

APPENDIX E

Supply Reliability Assessment With Wholesale Customer Supply Assurance

2025 URBAN WATER MANAGEMENT PLAN for the City and County of San Francisco

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Supply Reliability Assessment with Wholesale Customer Supply Assurance

The SFPUC has a Level of Service objective to provide an annual average of 265 MGD in normal years, as well as a contractual obligation to provide 184 MGD to the Wholesale Customers in accordance with the Supply Assurance in the Water Supply Agreement between the City and County of San Francisco and Wholesale Customers in Alameda County, San Mateo County, and Santa Clara County (WSA). In addition to the supply modeling presented in the main body of this UWMP, supply modeling was conducted to assess the SFPUC's ability to meet its contractual obligations. For purposes of the 2025 UWMP, Groveland Community Services District is reported as a wholesale customer but is considered a retail customer of the SFPUC solely for purposes of allocating Regional Water System (RWS) supplies between retail customers and Wholesale Customers. Its demands would be met by the retail supply allocation of 81 MGD.

As discussed in Section 7.1 of the UWMP, deliveries from the RWS to both retail and Wholesale Customers are limited to an average annual of 265 MGD for the watersheds. Current and projected supply availability from the RWS is presented in Table E-1.

Table E-1. Regional Water System Supply Availability in Normal Years (MGD)

RWS Supply Allocation	2030	2035	2040	2045	2050
Retail Customers ^{a, b}	81	81	81	81	81
Wholesale Customers ^{c, d}	184	184	184	184	184
Total RWS Supplies	265	265	265	265	265

- a Groundwater and recycled water are assumed to be used before RWS supplies to meet retail demand. However, if these alternative supplies are not available, up to 81 MGD of RWS supply could be used in normal years.
- b The Supply Assurance is the 184 MGD maximum annual average metered supply of water dedicated by San Francisco to public use in the Wholesale Customer service area (not including the cities of San Jose and Santa Clara).
- c Cordilleras MWC is not a party to the WSA, and it is not included in the Wholesale Customer supply allocation of 184 MGD. The demands of Cordilleras MWC are minor (projected to be less than 0.01 MGD) and are anticipated to be met with RWS supplies through 2050.

Table E-2 summarizes the expected availability of local groundwater and local recycled water which are only available to meet retail demands. Normal, single dry, and multiple dry year conditions are on a water year basis. Dry year availability is presented in terms of percentage of normal year availability. Groundwater and recycled water are assumed to be used before RWS supplies to meet retail demand. However, if groundwater and recycled water supplies are not available, up to 81 MGD of RWS supply could be used. Groundwater and recycled water availability are not impacted by dry year conditions nor the implementation of the Bay-Delta Plan Amendment.

- Groundwater supplies are assumed to be equivalent to projected demands for the San Francisco Groundwater Supply Project (4.0 MGD starting in 2040) and Castlewood CSA (0.3 MGD).
- Recycled water supplies are assumed to be equivalent to projected demands related to the Westside Recycled Water Project (1.7 MGD by 2050), Harding Park and Fleming Golf Courses (0.2 MGD), and Sharp Park Golf Course (up to 0.1 MGD) and Treasure Island (0.4 MGD starting in 2040).

Table E-2. Retail Groundwater and Recycled Water Supply Availability During Normal and Dry Years

Water Supply	Normal Year	Single Dry Year	Dry Year 1	Dry Year 2	Dry Year 3	Dry Year 4	Dry Year 5
Local Groundwater	100%	100%	100%	100%	100%	100%	100%
Local Recycled Water	100%	100%	100%	100%	100%	100%	100%

Projected supply reliability for years 2030 through 2050 assume total demand is equivalent to the sum of the projected retail and wholesale demands on the RWS, which includes Wholesale Customer purchase projections provided to the SFPUC by BAWSCA on March 4, 2026. Refer to Table E-3 below.

Table E-3. Retail and Wholesale RWS Demand Assumptions Used for Supply Reliability Modeling (MGD)

Customer	Base Year 2050
Retail Customers	66.7
Wholesale Customers	184.0
Total	250.7

The total amount of water the SFPUC can deliver to the retail and Wholesale Customers from the RWS depends on several factors, including (1) the amount of water that is available to the SFPUC from natural runoff, (2) the amount of water in reservoir storage, and (3) the amount of water that the SFPUC releases from the RWS for purposes other than customer deliveries (e.g., instream flow releases below RWS reservoirs). For planning purposes, the SFPUC “average year” or “normal year” is based on historical hydrology under conditions that allow the RWS reservoirs to be filled over the course of the snowmelt season, allowing full deliveries to customers. For “dry-year” supply scenarios, the SFPUC plans its water deliveries using a water-supply planning methodology with reference to a simulated 8.5-year design drought. Dry year availability is presented in terms of percentage of normal year availability.

Table E-4 shows RWS supplies under normal, single dry, and multiple dry year conditions (on a water year basis) and for each of the two supply scenarios. The SFPUC estimated RWS deliveries using the standard SFPUC procedure, which includes adding increased levels of rationing as needed in dry years to balance the demands on the RWS with available water supply. The five consecutive dry-year sequence shown in the tables below represent years 2 through 6 of the design drought. The SFPUC chose this sequence because year 2 is the first year in which system-wide water use reductions could take effect, as the design drought sequence generally begins year 1 with full reservoirs. All simulations that the SFPUC has prepared for its 2025 UWMP have increased levels of rationing in the final years of the design drought sequence. The SFPUC has presented the results in the standardized format prescribed by DWR. Additionally, the SFPUC has a Water Shortage Contingency Plan that defines six distinct shortage levels that the RWS may be in and the corresponding actions that the SFPUC would take to address the water shortage, ranging from use of dry year water supplies (when available), voluntary water use reductions, and mandatory water use reductions.

Supply modeling to assess whether the SFPUC can meet its Supply Assurance of providing an annual average of 184 MGD to Wholesale Customers in normal years was conducted using the same methodology described in Section 8.2. Because of the uncertainty surrounding implementation of the Bay-Delta Plan Amendment, the water supply reliability assessment includes a set of tables for each of the two future supply scenarios:

- **With Implementation of the Bay-Delta Plan Amendment:** Under this scenario, using the demand assumptions shown in Table E-3, the SFPUC anticipates RWS supplies will experience a reduction of up to 52% through the multiple dry-year sequence. The implementation of the Alternative Water Supply Program and associated potential projects will help reduce the anticipated supply shortfalls.
- **Without Implementation of the Bay-Delta Plan Amendment:** Under this scenario, using the demand assumptions shown in Table E-3, the SFPUC system can expect to experience RWS supply reductions of approximately 10% in a single dry year and across five consecutive dry years.

Table E-4. Water Supply Availability During Normal and Dry Years for Base Year 2050 With and Without Bay-Delta Plan Amendment

Supply Scenario	Normal Year ^a	Single Dry Year	Dry Year 1	Dry Year 2	Dry Year 3	Dry Year 4	Dry Year 5
With Bay-Delta Plan Amendment	100%	58%	58%	48%	48%	48%	48%
Without Bay-Delta Plan Amendment	100%	90%	90%	90%	90%	90%	90%

The SFPUC utilized the Water Shortage Allocation Plan (WSAP) that is incorporated in the Water Supply Agreement between the SFPUC and the Wholesale Customers to allocate the RWS supply available during dry years between the retail customers and the Wholesale Customers in the 2025 UWMP supply reliability analysis. The WSAP, also known as the Tier 1 Plan, defines the method for allocating between the retail customers collectively and Wholesale Customers collectively the available RWS supplies during system-wide shortages. For example, when the required level of system-wide reduction in water use is 6 to 10%, the retail customer Tier 1 Allocation is 36% of the annual water supply available, and the Wholesale Customer Tier 1 Allocation is 64% of the annual water supply available. The SFPUC and the Wholesale Customers most recently amended the WSAP in 2025. Also in 2025, the Wholesale Customers adopted an updated Tier 2 Plan, which allocates the collective Wholesale Customers' share of available RWS supplies from the Tier 1 Plan among each of the 26 Wholesale Customers. The WSAP addresses shortages that require a system-wide reduction in water use of 20% or less, consistent with the SFPUC's Level of Service Goal. For any shortage scenario requiring a system-wide reduction in water use above 20% in the supply reliability analysis, the SFPUC applied the Tier 1 Plan's allocation of supplies between the retail customers and Wholesale Customers for a shortage requiring a system-wide reduction in water use of 16 to 20%.

Under the WSAP, if the retail customers' share of the available water supply results in the retail customers having a "positive allocation" (i.e., a supply of additional water rather than a percentage reduction in water use), then the retail customers' percentage share of the available water supply would be reduced to eliminate any positive allocation to the retail customers, with a corresponding increase in the percentage share of the available water supply allocated to the Wholesale Customers. For any level of required reduction in system-wide water use, the SFPUC shall require the retail customers to conserve a minimum of 5%, with any resulting reallocated supply credited to storage for inclusion in the calculation of projected available RWS supply in a subsequent year.

Because of the uncertainty surrounding implementation of the Bay-Delta Plan Amendment, the RWS supply reliability assessment evaluates two future supply scenarios: (1) with implementation of the Bay-Delta Plan Amendment, and (2) without implementation of the Bay-Delta Plan Amendment. It is unknown when implementation may begin on the Bay-Delta Plan Amendment; for the purposes of the 2025 UWMP analysis, the SFPUC included it beginning in the 2030 modeling scenarios.

The SFPUC incorporated additional modeling assumptions in the 2025 UWMP analysis regarding the State Water Resources Control Board (SWRCB) curtailments and assumptions regarding agreements with Turlock and Modesto Irrigation Districts pertaining to instream flow obligations.

1. During the last two drought periods, 2013-2016 and 2021-2023, the SWRCB implemented curtailments through emergency regulations and curtailment orders that attempted to limit diversions from Central Valley watersheds including the Tuolumne River at certain times. Due to the uncertain legality of the SWRCB's curtailment actions as well as the uncertainties regarding any potential future curtailment actions against San Francisco, the SFPUC's RWS supply reliability analyses do not assume curtailments are in effect.
2. Through a 1966 agreement with the Modesto and Turlock Irrigation Districts (Districts), who are more senior downstream appropriative water rights holders on the Tuolumne River, San Francisco may become responsible for up to approximately 51.7% of any flow releases the Federal Energy Regulatory Commission (FERC) may require through issuance of a new license for the Districts' Don Pedro Hydropower Project. The exact flow contribution for which San Francisco may become responsible is highly uncertain and may depend on multiple currently unknown factors, including an anticipated Endangered Species Act biological opinion from the National Marine Fisheries Service and a Clean Water Act section 401 water quality certification from the SWRCB. San Francisco's potential responsibility for FERC-ordered flows may further depend on San Francisco's ability to enter into a new or extended agreement with the Districts to offset a portion of San Francisco's flow contributions in exchange for payment. Due to the high levels of uncertainty surrounding the Districts' FERC-relicensing process, as well as the unknown timing for license issuance, the SFPUC's RWS water supply reliability analyses do not assume additional water supply losses from any potential new FERC-ordered flow releases.
3. The simulation of the Bay-Delta Plan Amendment scenario assumes that a 1996 agreement between San Francisco and the Districts (the Side Agreement), which allows San Francisco to pay the Districts in lieu of contributing a portion of current FERC-ordered flow releases, remains in effect, and that the San Francisco share of flows in excess of and not covered by the Side Agreement is approximately 51.7%. These assumptions were made for the purpose of completing the modeling for the UWMP update, and they do not represent a commitment by San Francisco or the Districts to any future agreement or of San Francisco accepting responsibility for any future FERC-ordered flow releases.

Based on current projected demands for retail customers and Wholesale Customers' Supply Assurance of 184 MGD, supply modeling for the two future supply scenarios shows significantly different supply reliability projections for the RWS:

- **With Implementation of the Bay-Delta Plan Amendment:** During a normal year, no shortages are expected for the RWS. During a single dry year and year 1 of a multi-year drought, RWS supplies show an anticipated shortfall of 42% (or 145.4 MGD in available supplies). At shortages 20% or greater, the retail customers' allocation is assumed to be 37.5% (or 54.5 MGD) and the Wholesale Customers' allocation is assumed to be 62.5% (or 90.9 MGD). The total retail supply is calculated by adding the retail RWS allocation with local supplies. For wholesale, the total supply is the wholesale allocation. The difference between total supply and total demand is the shortfall (or -12.2 MGD for retail and -93.1 MGD for wholesale). During years 2 through 5 of a multi-year drought, RWS supplies show an anticipated shortfall of 52% (or 120.2 MGD in available supplies). Similar to year 1, the same retail and wholesale allocation split is applied. The shortfall between total supply and total demand during these years for retail is -21.6 MGD and for wholesale is -108.8

MGD. For supply and demand comparisons, see Table E-5 and Table E-6 for retail and wholesale supply, respectively.

- Without Implementation of the Bay-Delta Plan Amendment:** During a normal year, no shortages are expected for the RWS. During a single dry year and years 1 through 5 of a multi-year drought, RWS supplies show an anticipated shortfall of 10% (or 225.6 MGD in available supplies). At a 10% shortage, the retail customers' allocation is 36% (or 81.2 MGD) and the Wholesale Customers' allocation is 64% (or 144.4 MGD). Because the retail allocation is above the demand, excess allocation above 66.7 MGD is re-allocated to Wholesale Customers. Therefore, 14.5 MGD is added to the wholesale allocation bringing it to 158.9 MGD. The difference between total supply and total demand is the surplus/shortfall (or 14.5 MGD for retail and -25.1 MGD for wholesale). For supply and demand comparisons, see Table E-7 and Table E-8 for retail and wholesale supply, respectively.

Table E-5. Retail Supply and Demand Comparison for Projected Normal and Dry Year Scenarios With Bay-Delta Plan Amendment

Year	Retail Supply and Demand	Normal Year	Single Dry Year	Dry Year 1	Dry Year 2	Dry Year 3	Dry Year 4	Dry Year 5
2050	Total Retail Demand	73.4	73.4	73.4	73.4	73.4	73.4	73.4
2050	Total Retail Supply	73.4	61.2	61.2	51.8	51.8	51.8	51.8
2050	Retail Groundwater	4.3	4.3	4.3	4.3	4.3	4.3	4.3
2050	Retail Recycled Water	2.4	2.4	2.4	2.4	2.4	2.4	2.4
2050	RWS Supply Available to Retail	66.7	66.7	54.5	45.1	45.1	45.1	45.1
2050	Difference (Supply Surplus or Shortfall)	0.0	-12.2	-12.2	-21.6	-21.6	-21.6	-21.6
2050	Difference as Percentage of Demand	0.0%	-16.6%	-16.6%	-29.4%	-29.4%	-29.4%	-29.4%

Table E-6. Wholesale Supply and Demand Comparison for Projected Normal and Dry Year Scenarios With Bay-Delta Plan Amendment (MGD)

Year	Wholesale Supply and Demand	Normal Year	Single Dry Year	Dry Year 1	Dry Year 2	Dry Year 3	Dry Year 4	Dry Year 5
2050	Total Wholesale Demand	184.0	184.0	184.0	184.0	184.0	184.0	184.0
2050	Total Wholesale RWS Supply	184.0	90.9	90.9	75.2	75.2	75.2	75.2
2050	Difference (Supply Surplus or Shortfall)	0.0	-93.1	-93.1	-108.8	-108.8	-108.8	-108.8
2050	Difference as Percentage of Demand	0.0%	-50.6%	-50.6%	-59.1%	-59.1%	-59.1%	-59.1%

Table E-7. Retail Supply and Demand Comparison for Projected Normal and Dry Year Scenarios Without Bay-Delta Plan Amendment

Year	Retail Supply and Demand	Normal Year	Single Dry Year	Dry Year 1	Dry Year 2	Dry Year 3	Dry Year 4	Dry Year 5
2050	Total Retail Demand	73.4	73.4	73.4	73.4	73.4	73.4	73.4
2050	Total Retail Supply	73.4	87.9	87.9	87.9	87.9	87.9	87.9
2050	Retail Groundwater	4.3	4.3	4.3	4.3	4.3	4.3	4.3
2050	Retail Recycled Water	2.4	2.4	2.4	2.4	2.4	2.4	2.4
2050	RWS Supply Available to Retail	66.7	81.2 ^a	81.2 ^a	81.2 ^a	81.2 ^a	81.2 ^a	81.2 ^a
2050	Difference (Supply Surplus or Shortfall)	0.0	14.5	14.5	14.5	14.5	14.5	14.5
2050	Difference as Percentage of Demand	0.0%	19.8%	19.8%	19.8%	19.8%	19.8%	19.8%

a Per the WSA, at 10% shortage (Dry Years 1-5), the retail allocation is 36% (81.2 MGD) and the wholesale RWS supply allocation is 64% (144.4 MGD). Retail allocations above 66.7 MGD (or 14.5 MGD) are re-allocated to Wholesale Customers.

Table E-8. Wholesale Supply and Demand Comparison for Projected Normal and Dry Year Scenarios Without Bay-Delta Plan (MGD)

Year	Wholesale Supply and Demand	Normal Year	Single Dry Year	Dry Year 1	Dry Year 2	Dry Year 3	Dry Year 4	Dry Year 5
2050	Total Wholesale Demand	184.0	184.0	184.0	184.0	184.0	184.0	184.0
2050	Total Wholesale RWS Supply	184.0	158.9 ^a	158.9 ^a	158.9 ^a	158.9 ^a	158.9 ^a	158.9 ^a
2050	Difference (Supply Surplus or Shortfall)	0.0	-25.1	-25.1	-25.1	-25.1	-25.1	-25.1
2050	Difference as Percentage of Demand	0.0%	-13.6%	-13.6%	-13.6%	-13.6%	-13.6%	-13.6%

a Per the WSA, at 10% shortage (Dry Years 1-5), the wholesale RWS supply allocation is 64% (144.4 MGD) and the retail allocation is 36% (81.2 MGD). Retail allocations above 66.7 MGD are re-allocated to Wholesale Customers. Therefore, 14.5 MGD is added to the wholesale allocation, bringing it to 158.9 MGD.