LUMOS & ASSOCIATES

MEMORANDUM

DATE:	1/19/2024
TO:	Ed James
FROM:	Chelsea Cluff, P.E..
CC:	Tim Russell, P.E., WRS; Jonathan Lesperance, P.E.
SUBJECT:	Gardnerville Water Company Purveyor Data

1.0 Background Information

Lumos & Associates (Lumos) was contracted by the Carson Water Subconservancy District (CWSD) to assist the United States Geological Survey (USGS) with the data collection and analysis of 13 water purveyors within the Carson River Watershed as part of the Carson River Watershed 30-Year Regional Drought and Water Sustainability Plan. The intended purpose of this document is to identify potential deficiencies in water supply (both quantity and/or quality) over a 30-year planning horizon with a focus on existing and future municipal water production, water quality, and water rights for the Gardnerville Water Company (GWC). Where deficiencies are noted or anticipated, potential mitigation measures will be provided for future consideration. Existing and future pumping rates and well locations will be provided to USGS for use in modeling groundwater and surface water impacts across the watershed. Tabulated data including monthly production for each well over the current 5-year period of record, will be made available to USGS, CWSD, and the water purveyor.

GWC manages the operations and maintenance of the water system for the Gardnerville community, which is a census designated place within Douglas County, with a population of approximately 6,211 people as per 2020 U.S. Census Data. The GWC system includes seven (7) existing active municipal supply wells that service 2,880 connections. Gardnerville is located 20 miles south of Carson City and is approximately 4.7 mi^2 in size.

2.0 Existing and Future Production

2.1 Existing Production

GWC obtains its municipal water from seven (7) groundwater wells. Monthly total well production from each individual wells varies from 0.67 million gallons per month to 13.3 million gallons per month. Well 6 is the highest producing well with a pumping capacity of 2,000 gallons per minute (gpm) and a max daily production of 1,920,000 gallons per day (gpd). For a breakdown of each well with pumping capacity and max daily production capacity refer to Table 1. The existing locations and associated permit numbers for each well are listed within Table 5 in the supplemental information section.

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Table 1: Well Pumping Capacity & Max Daily Production Capacity

Well Name	Well Pumping Capacity Production (gpm)	Max Daily Production Capacity (gpd)
Well 1	400	384,000
Well 2	750	720,000
Well 3	450	432,000
Well 4	700	672,000
Well 6	2,000	1,920,000
Well 7	1,400	1,344,000
Well 9	1,200	1,152,000
Total	6,900	6,624,000
Notes: [1] Well Pumping capacity was analyzed using data from 2018 - 2022		

Combined, the seven wells have a total pumping capacity of 6,900 gpm and a max daily production of 6,624,000 gpd assuming a sixteen (16) hour a day pumping cycle. Overall, the production capacity of a system as identified in this report is the summer-time capacity since water demand increases three (3) to four (4) times compared to winter-time demands. Therefore, the capacity analysis is focused on the high production months. The maximum monthly production for all five (5) years analyzed occurred between June and August with the overall highest production month being August of 2020 at 71.8 million gallons (MG). The average day max month (ADMM) can be calculated by dividing the absolute maximum month for each year throughout the five years of data and dividing by the number of days within that month.

The ADMM was used along with the maximum pumping capacity (based on a sixteen (16) hour a day pumping cycle) to evaluate production deficiencies in the system. On Figure 1 the ADMM for the four (4) summer months is compared to the available production. For a breakdown of the production of all the wells through the summer period see Table 2, and for the yearly production of all wells broken down by month, reference Table 6 in the Supplemental Information section.

Table 2: Historical Total Monthly Well Production

Month	Monthly Well Production (gallons)					
	2018	2019	2020	2021	2022	2018-2022 Average
Jun	55,802,560	51,387,020	60,093,900	52,396,000	58,334,800	55,602,856
Jul	63,762,400	61,616,300	64,256,500	68,927,700	67,312,200	65,175,020
Aug	68,334,300	63,085,900	71,778,800	64,134,500	61,851,200	65,836,940
Sep	50,384,600	45,999,400	56,814,200	49,855,900	58,972,400	52,405,300

= Maximum Month

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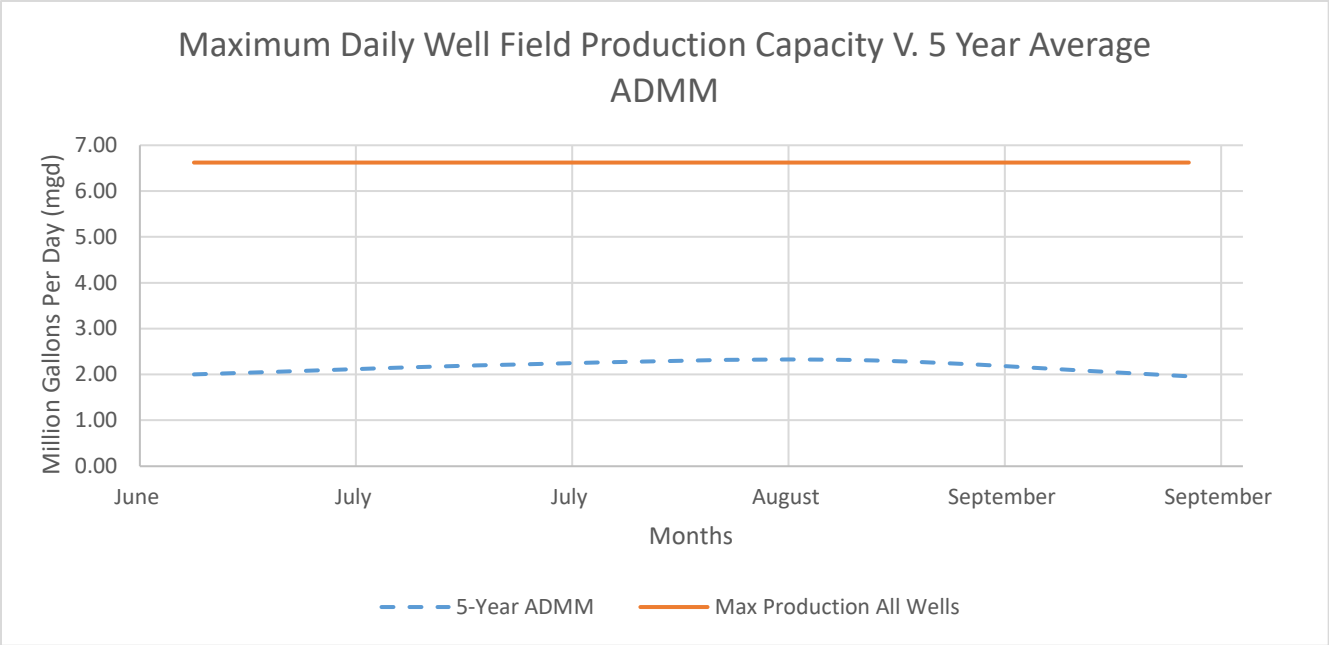


Figure 1: Maximum Well Field Production Capacity

2.2 Growth Projections & Future Required Production

To estimate the growth in water production for GWC, a planning period from 2021 through 2051 (30 years) was analyzed using a growth rate of 0.54%. The 0.54% growth rate is based on population data from 2010 to the current date and was provided by Douglas County for the whole planning area. Figure 2 illustrates the annual well production required using the Douglas County growth rate over the 30-year planning horizon. Table 7, in the Supplemental Information section, provides an in-depth breakdown of the growth rate and associated estimated population provided by Douglas County over the 30-year planning horizon. It is unknown if developable land (receiving area), planned developments, and land use classifications were taken into consideration in the growth analysis as this is a county provided estimate of production growth.

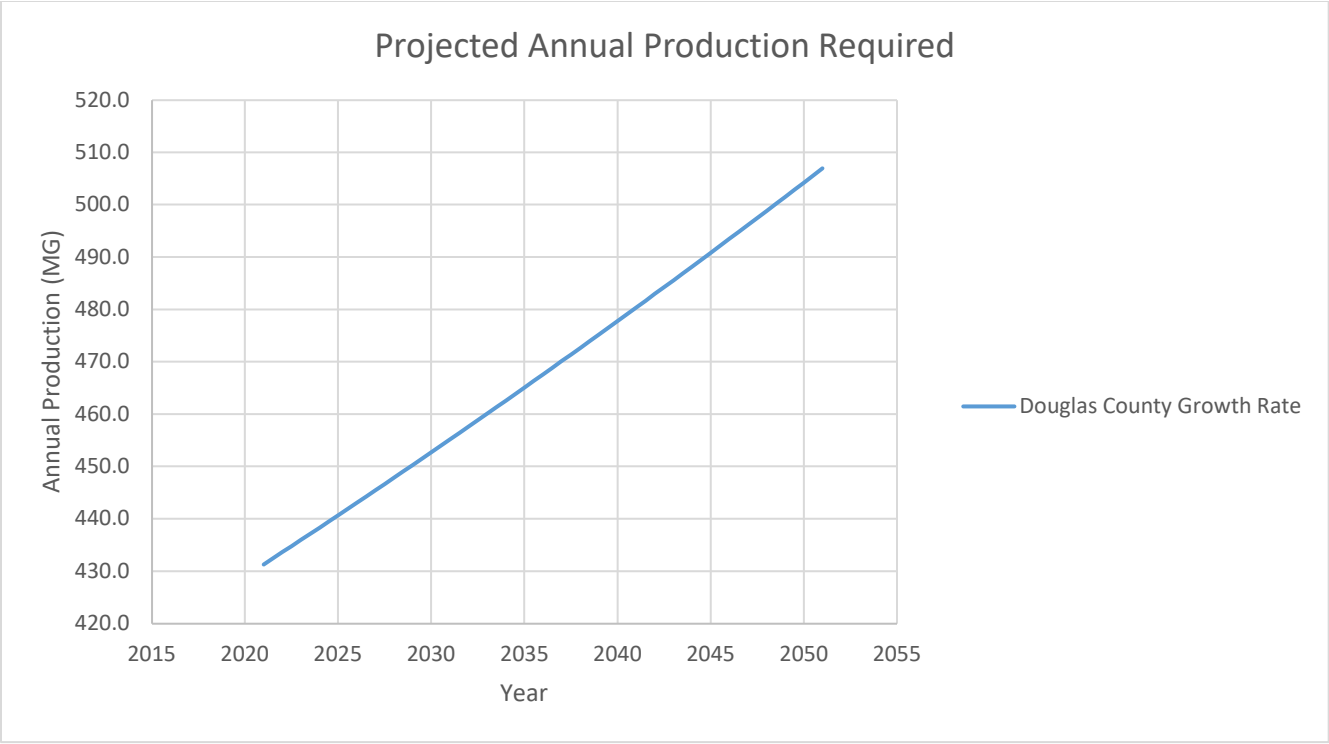


Figure 2: Projected Annual Production

2.3 Estimated Future Demand v. Existing Available Production

To estimate future well production necessary to meet anticipated water demand, the growth projections discussed in Section 2.2 were used to project the maximum daily demand required for GWC. The calculated demand for GWC in 2051 was approximately 507 MG based off Douglas County's growth rate, as described in Section 2.2. On Figure 3, the future estimated ADMM for both State Demographer and Douglas County Master Plan growth rates is compared against current available production capacity. For projected annual total production, see Table 8 in the supplemental information section.

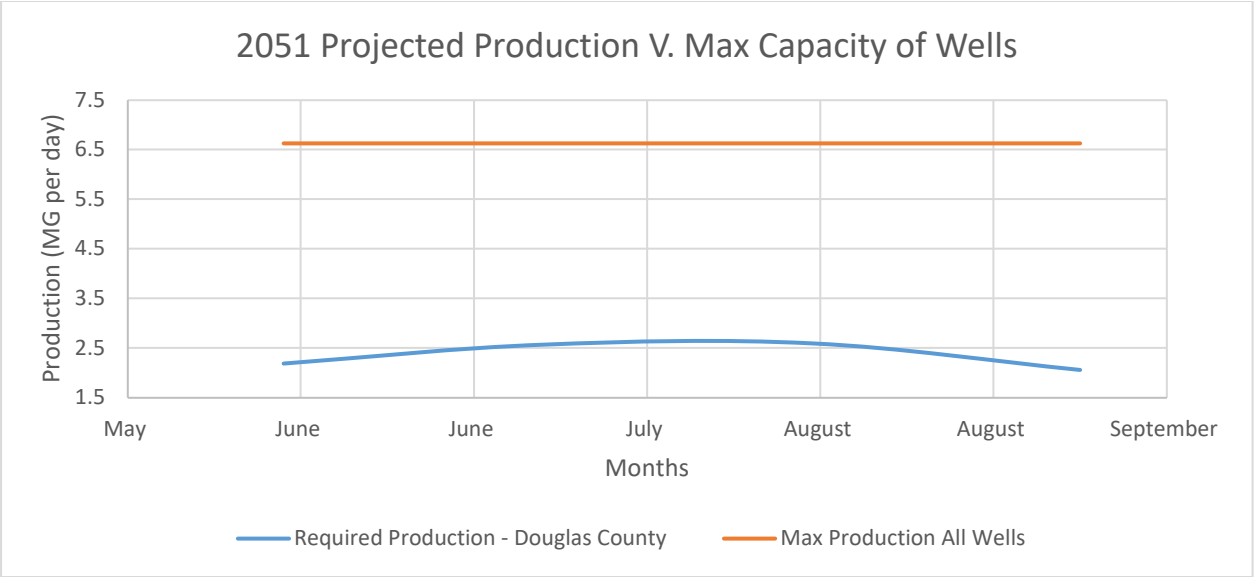


Figure 3: Projected 2051 Production versus Max Capacity of Wells

3.0 Water Quality

This section will be completed once water quality data has been received.

4.0 Water Rights

GWC has 4 certificates and 17 permitted water rights attributed to seven (7) municipal wells. The total combined duty of those water rights is 5,739.33 acre-feet annually (AFA). The current annual production for the base year (2021) is 1,319.8 acre-feet per year (AFA). Projected demand based on 0.54% (Douglas County growth rate) in 2051 is 1,551.3 AFA. Based on this conservative projected future demand, the GWC system has sufficient water rights over the 30-year planning period.

5.0 Summary

For the beginning of the planning period (2021), GWC currently has adequate well production capacity (6.62 MG/day) to meet the demands of its community (2.32 MG/day) and negligible water quality issues impacting their system. Based on the planning horizon of 30-years (2021 to 2051) and the growth rate (0.54%) used in the analysis, GWC has sufficient water rights (5,739.33 AFA) to account for future growth in 2051 (1,551.3 AFA). As development continues and the population grows within their district, the future required well production capacity will be 2.59 MG/day still well below the current capacity of 6.62 MG/day from the seven (7) active wells. However, it is critical to reanalyze future water supply to ensure demands can be met in case growth is higher than 0.54% year over year. For an in-depth look at all considerations and groundwater modeling scenarios, see Section 5.1 and Section 5.2. For a more detailed breakdown of projected well production required capacity and the surplus, see Table 7.

Table 3: Summarized Existing & Future Production

	Mgal/day	Gal/min
Existing (2021) Water Supply Capacity	6.62	6,900
Existing (2021) Water Demand	2.32	2,420
Existing (2021) Water Supply Deficit/Surplus[3]	4.30	4,480
Future (2051) Water Demand	2.59	2,700
Future (2051) Water Supply Deficit/Surplus	4.03	4,200

[1] Existing water supply capacity includes production from the following wells:
[2] The water demand in 2051 assumes the Douglas County growth rate, as discussed in Section 2.2.
[3] The deficit/surplus calculation assumes no additional well development between 2021 to 2051 to analyze the additional well capacity needed to meet future demands, A negative number represents a water production deficit (and the need for additional water production) and a positive number represents a water production surplus (no additional water production necessary to meet future water demands).

5.1 Future Water Supply Considerations

The current (2.32 MG/day) and future demands in 2051 (2.59 MG/day) are well below the maximum well capacities (6.62 MG/day), as shown in Figure 1 and Figure 3. Based on the current data and methodology used for the analysis, GWC's current water supply of seven (7) wells is sufficient for the projected growth in the service area and will not require additional wells to meet the projected water demand of 2,700 gpm. It is important to note that population growth in an area is dependent on many different factors that are not always able to be anticipated in a future growth analysis. Therefore, the population and expected community growth should be continually monitored in case an unanticipated population boom drives the water demand to be higher than the capacity of the existing water supply. For this reason, it is encouraged that all purveyors look at the benefits of water conservation.

1. Water Conservation
    - Pros: Reduce overall demand and production needs, inexpensive
    - Cons: Consumer buy in, does not fully accommodate long-term growth, loss of revenue

5.2 Modeling Options

The base condition that would be recommended for modeling purposes has been summarized below and in Table 4. The base condition uses the growth rate that was provided by Douglas County (0.54%). A summary of the projected population growth per year over the 30-year planning horizon can be found in Table 7. This is not a recommendation to the purveyor and purely an assumed option for modeling purposes.

Base Condition: Run existing wells with existing capacities for all seven (7) active existing wells and the one (1) proposed well being added in February 2024.

Table 4: Proposed Required Well Capacities in 2051

Options	Well 1	Well 2	Well 3	Well 4	Well 6	Well 7	Well 9	Well 10
Base Condition (gpm)	400	750	450	700	2,000	1,400	1,200	1,950

Notes:
[1] Max well production was assumed that wells could run 16 hours of the day during the peak months of June through September
[2] Proposed well capacities are based on the Douglas County growth rate of 0.54%.
[3] Well 10 is coming online February 2024

6.0 Supplemental Information

Table 5: Existing Well Locations & Depths

Parameter	Well 1	Well 2	Well 3	Well 4	Well 6	Well 7	Well 9	Well 10[1]
Depth	300	290	335	305	300	300	400	350
Casing Perforations From	95	100	120	125	100	96	140	120
To	295	288	335	305	300	294	400	320
Latitude	38.93	38.95	38.94	39.94	38.93	38.93	38.93	38.93
Longitude	-119.75	-119.75	-119.74	-119.74	-119.73	-119.75	-119.73	-119.73
Elevation (ft)	4755	4746	4764	4792	4785	4764	4796	4781
Notes: [1] Well 10 is coming online February 2024 and therefore not included in the capacity analysis								

Table 6: Historical Total Monthly Well Production

Month	Monthly Well Production (gallons)					
	2018	2019	2020	2021	2022	2018-2022 Average
Jan	15,069,100	15,555,100	17,294,200	11,294,300	13,170,100	14,476,560
Feb	15,505,200	13,079,800	15,409,004	11,005,300	18,816,200	14,763,101
Mar	13,190,800	15,034,500	16,899,800	15,207,300	18,228,900	15,712,260
Apr	28,485,800	29,116,800	33,841,900	44,048,800	39,765,500	35,051,760
May	39,791,000	36,830,430	57,774,500	38,339,200	49,735,800	44,494,186
Jun	55,802,560	51,387,020	60,093,900	52,396,000	58,334,800	55,602,856
Jul	63,762,400	61,616,300	64,256,500	68,927,700	67,312,200	65,175,020
Aug	68,334,300	63,085,900	71,778,800	64,134,500	61,851,200	65,836,940
Sep	50,384,600	45,999,400	56,814,200	49,855,900	58,972,400	52,405,300
Oct	30,303,400	31,890,900	39,006,500	27,804,500	34,988,700	32,798,800
Nov	16,718,900	14,302,800	13,348,900	23,812,700	15,328,900	16,702,440
Dec	13,922,700	14,899,400	11,429,500	24,496,200	16,459,600	16,241,480
Total	411,270,760	392,798,350	457,947,704	431,322,400	452,964,300	429,260,703
Average Day (gpd)	1,126,769	1,076,160	1,254,651	1,181,705	1,240,998	1,176,057
Max Month (gallons)	68,334,300	63,085,900	71,778,800	68,927,700	67,312,200	65,836,940
ADMM (gpd)	2,204,332	2,035,029	2,315,445	2,223,474	2,171,361	2,123,772

= Maximum Month

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Table 7: Projected Growth Rate & GWC Consumption

Year	Projected Growth Rate (%)	Production based on Douglas County Growth Rate
	State Demographer - Statewide	
2021 (base)		431,322,400
2022	0.54%	433,651,541
2023	0.54%	435,993,259
2024	0.54%	438,347,623
2025	0.54%	440,714,700
2026	0.54%	443,094,559
2027	0.54%	445,487,270
2028	0.54%	447,892,901
2029	0.54%	450,311,523
2030	0.54%	452,743,205
2031	0.54%	455,188,019
2032	0.54%	457,646,034
2033	0.54%	460,117,322
2034	0.54%	462,601,956
2035	0.54%	465,100,006
2036	0.54%	467,611,547
2037	0.54%	470,136,649
2038	0.54%	472,675,387
2039	0.54%	475,227,834
2040	0.54%	477,794,064
2041	0.54%	480,374,152
2042	0.54%	482,968,173
2043	0.54%	485,576,201
2044	0.54%	488,198,312
2045	0.54%	490,834,583
2046	0.54%	493,485,090
2047	0.54%	496,149,909
2048	0.54%	498,829,119
2049	0.54%	501,522,796
2050	0.54%	504,231,019
2051	0.54%	506,953,867

Notes:
[1] The percent change for 2041 was extended through 2051 to estimate populations through the planning period.

Table 8: Future Well Production

Year	Douglas County Growth Rate	Projected Flow	
		Gallons	MG
2021	0.54%	431,322,400	431.3
2022	0.54%	433,652,000	433.7
2023	0.54%	435,994,000	436.0
2024	0.54%	438,348,000	438.3
2025	0.54%	440,715,000	440.7
2026	0.54%	443,095,000	443.1
2027	0.54%	445,488,000	445.5
2028	0.54%	447,894,000	447.9
2029	0.54%	450,313,000	450.3
2030	0.54%	452,745,000	452.7
2031	0.54%	455,190,000	455.2
2032	0.54%	457,648,000	457.6
2033	0.54%	460,119,000	460.1
2034	0.54%	462,604,000	462.6
2035	0.54%	465,102,000	465.1
2036	0.54%	467,614,000	467.6
2037	0.54%	470,139,000	470.1
2038	0.54%	472,678,000	472.7
2039	0.54%	475,230,000	475.2
2040	0.54%	477,796,000	477.8
2041	0.54%	480,376,000	480.4
2042	0.54%	482,970,000	483.0
2043	0.54%	485,578,000	485.6
2044	0.54%	488,200,000	488.2
2045	0.54%	490,836,000	490.8
2046	0.54%	493,487,000	493.5
2047	0.54%	496,152,000	496.2
2048	0.54%	498,831,000	498.8
2049	0.54%	501,525,000	501.5
2050	0.54%	504,233,000	504.2
2051	0.54%	506,956,000	507.0

Notes:
[1] Total Projected Production is based off of a Douglas County provided growth rate described in section 2.2 and is the total of all wells in gallons.



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WELL LOCATIONS
GARDNERVILLE WATER CO.

CWSD

30-YEAR REGIONAL DROUGHT PLAN

1 OF 1

LEGEND

- GWC Wells

Paper Size: 8.5" x 11"

0 1,000 2,000
Feet

Projection: Transverse Mercator
Grid: NAD 1983 UTM Zone 11N
Datum: North American 1983
Created by: swaite

Date:	11/30/2023
Project #:	10974.000
Revision:	0