost Estimates



TRI-COUNTY WATER AUTHORITY

EXISTING & PROSPECTIVE CUSTOMERS

HDR | Archer
HDR ENGINEERING, INC.
3741 N.E. TROON DRIVE
LEE'S SUMMIT, MO 64064
816-554-3019 • FAX 816-554-3061

NO.	DATE	BY	REVISION
-	-	-	
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EXTERNAL REFERENCE

IMAGE REFERENCE

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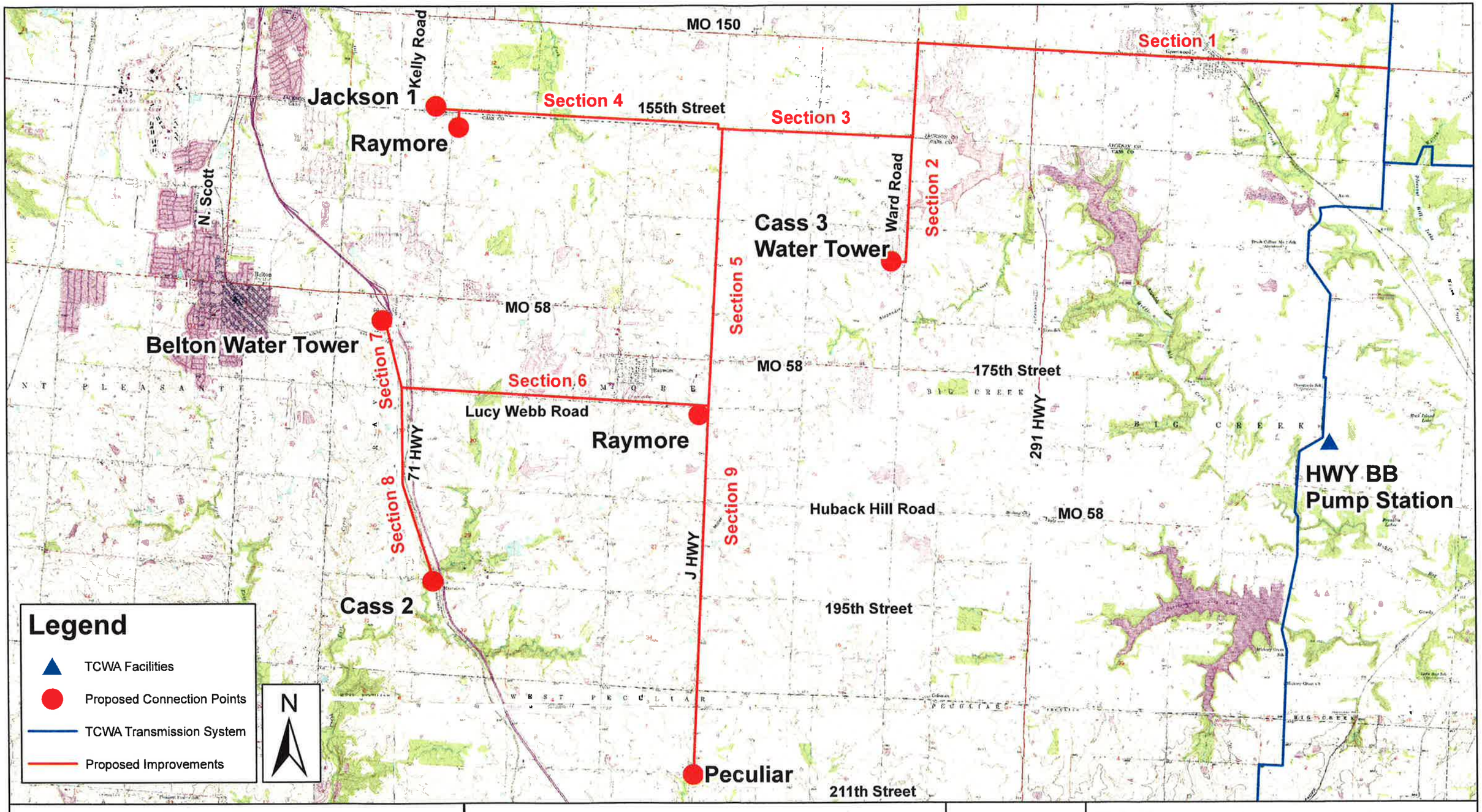


	Tri-County Water Authority **Suburban Customer Proposed Layout**	**April, 2011**	**Tri-County Water Authority** HDR | Archer

Tri County Water Authority
Suburban Customer Cost-of-Service (2011 Dollars)
Table 1 - Capital Cost Allocation
"Preliminary"

Component	Capacity(mgd)	Cost($xmillion)	----- Belton ----- mgd	$ (mil)	----- Cass 2 ----- mgd	$ (mil)	----- Cass 3 ----- mgd	$ (mil)	----- Jackson 1 ----- mgd	$ (mil)	----- Peculiar ----- mgd	$ (mil)	----- Raymore ----- mgd	$ (mil)
Wells	31.6	12.64	15.6	6.24	1.1	0.44	2.1	0.84	4.4	1.76	1.6	0.64	6.8	2.72
Treatment	31.6	79.00	15.6	39.00	1.1	2.75	2.1	5.25	4.4	11.00	1.6	4.00	6.8	17.00
WTP-Tyer (83,100 LF of 42")	31.6	22.69	15.6	11.20	1.1	0.79	2.1	1.51	4.4	3.16	1.6	1.15	6.8	4.88
Tyer Storage and Pumping	31.6	11.06	15.6	5.46	1.1	0.39	2.1	0.74	4.4	1.54	1.6	0.56	6.8	2.38
Tyer to Colbern (55,500 LF of 42")	31.6	15.15	15.6	7.48	1.1	0.53	2.1	1.01	4.4	2.11	1.6	0.77	6.8	3.26
Colbern Storage and Pumping	31.6	11.06	15.6	5.46	1.1	0.39	2.1	0.74	4.4	1.54	1.6	0.56	6.8	2.38
Colbern-to-Hwy 150 (42,000 LF of 42")	31.6	11.47	15.6	5.66	1.1	0.40	2.1	0.76	4.4	1.60	1.6	0.58	6.8	2.47
Suburban Storage and Pumping	31.6	11.06	15.6	5.46	1.1	0.39	2.1	0.74	4.4	1.54	1.6	0.56	6.8	2.38
Section 1 (31,800 LF of 42")	31.6	8.68	15.6	4.29	1.1	0.30	2.1	0.58	4.4	1.21	1.6	0.44	6.8	1.87
Section 2 (7,100 LF of 12")	2.1	0.55	-	-	-	-	2.1	0.55	-	-	-	-	-	-
Section 3 (10,500 LF of 42")	29.5	2.87	15.6	1.52	1.1	0.11	-	-	4.4	0.43	1.6	0.16	6.8	0.66
Section 4 (15,600 LF of 24")	7.8	2.43	-	-	-	-	-	-	4.4	1.37	-	-	3.4	1.06
Section 5 (16,200 LF of 36")	21.7	3.79	15.6	2.72	1.1	0.19	-	-	-	-	1.6	0.28	3.4	0.59
Section 6 (17,500 LF of 30")	16.7	3.41	15.6	3.19	1.1	0.22	-	-	-	-	-	-	-	-
Section 7 (3,600 LF of 30")	15.6	0.70	15.6	0.70	-	-	-	-	-	-	-	-	-	-
Section 8 (11,400 LF of 12")	1.1	0.89	-	-	1.1	0.89	-	-	-	-	-	-	-	-
Section 9 (26,300 LF of 12")	1.6	2.05	-	-	-	-	-	-	-	-	1.6	2.05	-	-
Master Meters (7)	-	1.60	15.6	0.40	1.1	0.20	2.1	0.20	4.4	0.20	1.6	0.20	6.8*	0.40
		201.10		98.78		7.98		12.90		27.45		11.94		42.05

Assumptions:

Wells:	$0.40 per 1 gpd
Treatment:	$2.50 per 1 gpd
Pipeline:	$6.50/LF/inch
Booster Pumping & Storage:	$0.35 per 1 gpd

*2 meters @ 3.4 mgd, each

Tri County Water Authority
Suburban Customer Cost-of-Service (2011 Dollars)
Table 2 - Water Rate Calculation
"Preliminary"

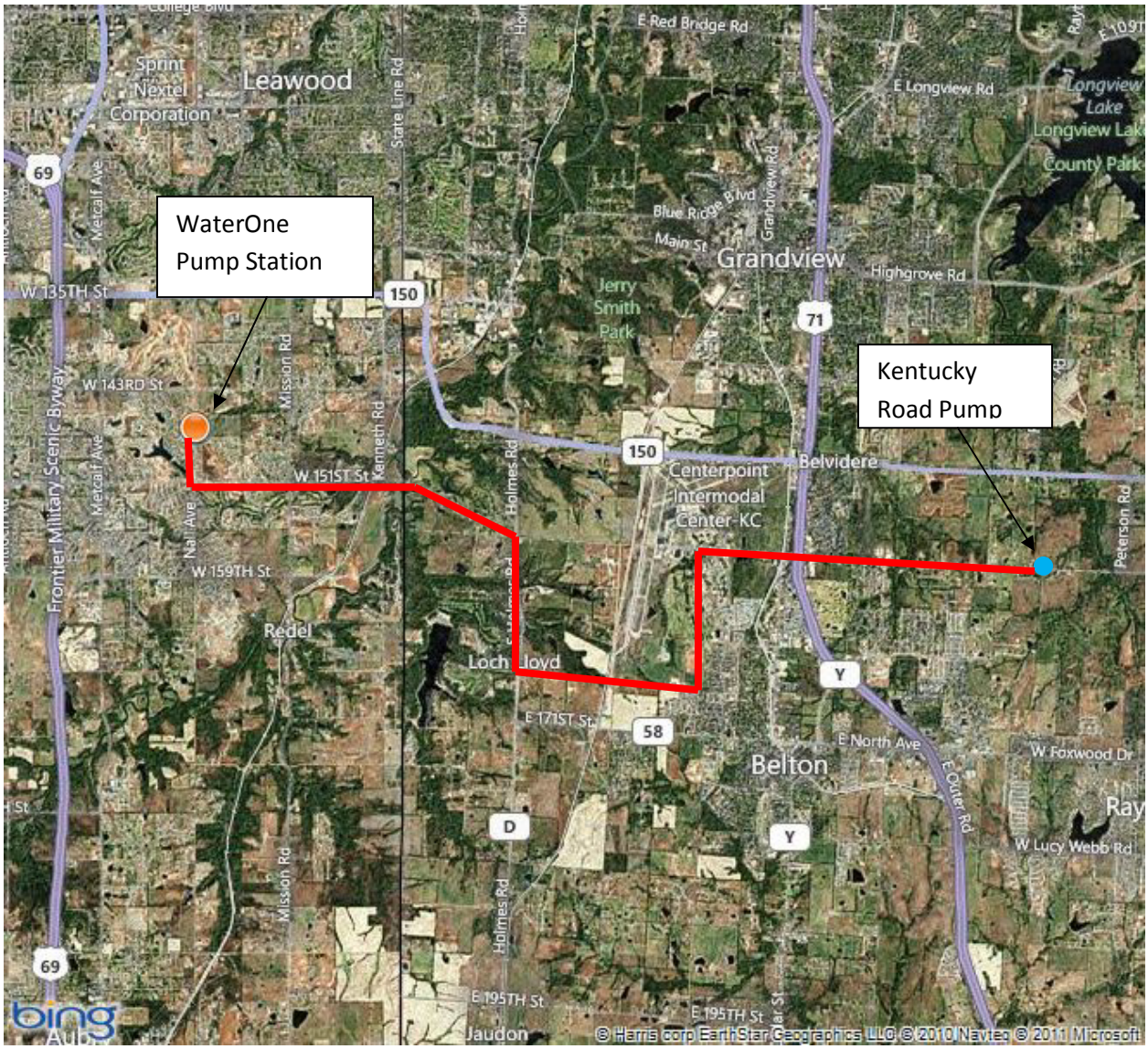
Customer	Capital Cost ($ x million)	2011 Debt Service ($ x million)	2011 Avg Day Demand (mgd)	---- 2011 Rate ($/1000 gal) ---- Debt	O&M	Total	2030 Debt Service ($ x million)	2030 Avg Day Demand (mgd)	---- 2030 Rate ($/1000 gal) ---- Debt	O&M	Total
Belton	98.78	6.67	3.00	6.09	1.75	7.84	8.15	6.23	3.58	1.75	5.33
Cass 2	7.98	0.54	0.42	3.51	1.75	5.26	0.66	0.56	3.22	1.75	4.97
Cass 3	12.90	0.87	0.18	13.25	1.75	15.00	1.06	1.20	2.43	1.75	4.18
Jackson 1	27.45	1.85	2.75	1.85	1.75	3.60	2.26	2.82	2.20	1.75	3.95
Peculiar	11.94	0.81	0.38	5.81	1.75	7.56	0.99	0.80	3.37	1.75	5.12
Raymore	42.05	2.84	1.43	5.44	1.75	7.19	3.47	2.27	4.19	1.75	5.94
Totals	201.10	13.57	8.16				16.59	13.88			

Assumptions:

Average annual debt service = Capital Cost x 0.075
Assume 1% annual growth factor in debt payment schedule

Appendix E, WaterOne Information

147th Street and Nall Avenue in Overland Park, Kansas
Connection to Raymore at the Kentucky Road Pump Station
Distance 65,000 to 75,000 Feet depending upon final route.



Water One Water Rate Information

STR

December 23, 2010

Chris Burns, P.E. President
Stephen J. Roth, P.E. LEED AP

Delich Roth & Goodwillie, P.A.
913 Sheidley Avenue, Suite 110
Bonner Springs, Kansas 66012

Gentlemen:
It was nice to see you both again. WaterOne looks forward to working with you and the City of Belton.

Enclosed please find scenarios for various MGD options that we discussed in our meeting. We have provided a base option of 1 MGD so that you could extrapolate precisely your needs. Also included are options for 2, 4 & 8 MGD each with and without a peaking factor. This should give you the ability to tailor "what if" scenarios to your future expansion needs. All costs are in 2011 dollars.

If you have further questions about any of these scenarios, please don't hesitate to call me (913-895-5522) or Darin Kamradt (913-895-5537).

Mary Lou Gaunt
Financial Planning Manager
Water district #1 of Johnson County

Test Year
2011

Line No.	Description	Net Plant Investment	Capacity	Unit Cost	Equivalent Demands	Supply & Treatment Max Day	Trans. & Distribution Max. Day	Trans. & Distribution Max. Hour	Total
		$	gpd	$/ gpd	gpd	$/Eq. Cust.	$/Eq. Cust.	$/Eq. Cust.	$/Eq. Cust.
1	Source of Supply	129,001,886	210,000,000	0.6143	1,000,000.00	614,295			614,295
2	Treatment	226,443,034	210,000,000	1.0783	1,000,000.00	1,078,300			1,078,300
	Transmission								
3	Max Day Related	162,297,288	210,000,000	0.7728	1,000,000.00		772,844		772,844
4	Max Hour Related	110,379,607	140,000,000	0.7884				0	0
5	Total	272,676,895							
	Distribution								
6	Max Day Related	117,445,206	210,000,000	0.5593	0.00		0		0
7	Max Hour Related	79,875,369	140,000,000	0.5705	0.00			0	0
8	Total	197,320,575							
9	Total Gross System Development Charge[1]	825,442,390				1,692,595	772,844	0	2,465,439
10	Surcharge							25.00%	616,360
11	Total Wholesale System Development Charge (Example)								$ 3,081,799

1. Outstanding principal and finance charges related to current debt are subtracted from net plant investment

Test Year
2011

Line No.	Description	Net Plant Investment	Capacity	Unit Cost	Equivalent Demands	Supply & Treatment Max Day	Trans. & Distribution Max. Day	Trans. & Distribution Max. Hour	Total
		$	gpd	$/ gpd	gpd	$/Eq. Cust.	$/Eq. Cust.	$/Eq. Cust.	$/Eq. Cust.
1	Source of Supply	129,001,886	210,000,000	0.6143	2,000,000.00	1,228,589			1,228,589
2	Treatment	226,443,034	210,000,000	1.0783	2,000,000.00	2,156,600			2,156,600
	Transmission								
3	Max Day Related	162,297,288	210,000,000	0.7728	2,000,000.00		1,545,688		1,545,688
4	Max Hour Related	110,379,607	140,000,000	0.7884				0	0
5	Total	272,676,895							
	Distribution								
6	Max Day Related	117,445,206	210,000,000	0.5593	0.00		0		0
7	Max Hour Related	79,875,369	140,000,000	0.5705	0.00			0	0
8	Total	197,320,575							
9	Total Gross System Development Charge[1]	825,442,390				3,385,190	1,545,688	0	4,930,878
10	Surcharge							25.00%	1,232,720
11	Total Wholesale System Development Charge (Example)								$ 6,163,598

1. Outstanding principal and finance charges related to current debt are subtracted from net plant investment

Test Year
2011

Line No.	Description	Net Plant Investment	Capacity	Unit Cost	Equivalent Demands	Supply & Treatment Max Day	Trans. & Distribution Max. Day	Trans. & Distribution Max. Hour	Total
		$	gpd	$/ gpd	gpd	$/Eq. Cust.	$/Eq. Cust.	$/Eq. Cust.	$/Eq. Cust.
1	Source of Supply	129,001,886	210,000,000	0.6143	2,000,000.00	1,228,589			1,228,589
2	Treatment	226,443,034	210,000,000	1.0783	2,000,000.00	2,156,600			2,156,600
	Transmission								
3	Max Day Related	162,297,288	210,000,000	0.7728	2,000,000.00		1,545,688		1,545,688
4	Max Hour Related	110,379,607	140,000,000	0.7884	1,000,000.00			788,426	788,426
5	Total	272,676,895							
	Distribution								
6	Max Day Related	117,445,206	210,000,000	0.5593	0.00		0		0
7	Max Hour Related	79,875,369	140,000,000	0.5705	0.00			0	0
8	Total	197,320,575							
9	Total Gross System Development Charge[1]	825,442,390				3,385,190	1,545,688	788,426	5,719,304
10	Surcharge							25.00%	1,429,826
11	Total Wholesale System Development Charge (Example)								$ 7,149,130

1. Outstanding principal and finance charges related to current debt are subtracted from net plant investment

Test Year
2011

Line No.	Description	Net Plant Investment	Capacity	Unit Cost	Equivalent Demands	Supply & Treatment Max Day	Trans. & Distribution Max. Day	Trans. & Distribution Max. Hour	Total
		$	gpd	$/ gpd	gpd	$/Eq. Cust.	$/Eq. Cust.	$/Eq. Cust.	$/Eq. Cust.
1	Source of Supply	$29,001,886	210,000,000	0.6143	4,000,000.00	2,457,179			2,457,179
2	Treatment	226,443,034	210,000,000	1.0783	4,000,000.00	4,313,201			4,313,201
	Transmission								
3	Max Day Related	162,297,288	210,000,000	0.7728	4,000,000.00		3,091,377		3,091,377
4	Max Hour Related	110,379,607	140,000,000	0.7884				0	0
5	Total	272,676,895							
	Distribution								
6	Max Day Related	$17,445,206	210,000,000	0.5593	0.00		0		0
7	Max Hour Related	79,875,369	140,000,000	0.5705	0.00			0	0
8	Total	197,320,575							
9	Total Gross System Development Charge[1]	825,442,390				6,770,379	3,091,377	0	9,861,756
10	Surcharge							25.00%	2,465,439
11	Total Wholesale System Development Charge (Example)								$ 12,327,195

1. Outstanding principal and finance charges related to current debt are subtracted from net plant investment

Test Year
2011

Line No.	Description	Net Plant Investment	Capacity	Unit Cost	Equivalent Demands	Supply & Treatment Max Day	Trans. & Distribution Max. Day	Trans. & Distribution Max. Hour	Total
		$	gpd	$/ gpd	gpd	$/Eq. Cust.	$/Eq. Cust.	$/Eq. Cust.	$/Eq. Cust.
1	Source of Supply	129,081,886	210,000,000	0.6143	4,000,000.00	2,457,179			2,457,179
2	Treatment	226,443,034	210,000,000	1.0783	4,000,000.00	4,313,201			4,313,201
	Transmission								
3	Max Day Related	162,297,288	210,000,000	0.7728	4,000,000.00		3,091,377		3,091,377
4	Max Hour Related	110,379,607	140,000,000	0.7884	2,000,000.00			1,576,852	1,576,852
5	Total	272,676,895							
	Distribution								
6	Max Day Related	117,445,206	210,000,000	0.5593	0.00		0		0
7	Max Hour Related	79,875,369	140,000,000	0.5705	0.00			0	0
8	Total	197,320,575							
9	Total Gross System Development Charge[1]	825,442,390				6,770,379	3,091,377	1,576,852	11,438,608
10	Surcharge							25.00%	2,859,652
11	Total Wholesale System Development Charge (Example)								$ 14,298,260

1. Outstanding principal and finance charges related to current debt are subtracted from net plant investment

Test Year
2011

Line No.	Description	Net Plant Investment	Capacity	Unit Cost	Equivalent Demands	Supply & Treatment Max Day	Trans. & Distribution Max. Day	Trans. & Distribution Max. Hour	Total
		$	gpd	$/ gpd	gpd	$/Eq. Cust.	$/Eq. Cust.	$/Eq. Cust.	$/Eq. Cust.
1	Source of Supply	129,001,886	210,000,000	0.6143	8,000,000.00	4,914,358			4,914,358
2	Treatment	226,443,034	210,000,000	1.0783	8,000,000.00	8,626,401			8,626,401
	Transmission								
3	Max Day Related	162,297,288	210,000,000	0.7728	8,000,000.00		6,182,754		6,182,754
4	Max Hour Related	110,379,607	140,000,000	0.7884				0	0
5	Total	272,676,895							
	Distribution								
6	Max Day Related	117,445,206	210,000,000	0.5593	0.00		0		0
7	Max Hour Related	79,875,369	140,000,000	0.5705	0.00			0	0
8	Total	197,320,575							
9	Total Gross System Development Charge[1]	825,442,390				13,540,759	6,182,754	0	19,723,513
10	Surcharge							25.00%	4,930,878
11	Total Wholesale System Development Charge (Example)								$ 24,654,391

1. Outstanding principal and finance charges related to current debt are subtracted from net plant investment

Test Year
2011

Line No.	Description	Net Plant Investment	Capacity	Unit Cost	Equivalent Demands	Supply & Treatment Max Day	Trans. & Distribution Max. Day	Trans. & Distribution Max. Hour	Total
		$	gpd	$/gpd	gpd	$/Eq. Cust.	$/Eq. Cust.	$/Eq. Cust.	$/Eq. Cust.
1	Source of Supply	129,001,886	210,000,000	0.6143	8,000,000.00	4,914,358			4,914,358
2	Treatment	226,443,034	210,000,000	1.0783	8,000,000.00	8,626,401			8,626,401
	Transmission								
3	Max Day Related	162,297,288	210,000,000	0.7728	8,000,000.00		6,182,754		6,182,754
4	Max Hour Related	110,379,607	140,000,000	0.7884	4,000,000.00			3,153,703	3,153,703
5	Total	272,676,895							
	Distribution								
6	Max Day Related	117,445,206	210,000,000	0.5593	0.00		0		0
7	Max Hour Related	79,875,369	140,000,000	0.5705	0.00			0	0
8	Total	197,320,575							
9	Total Gross System Development Charge[1]	825,442,390				13,540,759	6,182,754	3,153,703	22,877,216
10	Surcharge							25.00%	5,719,304
11	Total Wholesale System Development Charge (Example)								$ 28,596,520

1. Outstanding principal and finance charges related to current debt are subtracted from net plant investment

WaterOne

Water District No. 1 of Johnson County

Wholesale SDC and Volume Rates

Ron Appletoft

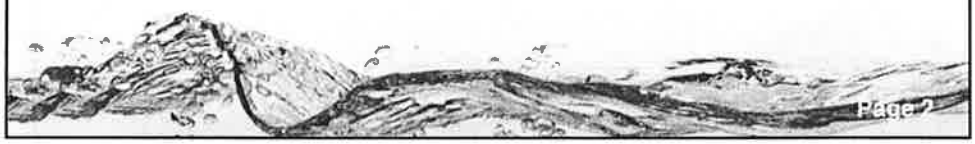
Finance Committee

March 29, 2011

WaterOne

Agenda

- Wholesale Background
- Why Change
- Recommendations
  - System Development Charge
  - Volume Rate
- Customer Comparison
- Board Action



Wholesale Background

WaterOne

2003 study revised wholesale methodology

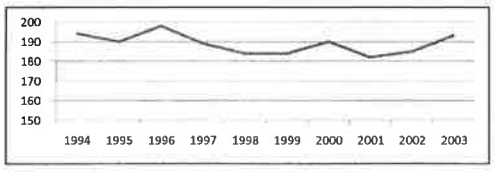
- Prior to 2003
  - Commodity-demand based rates
  - Recovered capital investment through water rates
  - Included take or pay provisions
- Revised wholesale structure
  - Added SDC to recover capital investment up-front
  - Implemented uniform volume rate
  - Added 25% wholesale fee to both the SDC and volume rate

Page 3

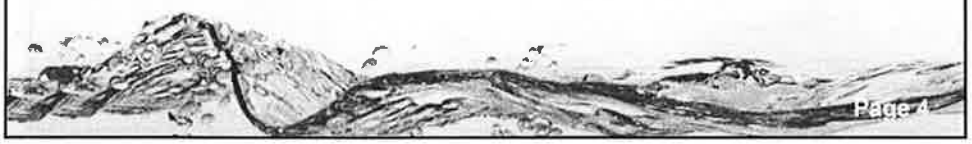
2003 Environment

WaterOne

- Base consumption was stable
  - R1 AWC
  - Gallons per day
  - 1994 = 194
  - 2003 = 193



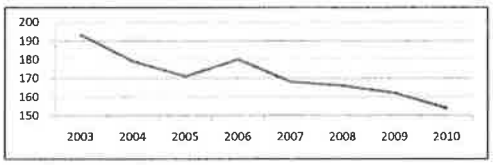
- Rapid customer growth
- Planning for capacity expansion (Phase V)
- Olathe stopped buying water as wholesale customer



Page 4

Current Environment

- Base consumption is declining
  - R1 AWC
  - Gallons per day
  - 2003 = 193
  - 2010 = 154



- Slow customer growth
- Phase V-A expansion complete at 30mgd
- Wholesale customer inquiries

Why Change

- Current environment is different
- Create the opportunity to add large base consumption customers
- Wholesale pricing more competitive
- More closely follow cost of service methodology

Recommendations

- Eliminate wholesale fee on SDC
- Change wholesale fee on volume rate calculation methodology

System Development Charge

Eliminate 25% wholesale fee on SDC

- Wholesale SDC is higher than retail SDC
  - Wholesale does not benefit from average demands
  - Examples later in customer comparison
- Cost of service theory
  - Wholesale or out of boundary fee normally in volume rate
  - Current rate consultant recommended change
- Little risk, if they cancel the contract
  - WaterOne keeps the upfront SDC
  - WaterOne keeps the donated improvements to connect

System Development Charge

RETAIL	WHOLESALE
+ Backbone Facilities	+ Backbone Facilities
+ Restricted Cash	+ Restricted Cash
+ Financing Costs	+ Financing Costs
- Outstanding Debt	- Outstanding Debt
= Total System Equity	= Total System Equity
	- Distribution & Fire Protection Assets
	= WHOLESALE System Equity
÷ System Capacity	÷ System Capacity
= Unit Cost of Capacity	= Unit Cost of Capacity
x Average Max Day/Hour Demand	x Individual Max Day/Hour Demand
= Base Retail SDC Charge	= Wholesale SDC Charge
	+ 25% Wholesale Fee
	= Total Wholesale SDC Charge

Wholesale Volume Rate

Change wholesale fee on volume rate calculation methodology

- Remove specific rate from rules & regulations
- Include wholesale volume rate "formula" in each wholesale contract
- Each wholesale contract approved by the Board
- Wholesale volume rate "formula" based on cost of service plus a variable wholesale fee

Volume Rates

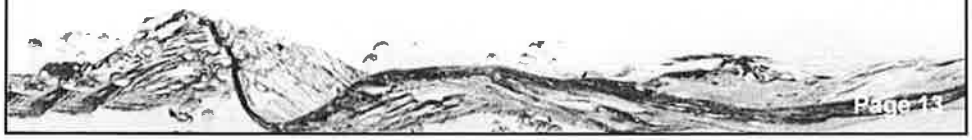
RETAIL	WHOLESALE
Service Charge Costs	Service Charge Costs
+ Meters & Services	+ Meters & Services
+ Billing	+ Billing
+ Distribution Mains (Readiness to Serve)	
+ Fire Protection	
Volume Rate	Volume Rate
+ Volume Costs (Base, Max Hr, Max Day)	+ Volume Costs (Base, Max Hr, Max Day)
	- ***Distribution Mains***
	- ***Fire Protection***
	+ 25% Wholesale Fee

Wholesale Volume Rate "Formula"

- Volume rate based on Cost of Service Model
- Plus a variable wholesale fee
- Wholesale fee =
  - WaterOne cost of debt + 4.0%
  - 2011 fee would be 3.8% + 4.0% = 7.8%
- Methodology is similar to the "Return on Rate Base" used in Utility Basis cost of service theory

Volume Rate Comparison for 2011

Current Retail Block 1 rate	$3.30
Current Wholesale Rate $2.34 + 25.0%	$2.93
Potential Wholesale Rate $2.34 + 7.8%	$2.53



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Base Capacity Available

	January 2003	January 2010	7 Year Change
No. of Customers	125,295	137,136	9.5%
Water Loss %	10.6%	11.6%	1.0%
Calculated Expected Water Production Increase			10.5%
Actual Water Production MGD	38.8	39.7	2.3%
Seven Year Decline			<8.2%>
Base Capacity Available	Last 7 Years	38.8 x 8.2% =	3.2 MGD

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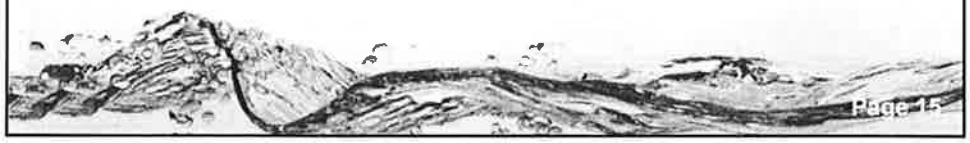
Benefits of Wholesale Base Consumption

- Offsets declining base retail consumption
- Offsets slow retail customer growth
- Does not put pressure on max day capacity
- Increases average asset utilization
- Increases average gallons sold
- Mitigates upward retail rate pressure



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Customer Comparison

2 MGD Capacity Equivalent Customer				
	Wholesale No Peak	**21 - Industrial** Low Peak	**150 – Avg. C2** Med Peak	**6 - Golf Course** High Peak
System Development Charge	$4.9M	$2.3M	$5.8M	$3.6M
Annual Water Revenue	$1.85M	$1.92M	$0.84M	$0.82M

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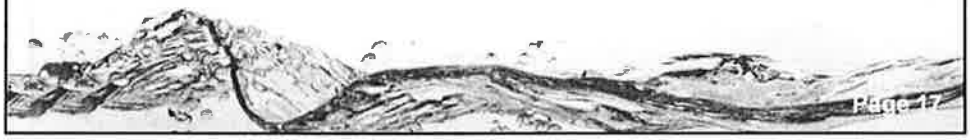
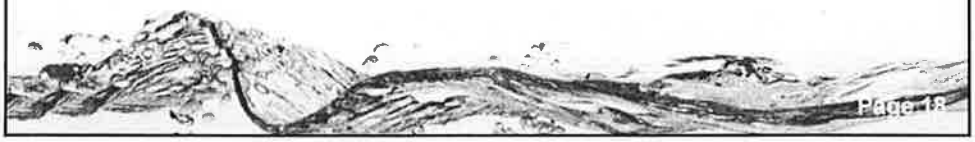
Contract Items

- Water use in excess of SDC capacity
  - Emergency
  - Routine
- Water restrictions
- Minimum usage
- Wheeling
- Metering/Billing/Payment
- System improvements to connect
- Contract termination



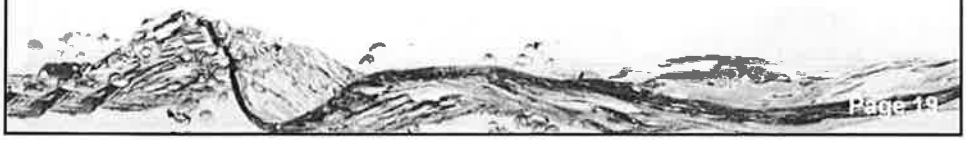
Action Item Summary

- Eliminate 25% wholesale surcharge on SDC
- Adopt a new method of calculating the wholesale fee on the volume rate
- Modify some language in the rules and regulations
  - primarily housekeeping in removing duplicative detail



WaterOne

Questions?



Test Year
2010

Line No.	Description	Net Plant Investment	Capacity	Unit Cost	Equivalent Demands	Supply & Treatment Max Day	Trans. & Distribution Max. Day	Trans. & Distribution Max. Hour	Total
		$	gpd	$/ gpd	gpd	$/Eq. Cust.	$/Eq. Cust.	$/Eq. Cust.	$/Eq. Cust.
1	Source of Supply	134,249,512	210,000,000	0.6393	2,000,000.00	1,278,567			1,278,567
2	Treatment	227,072,135	210,000,000	1.0813	2,000,000.00	2,162,592			2,162,592
	Transmission								
3	Max Day Related	156,953,872	210,000,000	0.7474	2,000,000.00		1,494,799		1,494,799
4	Max Hour Related	106,745,510	140,000,000	0.7625	950,000.00			724,345	724,345
5	Total	**263,699,382**							
	Distribution								
6	Max Day Related	110,158,625	210,000,000	0.5246	0.00		0		0
7	Max Hour Related	74,919,710	140,000,000	0.5351	0.00			0	0
8	Total	**185,078,335**							
9	Total Gross System Development Charge	**810,099,364**				3,441,159	1,494,799	724,345	**5,660,302**
10	Surcharge							25.00%	1,415,075
11	**Total Wholesale System Development Charge (Example)**								**$ 7,075,377**

1. Outstanding principal and finance charges related to current debt are subtracted from net plant investment

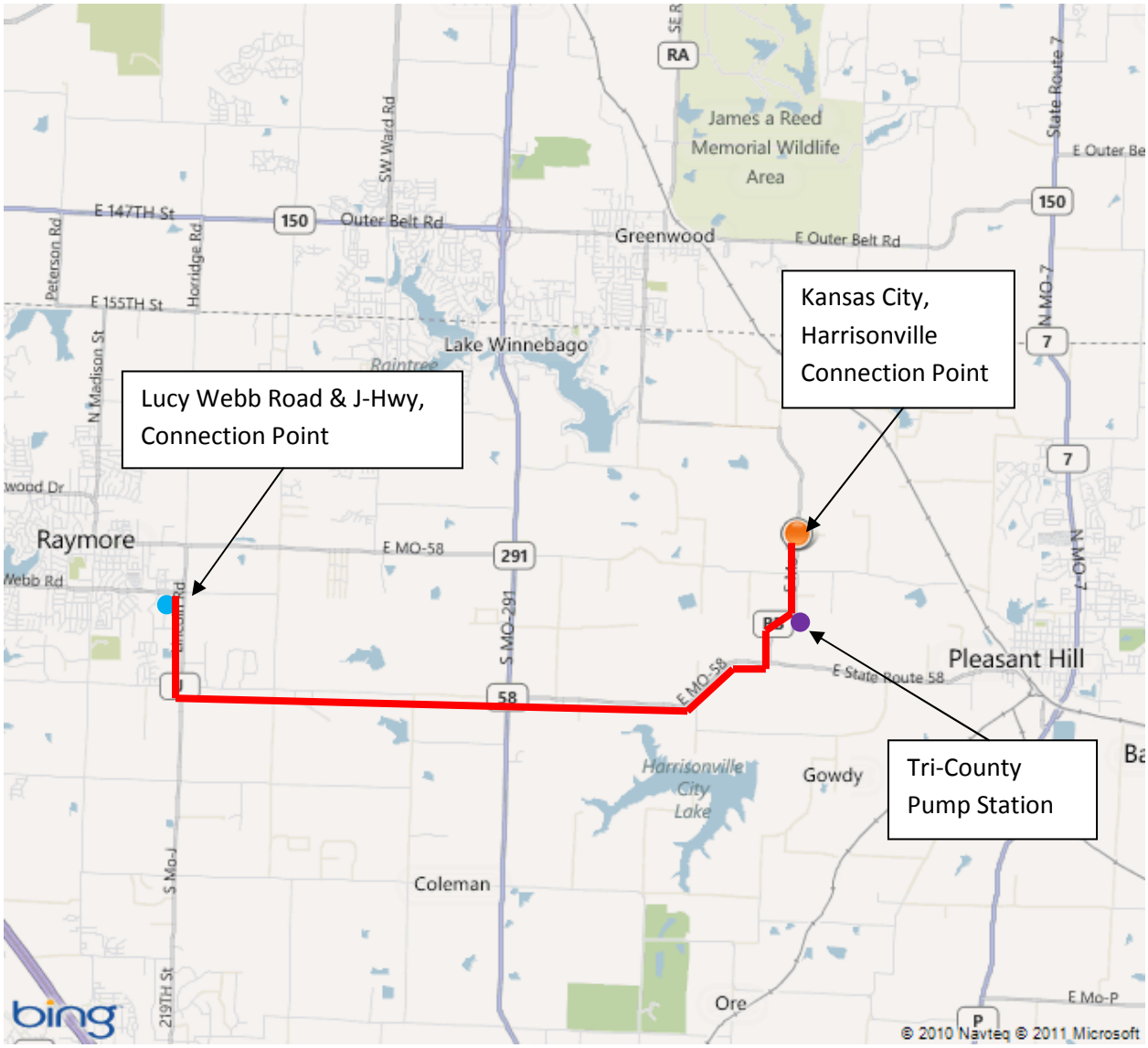
Incremental Cost of Mains to Serve the City of Belton, Missouri

Project	Location	Original Size (in)	Revised Size (in)	Incremental Size (in)	Length (l.f.)	$/in. dia./l.f.	Incremental Cost	Current Planned In Service Date
MP-12004	151st Street, Nall to Mission	20	24	4	5300	$10	$212,000	End of 2012
MP-09004	151st Street, Mission to Kenneth	12	16	4	5300	$10	$212,000	End of 2011
N/A	151st Street, Kenneth to State Line	0	16	16	1300	$10	$208,000	N/A
	Subtotal Mains						$632,000	
N/A	Metering facility						$100,000	
							$732,000	
							$183,000	
	TOTAL						$915,000	
MP-12004	151st Street, Nall to Mission	20	24	4	5300	$10	$212,000	End of 2012
MP-09004	151st Street, Mission to Kenneth	12	20	8	5300	$10	$424,000	End of 2011
N/A	151st Street, Kenneth to State Line	0	16	16	1300	$10	$208,000	N/A
	Subtotal Mains						$844,000	
N/A	Metering facility						$100,000	
							$944,000	
	25% Contingency						$236,000	
	TOTAL						$1,180,000	

Estimate for main installation based on a price of $10.00 per inch diameter per linear foot of main.

Appendix F, Kansas City Harrisonville Connection Map

Appendix F, Kansas City, Harrisonville Connection
Location 172nd Street & Mo Route BB, West of Pleasant Hill, MO
Connect to Lucy Webb Road & J-Hwy
Distance = 42,200 Feet



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