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MEMORANDUM

TO: City of Eau Claire

FROM: Randy Sanford, PE (Lic.WI)
Chad Katzenberger

DATE: June 6, 2022

RE: Water System Capacity Review
SEH No. EAUCL 14.00

Potential water use from a proposed large scale water user has been reviewed in relation to the ability of the City of Eau Claire to supply the added water system demand. The anticipated water use from the proposed user is described below along with expected independent water system impacts in relation to water demand growth. The expected demand for the proposed user will be evaluated in relation to the overall impacts of in the operation within the water system including supply sustainability and redundancy, treatment capacity, distribution, and transmission capacity as well as reserve storage. Additional supporting documentation from previous planning and study efforts has been included in Appendix A of this document.

BACKGROUND

The City has been proactive in water system planning to provide safe and reliable water supply to City residents for years to come. The City regularly consults water system planning documents while making major decisions related to the overall water supply and water distribution system. SEH previously worked with the City to develop an overall Water System Evaluation as well as a Water Supply and Treatment Evaluation for the City, both of which were completed and published in December of 2014. These two documents along with companion plans such as the City's wellhead protection plan formulate the City's comprehensive water plan. The City follows water system requirements and standards set by the US EPA (Environmental Protection Agency), The Wisconsin Department of Natural Resources (Chapter NR 811 – Requirements for the Operation And Design of Community Water Systems) in addition to the Great Lakes - Upper Mississippi River Board (GLUMRB) which set Standards for water and wastewater facilities.

Since the most recent planning documents were developed, the City has experienced stable water use demands in line with anticipated water use projections. The previous water system evaluation(s) developed a plan and vision for water system upgrades and improvements to support existing water system performance and accommodate long range water system growth in addition to water supply sustainability (aquifer) capacity. The results and recommendations of these studies have been considered in connection with the expected water demand growth that may occur if the proposed water user were to come online. Figure 1 below identifies the general proposed water user with respect to the overall water system and its location within the Folsom (Northwest) pressure zone.

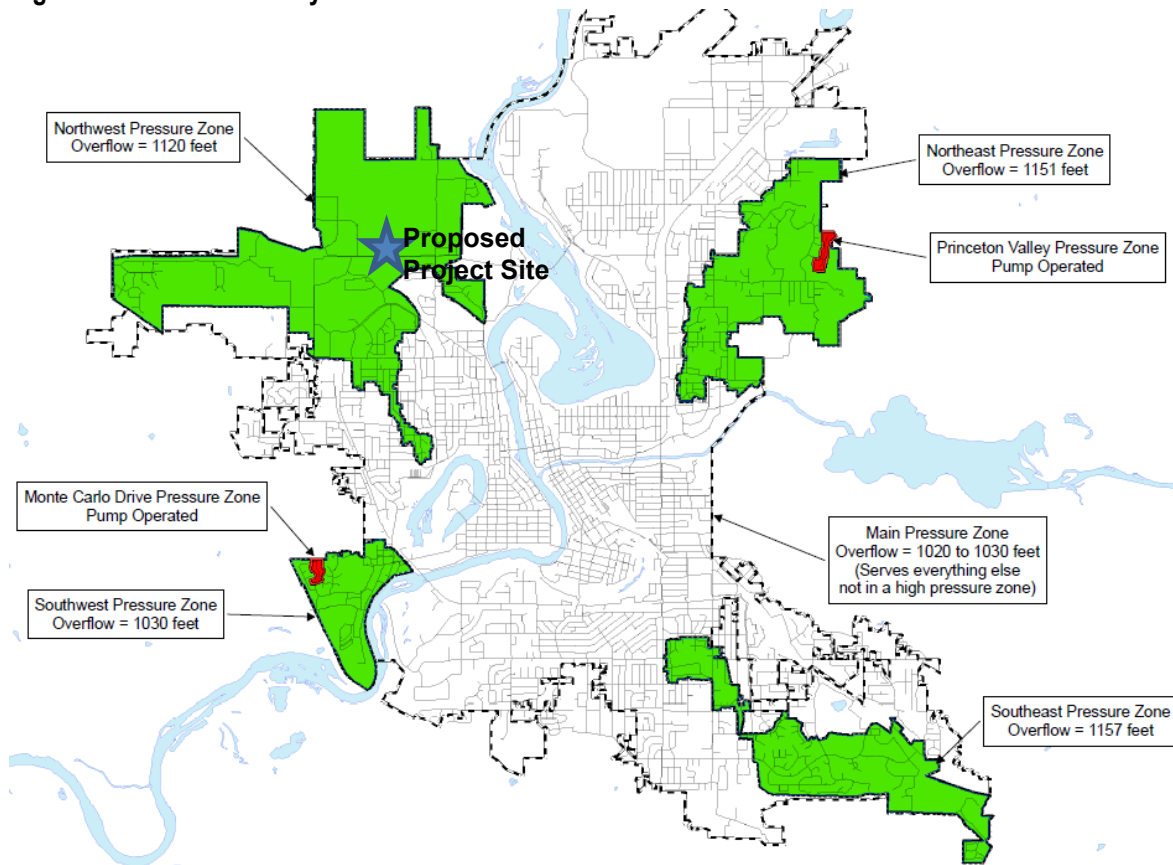
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Figure 1 – Overall Water System



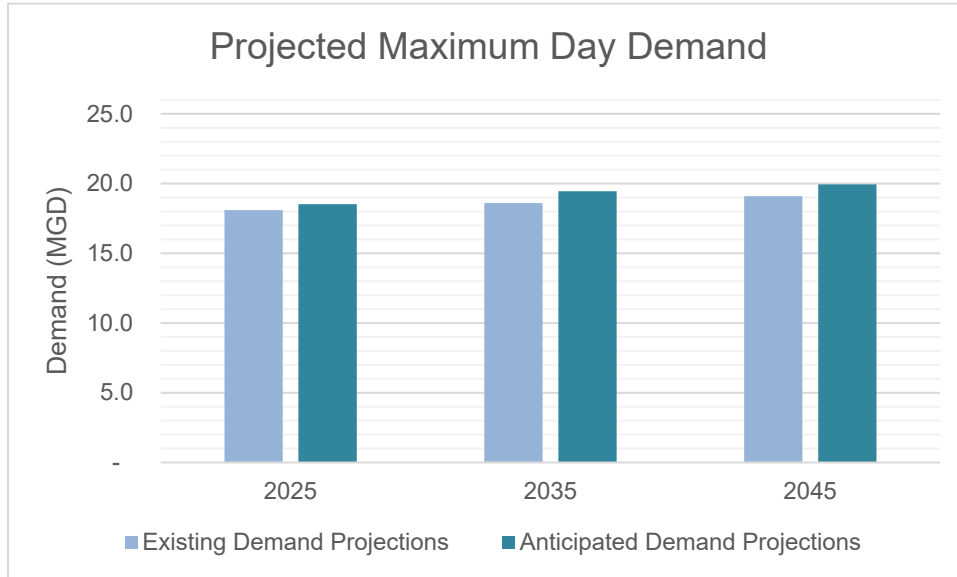
WATER NEEDS PROJECTIONS

Previous water system planning efforts developed future water use projections based on land use and anticipated population growth. A modest amount of City growth was projected within the city for the 20-year planning period. The demand projections documented below extend the previous demand projections through 2045. In addition, modified projections were developed that represent the potential increase in demand with the prospective large water customer. The customer has indicated a desire to purchase up to 425,000 gallons of water per day during phase 1 (next 6 to 8 years) and up to 850,000 gallons per day thereafter.

Table1 – Water System Demand Projections

Planning Period	Existing Projections (2014)		Updated Projections (2022)	
	*Average Day Demand (MGD)	Max Day Demand (MGD)	*Average Day Demand (MGD)	Max Day Demand (MGD)
Existing	9.0	16.3	N/A	
2025	9.3	18.1	9.7	18.5
2035	9.5	18.6	10.4	19.5
2045	9.7	19.1	10.6	20.0

* Avg of recent 3 year period, ** Assumes two largest wells offline, 2045 Projections interpolated from 2035.



WATER SUPPLY & TREATMENT IMPACTS

The City of Eau Claire has the single largest groundwater treatment facility in in the State of Wisconsin. The water treatment plant is supplied by 16 wells with a total supply capacity of 27.2 million gallons per day (MGD). For conservative planning purposes, an assumption for “firm” supply capacity is made which assumes that the two largest wells may be offline at any given moment either due to potential loss of function or regularly scheduled maintenance. As such the **City’s “firm” well supply capacity is estimated to be 22.1 MGD**. In short, this is the volume that would be available to supply the largest daily demand also known as the Maximum Day Demand (MDD). This often will occur during the summer months when outdoor water use is most prevalent among water users. MDD levels can vary year to year depending on several factors such as rainfall and average temperature. The largest MDD to occur in recent times happened in 1989 with a MDD of 20.9 MGD. In the past 10 year, which are more representative of current water use trends, the largest daily demand was 18.7 MGD occurring in 2013.

A general rule for water suppliers is to plan for supporting future demands using “firm” supply capacity available that is greater than the projected MDD. Wisconsin Administrative Code NR 811.26 requires water systems to have more than two pumping units, the total capacity is such that if any one pump is taken out of service the remaining pumps can supply the peak demand. In the analysis below the firm capacity is calculated with an even more conservative approach using the two largest well pumps and assuming they are out of service. The table below documents the amount of surplus “firm” supply capacity available for both the current City water use projections and proposed projections with the added large water customer. As you can be seen in the table below, the City currently has enough firm supply capacity to accommodate projected City water use through the 2045 planning period while also accommodating the proposed large water customer. The table below documents the reserve “firm” well supply capacity both with and with the added large water customer.

Surplus Firm Supply Capacity

Planning Period	Existing (MGD) (2014)	Proposed (MGD) (2022)
2025	4.0	3.5
2035	3.5	2.6
2045	3.0	2.1

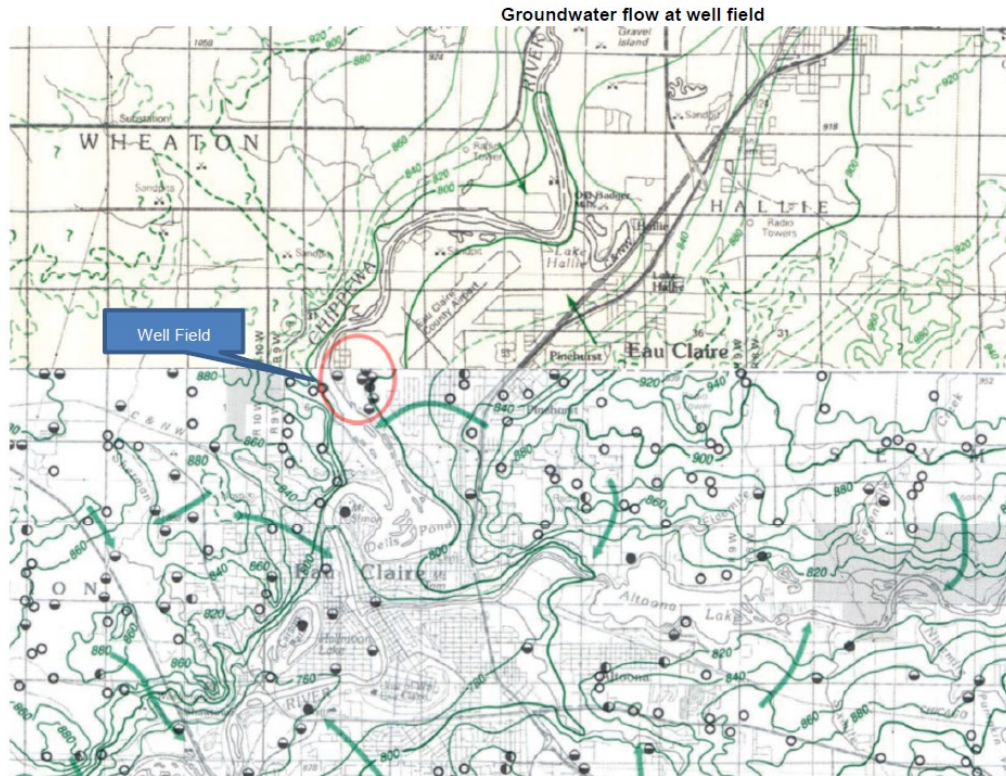
Assumes two largest wells offline, 2045 Projections interpolated from 2035.

LONG TERM PUMPING AND WATER SUPPLY SUSTAINABILITY

The prior section investigated the ability of the water system facilities to safely accommodate the potential max day demand from all water users. In addition to MDD, peak day needs, long term overall water users should be accounted for. The proposed bottling company facility is expected to utilize up to 425,000 gallons of water per day (phase 1) for the first 6-8 years and up to 850,000 gallons per day thereafter (phase 2). That equates to 155 MGY (million gallons per year) in the near term and 310 MGY in the long term. This would place the proposed customer within the same consumption range as the current 3 top water users in the City and slightly ahead of the current top water user long term. As a percentage of total water sold, the proposed customer would represent about 6% of total water sales in the near term and 11% in the long-term planning period.

- The previous Water Supply and Treatment Evaluation discussed the benefit of “resting” wells, which involves operating them for less than 24-hours per day.
- An expressed goal of the report was to aim for 12-hour operation of the wells, to allow for recharge.
- When comparing typical average daily pumpage, the projected 2045 Average day demand with the added customer is estimated to be 10.6 MGD compared to a 12-hour operation firm well capacity of 11.0 MGD. This indicates that on an average day, through the projected period, with the added customer, the City currently has sufficient firm supply capacity(two wells offline) to operate the water supply wells for 12-hours or less per day while satisfying the average daily demand.
- During peak days, the wells would be expected to operate in the 12-hour to 18-hour range. With the current number of wells (16), if the city were to ever have a situation with only one well offline to meet MDD in the future it is recommended that the City add one additional well to the current wellfield to allow for 18-hours or less operation of the “firm” wells during a maximum day demand event (recommendation would apply to both current estimated demand conditions and anticipated demands with proposed large water customer)
- Additional wells beyond the previously recommended well facilities are not expected to be needed to accommodate the prospective large water customer.

Figure 2 – City Well Field and regional groundwater flow



WATER SUPPLY (AQUIFER) CHARACTERISTICS AND SUSTAINABILITY

In general, the Great Lakes and Upper Mississippi River States have a stable supply of water with defined water rights. This resource is an extremely important asset that needs to be stewarded well for future generations. Region protections such as the Great Lakes Compact prevent diversions of water supply to water scarce areas such as the Southwestern part of the US. Though Eau Claire is not located within The Great Lakes–St. Lawrence River Basin, the importance of sustaining local water supply through prudent management is recognized.

The existing City well field currently draws water from a robust water supply source through a series of alluvial wells situated in the sand and gravel deposits in the Chippewa River Valley (see appendix A).

- These deposits include meltwater-stream sediment of the Copper Falls Formation and were deposited by meltwater streams flowing away from the Chippewa Lobe or deposited in valleys by streams flowing off highlands during glaciation.
- The sand and gravel deposits sit on top of bedrock, typically shown as the Mt. Simon Formation sandstone with some of the wells sitting above granite formations.
- There is believed to be a buried bedrock valley north of the well field and east of the Chippewa River This buried valley, which is filled with sand and gravel, provides a reservoir for groundwater storage.
- The sand and gravel deposits also have significant pore spaces, which allows storage of large quantities of water. This porosity then allows construction of wells that yield relatively high flow rates of 1,000 to 2,000 gpm.

Even with relatively robust well production rates, aquifer data indicates a reliable sustainable supply of water available. Previous and current reviews of the static water levels in existing City of Eau Claire wells indicate a stable and reliable water supply. Water levels tend to fluctuate from year to year, with no overall declining trend.

1. The robust pumping capacity of the wells (several exceeding 2,000 gpm) confirms the aquifer's ability to produce high yields.
2. Wells withdraw water from an unconfined, sand and gravel aquifer hydraulically connected to the Chippewa River.
3. The aquifer's connection to the Chippewa River indicates that surface water conditions will reflect aquifer conditions.
4. Based on an approximate Maximum Day Pumpage of water of 18 million gallons per day and DNR records at the Dells Dam on the Chippewa River, the Maximum Day Pumpage would represent 0.5 percent of the total discharge from the groundwater endpoint in the Chippewa River Watershed (where groundwater discharges into the river); doubling the Peak Day Usage would only account for 1 percent of total discharge. (See Appendix A for Reference)
5. The annual average precipitation has increased in Eau Claire County over the past fifty years (See Appendix A for reference), which will likely supplement aquifer recharge even further.
6. Water usage over the last 10 years has averaged significantly below peak usage in 1988:

Year	MGY	
	1988	2011-2021 (Average)
Actual Water Usage	3,737	3,280
Average Daily Usage	10.2	9.0
Maximum Daily Usage	20.9	15.4

7. An increase daily usage of 850,000 gallons falls within the firm operating capacity of the 400-acre wellfield.

Water Treatment Plant Capacity

Recently the City Water Department completed a water treatment plant upgrade that included new header box, sediment basin with plate settlers, improved mixing, chemical feed and flume optimization that will accommodate up to 24 MGD of water supply from the City's existing 16 wells.

Water Distribution

Existing piping that delivers water from the water treatment facility to the Folsom pressure zone is sufficiently sized to accommodate the anticipated increase in system demand. Additional water main construction beyond localized site piping is not expected to be needed to accommodate the proposed water user. Additional City trunk water main is not expected to be needed to accommodate the user.

Water System Booster Pumping

Since the proposed customer is located in the Folsom pressure zone, considerations should be made for the existing capacity of the **Jeffers Road Booster Station** which delivers water to the pressure zone and eventually fills the water storage tank. This booster station has backup power provided by a standby generator. This station has one 500 gpm pump and three 1,500 gpm pumps.

- The "firm" capacity of the pump station (capacity the largest pump offline) is 3,500 gpm or **5.0 MGD**.
- The previous water system evaluation projected a 2035 Average day demand of 2.0 MGD and Max Day Demand of 2.8 MGD.
- Interpolating for the 2045 design period and adding the expected new user demand would result in a potential **zone max day demand of 4.0 MGD** (2,775 gpm).
- The existing Jeffers Road Pump station has sufficient capacity to meet the projected 2045 MDD with the added user.

Water Storage

The Folsom water storage reservoir sustains system pressure and provides reserve storage to the pressure zone. The existing storage tank has a capacity of 2,000,000 gallons. When referencing table 6-20 from the water system evaluation, the anticipated water storage needs for the pressure zone can be updated for the 2045 demand projections that include the proposed water user. The previous estimate storage volume needs for the 2035 planning period (2014) was 839,000 gallons. For the 2045 planning period (2022) with the added user, the estimate storage need is 868,000 gallons which accommodates fire protection needs as well as provides for operational storage. Since the Folsom Street Booster station has rather robust pumping capacity, large amounts of localized storage in the pressure zone are not required. However, as the area expands, the City may choose to construct additional storage in this pressure zone to support future growth in other areas.

RECOMMENDATIONS

Based on the review of the 2014 Water Supply and Water Distribution System Plans, the City can accommodate near term and long term demands from the intended bottling company facility within the Northwest (Folsom) pressure zone and still maintain its future water needs for its existing and other new customers. The 400-acre well field has sufficient ground water supply and recharge and continues to be a sustainable resource for the City of Eau Claire and its planned growth over the next 20 years and beyond. The water treatment plant can produce more than the 2045 MDD volume of water meeting the current water quality stands for iron and manganese. An increased daily usage of 825,000 gallons falls within the firm operating capacity of the wellfield and represents a very small fraction of the overall water availability.

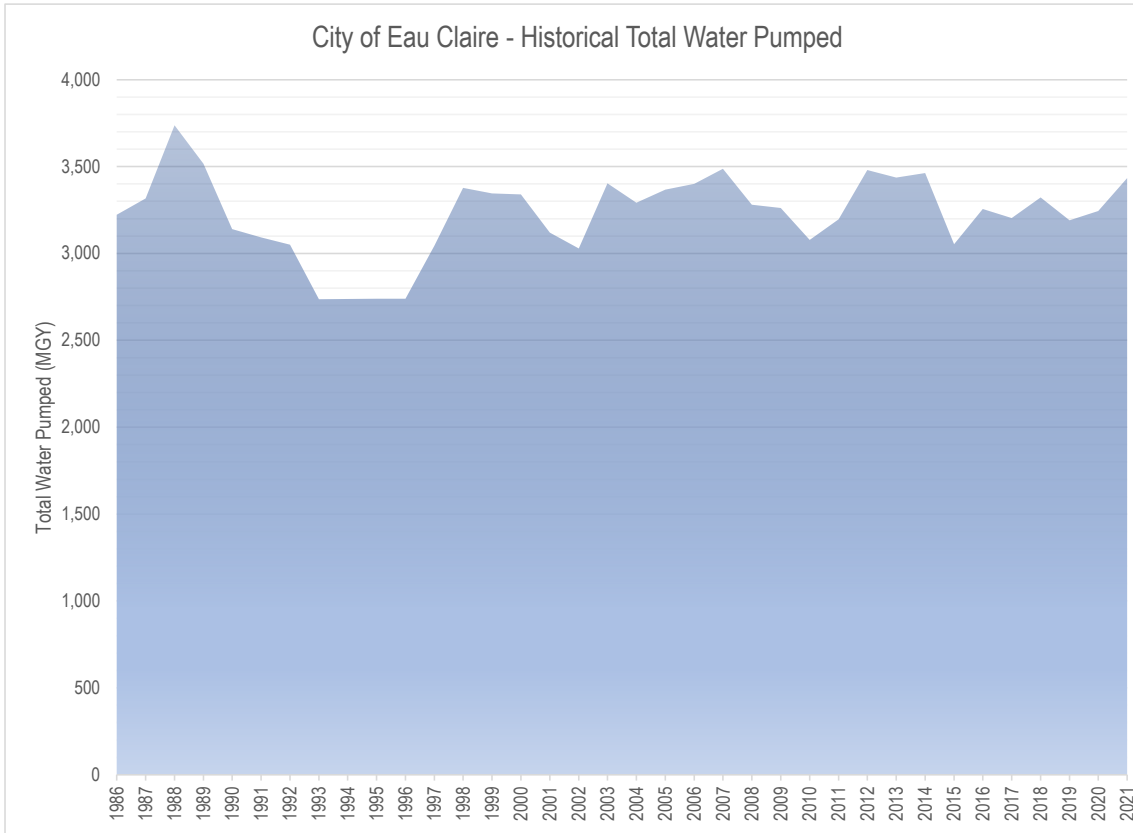
Appendix A - Reference Figures

Historical Water Use

Eau Claire Water Utility - City of Eau Claire, Wisconsin

Year	Pop.	Annual Water Sales (MGY)				Total Sales (MGY)	% Water Sold	Total Pumpage	Average Day (MGD)	Max Day (MGD)
		Res	Com	Ind	Public					
1986	52,507	1,045	604	1,046	227	2,921	90.6%	3,223	8.8	18.3
1987	52,593	1,091	622	917	218	2,847	85.8%	3,317	9.1	19.7
1988	53,013	1,408	673	807	245	3,133	83.8%	3,737	10.2	19.8
1989	53,417	1,245	650	800	227	2,921	83.1%	3,516	9.6	20.9
1990	55,130	1,073	626	772	210	2,680	85.4%	3,140	8.6	15.5
1991	55,393	1,075	616	660	208	2,560	82.8%	3,093	8.5	17.1
1992	55,719	1,190	637	550	204	2,581	84.6%	3,051	8.4	20.2
1993	56,274	1,008	613	491	194	2,306	84.3%	2,737	7.5	12.6
1994	56,507	1,117	623	511	213	2,464	90.0%	2,738	7.5	15.5
1995	56,978	1,117	632	553	218	2,520	92.0%	2,739	7.5	20.4
1996	57,620	1,122	646	557	224	2,550	93.1%	2,740	7.5	13.3
1997	58,104	1,091	646	545	200	2,482	81.5%	3,044	8.3	17.5
1998	58,715	1,269	702	633	313	2,917	86.4%	3,377	9.3	19.9
1999	59,395	1,148	709	656	211	2,724	81.4%	3,346	9.2	14.5
2000	59,794	1,199	681	700	217	2,797	83.8%	3,339	9.1	15.0
2001	60,418	1,205	704	573	207	2,689	86.2%	3,120	8.5	18.6
2002	61,248	1,150	711	693	223	2,777	91.7%	3,029	8.3	18.0
2003	61,900	1,342	704	581	230	2,857	83.9%	3,404	9.3	17.2
2004	61,912	1,214	690	594	227	2,726	82.8%	3,292	9.0	16.6
2005	62,645	1,258	706	556	257	2,776	82.5%	3,367	9.2	16.5
2006	63,050	1,372	696	617	259	2,945	86.6%	3,400	9.3	18.0
2007	63,190	1,386	716	607	257	2,965	85.0%	3,487	9.6	16.6
2008	63,360	1,245	695	613	255	2,807	85.6%	3,280	9.0	14.6
2009	63,900	1,289	668	518	260	2,734	83.8%	3,262	8.9	15.8
2010	63,931	1,182	657	506	243	2,590	84.2%	3,078	8.4	14.8
2011	64,080	1,210	673	604	241	2,729	85.4%	3,196	8.8	15.5
2012	64,190	1,298	702	613	265	2,877	82.7%	3,480	9.5	18.0
2013	66,480	1,351	651	572	254	2,827	82.3%	3,436	9.4	18.7
2014	67,036	1,267	554	608	224	2,653	76.6%	3,463	9.5	16.0
2015	67,385	1,225	531	595	234	2,584	84.7%	3,053	8.4	14.0
2016	67,654	1,260	538	593	237	2,627	80.7%	3,255	8.9	14.8
2017	67,945	1,243	484	586	202	2,514	78.5%	3,204	8.8	14.2
2018	68,086	1,331	507	649	208	2,694	81.1%	3,323	9.1	15.5
2019	68,187	1,253	487	588	191	2,519	78.9%	3,191	8.7	12.6
2020	68,720	1,378	455	563	179	2,575	79.4%	3,244	8.9	14.1
2021	68,720	1,435	488	625	193	2,740	79.8%	3,433	9.4	16.3

YEARLY WATER PUMPAGE



Eau Claire Water Utility - Existing Water Supply Wells

Installation	Daily Capacity (gal.)	Total Capacity (gpm)	Total Capacity (MGD)	18-Hour Capacity (MGD)	12-Hour Capacity (MGD)
Well No.6	1,000,000	694	1.0	0.8	0.5
Well No.8	1,210,000	840	1.2	0.9	0.6
Well No.9	2,000,000	1,389	2.0	1.5	1.0
Well No.11	1,070,000	743	1.1	0.8	0.5
Well No.12	2,300,000	1,597	2.3	1.7	1.2
Well No.13	1,300,000	903	1.3	1.0	0.7
Well No.14	1,870,000	1,299	1.9	1.4	0.9
Well No.15	1,300,000	903	1.3	1.0	0.7
Well No.16	1,050,000	729	1.1	0.8	0.5
Well No.17	1,900,000	1,319	1.9	1.4	1.0
Well No.18	2,300,000	1,597	2.3	1.7	1.2
Well No.19	1,470,000	1,021	1.5	1.1	0.7
Well No.21	2,540,000	1,764	2.5	1.9	1.3
Well No.22	2,600,000	1,806	2.6	2.0	1.3
Well No.23	2,150,000	1,493	2.2	1.6	1.1
Well No.24	1,150,000	799	1.2	0.9	0.6
Total	27,210,000	18,896	27.2	20.4	13.6
Firm Supply Capacity (1 Well Offline)	24,610,000	17,090	24.6	18.5	12.3
Firm Supply Capacity (2 Wells Offline)	22,070,000	15,326	22.1	16.6	11.0

2014 Water System Evaluation Demand Projections – Total Water System

Table 4-13
Future Pumpage Projections within City Limits
 Eau Claire Water Utility
 City of Eau Claire, Wisconsin

	<u>Actual 2013</u>	<u>Projected 2025</u>	<u>Projected 2035</u>
Total Annual Sales (MGY)	2,827	3,010	3,100
Total Annual Pumpage (MGY)	3,354	3,380	3,480
Average Day Pumpage (MGD)	9.19	9.3	9.5
Maximum Day Pumpage (MGD)	17.92	18.1	18.6
Design Peak Hour Demand (gpm)	19,000	19,000	19,000

Notes:

1. Year 2013, 2025 and 2035 design maximum day pumpage projections were estimated using a ratio of maximum to average day pumpage of 195 percent.
2. Year 2013, 2025 and 2035 design peak hour demand projections were estimated using a ratio of peak hour demand to maximum day pumpage of 150 percent.

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Updated Projections

Planning Period	Existing Projections (2014)		Updated Projections w/ New Customer (2022)	
	*Average Day Demand (MGD)	Max Day Demand (MGD)	*Average Day Demand (MGD)	Max Day Demand (MGD)
Existing	9.0	16.3	N/A	
2025	9.3	18.1	9.8	18.6
2035	9.5	18.6	10.4	19.5
2045	9.7	19.1	10.6	20.0

* Avg of recent 3-year period, ** Assumes two largest wells offline, 2045 Projections interpolated from 2035.

2014 Water System Evaluation Demand Projections – Folsom (Northwest) Pressure Zone

Table 4-14
Water Sales and Pumpage Projections within Northwest Pressure Zone
Eau Claire Water Utility
City of Eau Claire, Wisconsin

<u>Customer Classification</u>	<u>Estimated 2013</u>	<u>Projected 2025</u>	<u>Projected 2035</u>
Population inside City Limits ¹	66,480	67,673	68,866
Population increase inside City Limits		1,193	2,386
Residential Sales			
Portion of Residential Parcels	8.9%	10.7%	12.1%
Portion of Residential Parcel Development		25%	25%
Per Capita Sales (gpcd)	56	55	55
Annual Sales (MGY)	68	74	80
Public Sales			
Per Capita Sales (gpcd)	10	11	11
Annual Sales (MGY)	2.8	3.9	5.1
Commercial Sales			
Portion of Commercial Parcels	3.8%	5.2%	6.4%
Portion of Commercial Parcel Development		23%	23%
Per Capita Sales (gpcd)	27	30	30
Annual Sales (MGY)	35	38	41
Industrial Sales^{2,3}			
Portion of Industrial Parcels	26%	33%	39%
Portion of Industrial Parcel Development		90%	90%
Developed Industrial Area (Acres)	560	708	1,028
Planned Industrial Area (Acres)	0	234	468
Vacant Industrial Area (Acres)	468	234	0
Acreage Sales (gpd/Acre)	730	730	730
Annual Sales (MGY)	398	460	520
TOTAL METERED SALES (MGY)	504	580	650
Non-Revenue Water - 11 % (MGY) ⁴	66	70	80
TOTAL PUMPAGE IN PRESSURE ZONE (MGY)	570	650	730
Total Pumpage (mgd)	1.6	1.8	2.0

Notes:

1. Population projection derived from 2030 population in Fringe Growth Plan. 20 % of growth is inside City limits.
2. Projections assume no significant changes in consumption patterns of largest Utility customers.
3. Industrial Sales projected from per acre sales in 2013. Projections assume development of all undeveloped by 2035.
4. Non-Revenue water was projected at 11 % of total pumpage for future years from 6 year average (2008 - 2013).

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Updated Projections

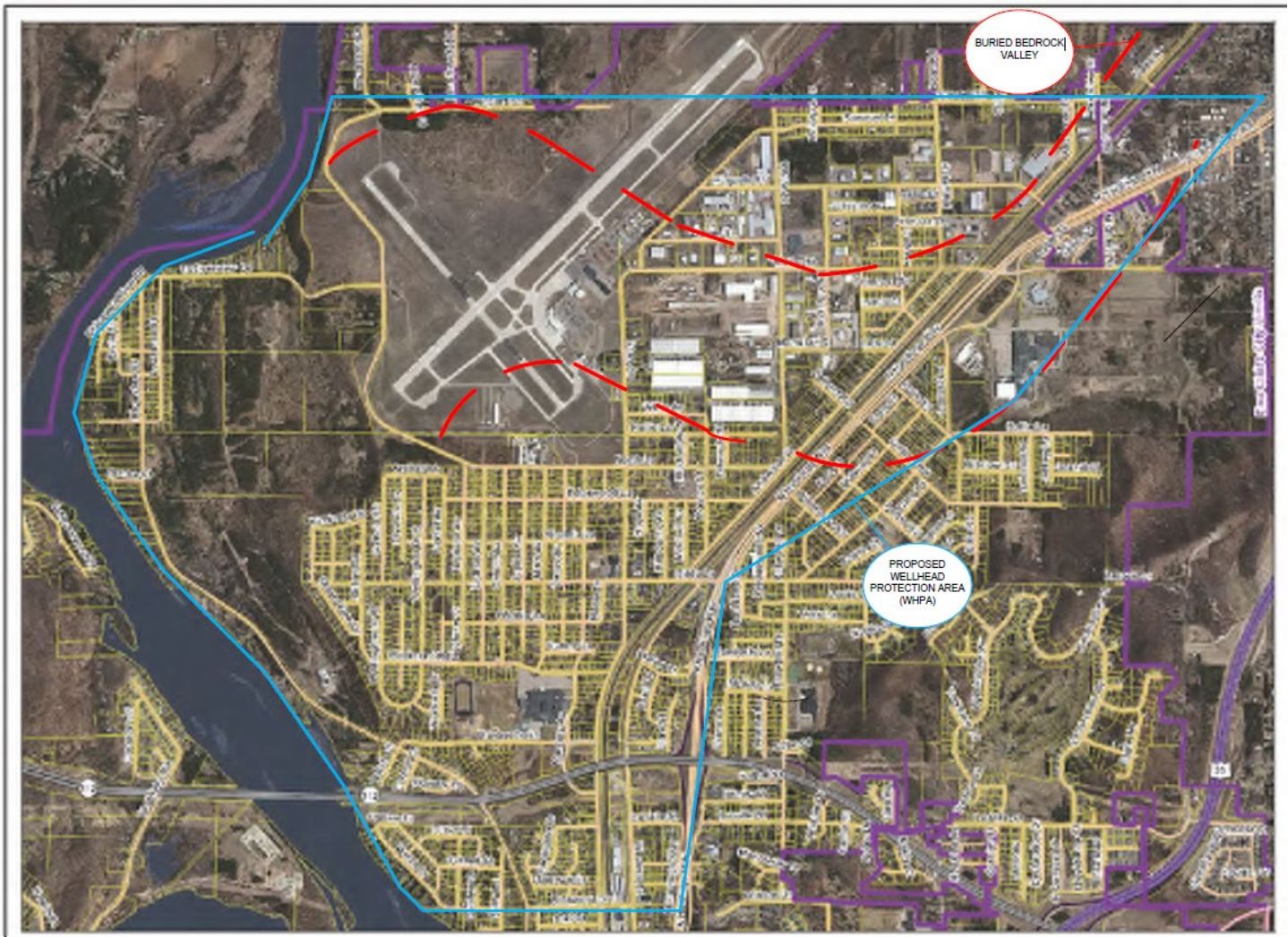
Planning Period	Existing Projections (2014)		Updated Projections w/ New Customer (2022)	
	*Average Day Demand (MGD)	Max Day Demand (MGD)	*Average Day Demand (MGD)	Max Day Demand (MGD)
2025	1.8	2.5	2.3	3.0
2035	2.0	2.8	2.9	3.7
2045	2.2	3.1	3.1	4.0

* Avg of recent 3-year period, ** Assumes two largest wells offline, 2045 Projections interpolated from 2035.

Existing 400 Acre Well Field And Future Well Sites



WELL HEAD PROTECTION AREA (From 2020 Well Head Protection Plan Update)



Water Supply References

<https://dnr.wi.gov/water/waterDetail.aspx?key=889365#:~:text=The%20average%20annual%20flow%20for%20the%20river%20is,includ%20the%20Eau%20Claire%20and%20Red%20Cedar%20Rivers.>

Voss, Karen and Sarah Beaster. 2001. The State of the Lower Chippewa River Basin. PUBL-WT-554 2001. Wisconsin Department of Natural Resources, Madison, WI

State of the Groundwater in Eau Claire County, Wisconsin – 2018

<https://www.co.eau-claire.wi.us/home/showpublisheddocument/25741/636699310364070000>

Table 4-5
Summary of Largest Utility Customers
 Eau Claire Water Utility
 City of Eau Claire, Wisconsin

Rank	Largest Customer Consumption 10 Largest Consumers	Type	2013 (MGY)	2012 (MGY)	2011 (MGY)	2010 (MGY)	2009 (MGY)	% of Total Metered Sales (2013)
1	Nestle USA	Industrial	245.6	229.6	168.4	144.9	135.0	8.7%
2	Hutchinson Technology	Industrial	135.1	224.1	208.2	179.4	188.0	4.8%
3	Cascades USA	Industrial	98.5	122.4	123.4	107.7	133.5	3.5%
4	University of Wisconsin - Eau Claire	Commercial	64.5	75.8	66.0	64.1	74.5	2.3%
5	American Phoenix	Industrial	50.6	59.9	71.1	50.3	35.5	1.8%
6	Eau Claire Area School System	Commercial	41.5	39.7	34.2	42.1	42.7	1.5%
7	Sacred Heart Hospital	Commercial	36.3	53.5	50.1	39.7	45.1	1.3%
8	Mayo Clinic Health System	Commercial	32.8	38.9	32.6	30.9	33.2	1.2%
9	Silver Springs Foods	Industrial	16.9	16.7	13.5	15.7	--	0.6%
10	Oak Ridge Village	Residential	--	14.3	13.1	13.0	12.0	---
Total Sales to Top Ten Customers			721.9	874.8	780.7	687.6	699.5	25.5%
<i>Total Sales to Top Four Industrial Customers</i>			<i>529.8</i>	<i>636.0</i>	<i>571.2</i>	<i>482.3</i>	<i>492.0</i>	<i>18.7%</i>
Total Sales			2,827	2,877	2,729	2,590	2,734	100%

Notes:

1. Oak Ridge Village is a mobile home park that has historically experienced many water main breaks. The high sales were in part due to these breaks.

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Top Water Users in 2021

2021 Top 10 Water Users - Eau Claire, WI

Customer Name	Gallon Usage	% of Total
Nestle USA	250,918,844	9.2%
Cascade Tissue of WI Inc	133,121,560	4.9%
Hutchinson Technology	95,539,796	3.5%
American Phoenix	92,069,824	3.4%
Mayo Clinic Health System	43,638,320	1.6%
University of Wisconsin - Eau Claire	41,896,228	1.5%
Silver Springs Foods	26,761,196	1.0%
Sacred Heart Hospital	23,735,536	0.9%
Eau Claire Area School District	22,870,848	0.8%
KwikTrip	20,447,328	0.7%