Information Item

Joint meeting of the Metropolitan Area Water Supply Advisory Committee
and the Metropolitan Area Water Supply Technical Advisory Committee

METROPOLITAN
C O U N C I L

Meeting Date: January 9, 2024

Topic

Metro Region Water Demand Projection Methodology

District(s), Member(s): All

Policy/Legal Reference: Minnesota Statutes 473.1565

Staff Prepared/Presented: Greg Johnson, Principal Engineer, 651-602-1016

Division/Department: Environmental Services

Background

This memorandum provides a summary of the proposed method to project total water demand for the Twin Cities Metropolitan Area for municipal groundwater and surface water systems and private high capacity wells that are permitted with the DNR and produce more than 10,000 gallons per day on average or more than 1 million gallons per year. The total water demand in the metro region includes demands from municipal water systems (surface water and groundwater systems) and private high-capacity wells that are permitted by the DNR. This work is being done in support of the regional Metro Area Water Supply Plan update that is currently in progress. The memorandum describes the proposed use of region-wide water demand projections and details of the proposed approach.

MAWSAC and TAC are invited to provide input on this proposed approach.

Use of Projections

The Metropolitan Council is developing water use projections in support of the update to the regional Metro Area Water Supply Plan, currently in progress. This information will help us to generally understand the magnitude and distribution of future water use in the region. The projections also serve as an input to our groundwater modeling efforts and water supply analyses to predict resource constraints and evaluate approaches under future scenarios.

The water demand projections are intended to:

1. Assist Met Council planners and policy makers, state agencies, and community planners to plan for future growth and address regional issues. These projections can help us understand where future water demand might bump up against or exceed capacity, or where there is sufficient capacity to support growth.
2. Provide subregional and regional water demand data for Met Council's groundwater modeling projects, surface water analyses, and other studies.
3. Provide guidance for communities as they develop content for the water supply section of their comprehensive plan to project water utility revenue, plan for water infrastructure improvements, and request DNR appropriation permit amendments as needed to serve growth.

Method Overview

The total metro region's water demand is the sum of the demands from municipal water use (surface water and groundwater systems) and private high capacity well use. The demand projections based on this approach represent a scenario of future water use in the years 2030, 2040, and 2050, and assumes that the water use that occurred between 2013 and 2022 in the metro region is representative of how water will continue to be used in the future. The scenario also ties regional water use planning to the broader regional development framework, *Imagine 2050*, using population forecasts to be adopted for 2030, 2040, and 2050.

The total metro region water demand includes the following basic equation:

Total Metro Region Water Demand = Projected Municipal Water Use + Projected Private High Capacity Well Use (permitted wells)

The projection method for each type of water demand is described as follows:

Projected Municipal Water Use

The method used for projecting municipal water demand uses a total per capita unit use coefficient approach for each of the municipal water utilities in the seven-county metropolitan area. The total per capita unit use coefficient is the total gallons per capita per day water usage (TGPCD) from all water uses in a community including residential, commercial, governmental, and institutional water uses, and unaccounted for water (water leaks, unmetered uses, etc.). This approach calculates a total per capita water use for each community based on the average TGPCD that occurred from 2013-2022 and assumes that the average per capita use will remain constant over the planning horizon of the Metro Area Water Supply Plan. A variable range is applied to reflect uncertainty in demand from year to year.

Future water demand projections for municipal water systems will be obtained by multiplying future water service population projections by the average annual TGPCD water demand that occurred from 2013-2022 with a variable range factor (+/-) to account for variations in the TGPCD that occurred from 2013-2022. Data used in this analysis is from the MN Department of Natural Resources Permitting and Reporting System (MPARS).

The average annual TGPCD demand across the entire metro region for municipal water systems was 104.30 TGPCD from 2013-2022, based on preliminary calculations using MPARS data (see Table 1 and Figure 1 below). It is important to note that 104.30 TGPCD was the *average* water usage that occurred during this timeframe, and it is essential to plan for a variable range of future water demands to account for changes in TGPCD demands that occurred from 2013-2022, additional population and industrial growth beyond growth projections, changes in water efficiency, extreme weather patterns (wet and dry), and other variable conditions that could affect future water demands.

Table 1. Average 2013-2022 total gallons per capita per day across the entire metro region for municipal water systems.

Year	Total GPCD (Total Usage/Service Population)
2013	115.49
2014	107.66
2015	104.27
2016	103.11
2017	101.72
2018	102.46
2019	94.78
2020	100.31
2021	107.43
2022	105.81
Range	94.78-115.49
Average (2013-2022)	104.30
% Above Average	10.72
% Below Average	-9.13

Figure 1. Average annual total gallons per capita per day (TGPCD) across the entire metro region for municipal water systems for the years 2013-2022 (blue line). The average annual TGPCD ranged by approximately +/-10% above and below the trend line (dotted blue line).
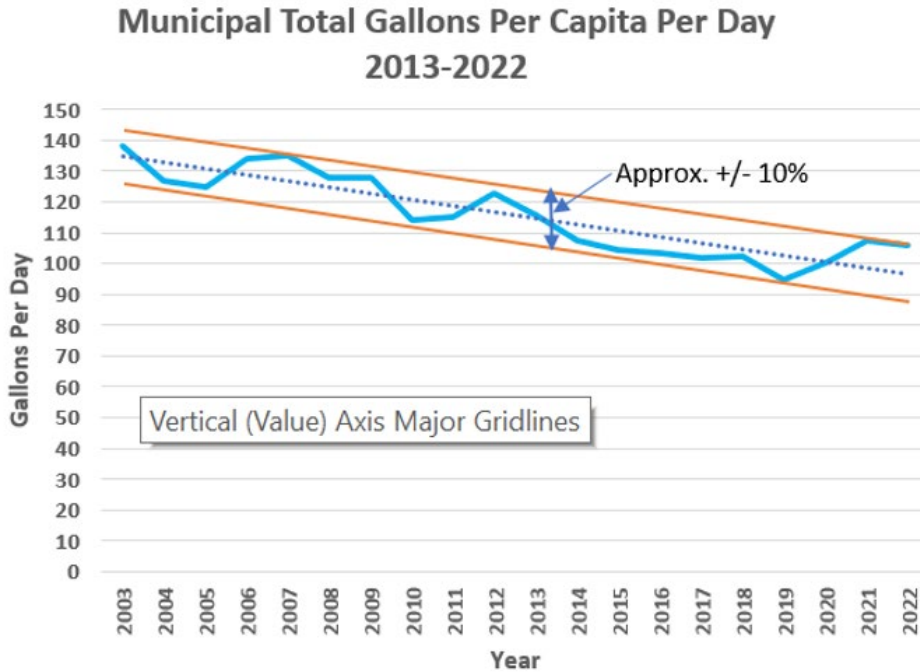
The highest annual TGPCD demand, 115.49 GPCD, occurred in 2013. This demand is 10.72% above the average annual TGPCD (104.30) that occurred from 2013-2022 (see Table 1 and Figure 1 above). Therefore, it is recommended to use 10% for the variable upper range for calculating the **total metro region water demand** as a whole to account for additional

population and industrial growth beyond growth projections, changes in water efficiency, extreme weather patterns (wet and dry), and other variable conditions that could affect future water demands. The lowest annual TGPCD demand, 94.78 GPCD, occurred in 2019. This demand is 9.13% below the average annual TGPCD (104.30) that occurred from 2013-2022 (see Table 1 and Figure 1 above). Therefore, it is recommended to also use 10% for the variable lower range for calculating the **total metro region water demand** as a whole to provide consistency (same as upper range). A **minimum variable range of +/-10%** is recommended to project **future annual water demands for the entire metro region** as a whole through 2050. This variable range reflects the historical variable range that occurred from 2013-2022 in the metro region.

Individual communities should consider using a **higher variable range of +/-20% when planning for water system infrastructure improvements and adjusting water utility billing rates** to account for additional population and industrial growth beyond growth projections, changes in water efficiency, extreme weather patterns (wet and dry), and other variable conditions that could affect future water demands. This recommendation is supported by the fact that a number of communities in the metro region experienced water demands that fluctuated greater than +/-10% and closer to +/-20% from 2013-2022. These communities experienced higher variable water demands mainly due to significant changes in their industrial water use and rapid and unforeseen residential growth. The projected municipal water use includes the following equation:

Projected Municipal Water Use = [Projected Water Service Population] X [2013-2022 Average Municipal Total Per Capita Water Use] X 365 Days with a Variable Range (+/-10% for entire metro region water demand as a whole and +/-20% for individual communities)

Projected Private High Capacity Well Use
Water demands from private high-capacity wells that produce more than 10,000 gallons per day or more than one million gallons per year will also be projected for the metro region for 2030, 2040, and 2050. These wells require a permit from the MN Department of Natural Resources, and annual pumping is reported in MPARS. The growth rate for this type of water use will be the average annual growth rate that occurred from the permittee's total private high capacity well use from 2013-2022.

Similar to the assumptions made for the future municipal water demand projections, a variable range of +/-10 to 20% is also recommended to project future water demands from private high-capacity wells in each community. This will provide a reasonable planning approach to account for additional industrial growth beyond growth projections, changes in water efficiency, extreme weather patterns (wet and dry), and other variable conditions that could affect future water demands for private high capacity well owners. The projected private high capacity well use includes the following equation:

Projected Private High Capacity Wells Water Use = [Current Total Annual High Capacity Wells Demand] X [2013-2022 Average Annual Increase Percentage in Demand] with a Variable Range (+/-10% for entire metro region water demand as a whole and +/-20% for individual private high capacity well owners)

Total Metro Region Water Demand

In summary, the Total Metro Region Water Demand will be calculated according to the following combined equation that accounts for each type of water use:

Total Metro Region Water Demand =

Projected Municipal Water Use = [Projected Water Service Population] X [2012-2021 Average Municipal Total Per Capita Water Use] X 365 Days with a Variable Range (+/- 10% for entire metro region water demand as a whole and +/-20% for individual communities)

+

Projected Private High Capacity Wells Water Use = [Current Total Annual High Capacity Wells Demand] X [2013-2022 Average Annual Increase Percentage in Demand] with a Variable Range (+/-10% for entire metro region water demand as a whole and +/-20% for individual private high capacity well owners)

The Technical Advisory Committee (TAC) advised not including demand projections for low capacity residential private wells that are not permitted by the DNR since this category uses only about 5 percent of the total water use in the metro region and the vast majority of this water is returned to the groundwater from septic drain fields and does not leave the metro region unlike the majority of municipal and industrial water that eventually leaves the metro region via wastewater treatment facilities that discharge to the Mississippi River.

Water Use Data
Data used to support this preliminary analysis were taken from multiple sources to help consider some of the uncertainties related to projecting water demands.

- Population and land use data from Metropolitan Council growth scenarios (learn more in 7/12/23 presentation to Metropolitan Council)
- Water use data for annual use was obtained from the Minnesota Department of Natural Resources Permitting and Reporting System (MPARS). The annual use data was taken from data published on the DNR website for each year between 2012 and 2021: http://www.dnr.state.mn.us/waters/watermgmt_section/appropriations/wateruse.html
- DNR published on their website an estimate that the average Minnesota resident uses about 52 gallons per person per day: https://www.dnr.state.mn.us/waters/watermgmt_section/appropriations/water-conservation-residents.html#:~:text=Indoors,clothes%20washing%2C%20faucets%20and%20leaks.

Historical Population Data
Total population for each community will be obtained from interpolated US Census data and projections to be developed by Met Council's research planners.

In many communities, there is a difference between total population and population served by the public water system. Data on population served by the public water system in each community was obtained from Water Supply Plans submitted to the DNR by each community. The population not served by the water system was calculated as the difference between the

reported total population and population served. This unserved population was averaged over the number of years with complete data.

Water Service Population Calculations

Future water service populations for each community that is served by a municipal water system will be calculated by adding Met Council's projected sanitary sewered population increases for 2022 to 2050 to the Minnesota Department of Health's 2022 water service population data. This will also provide consistency in the planning efforts for Met Council's water supply and wastewater plans.

Water Service Population = MDH 2022 Water Service Population + Projected Sanitary Sewered Population Increases from 2022 to 2050

Per Capita Water Use Calculations

Total per capita water use for each community will be calculated for each year between 2013 and 2022 by dividing the reported water use by the estimated water service population. The per capita water use will then be averaged over this ten-year period. The average per capita water use based on population served is reported in this way for each community.

Total Per Capita Water Use = (Total Municipal Water Use) / (Water Service Population)

This value represents the total municipal water use per capita for each community. This includes all water use in the community, including commercial, governmental, industrial, and institutional uses, and unaccounted for water.