

CHAPTER 5. WATER SUPPLY RELIABILITY

The City uses surface water from the Sacramento and American Rivers, and groundwater pumped from the North American and South American Subbasins to meet its water demands; although, as noted in Chapter 4, the City does not pump a substantial amount of groundwater south of the American River. The purpose of this chapter is to discuss the reliability of these supplies during various hydrologic conditions, describe the total water supplies available during normal years, single dry years, and multiple dry years, discuss water quality impacts on reliability, and discuss other potential supply opportunities.

RELIABILITY OF THE CITY'S SURFACE WATER SUPPLIES

The City's reliable surface water supply is discussed, followed by a discussion of historical diversions and future water supply projections used for the evaluation of supply availability during drought conditions for this UWMP.

1957 Water Rights Settlement Contract with the Bureau

The Bureau and the City entered into a permanent water rights settlement contract (the "Settlement Contract") pertaining to the use of water from the Sacramento and American Rivers. As described previously in Chapter 4, among other provisions of the Settlement Contract, in exchange for the Bureau's agreement to operate so as to assure the City a reliable supply of surface water under the City's appropriative water right permits, the City agreed to limitations on the City's rate and amount of diversions under the permits. These limitations are summarized below for each river.

Limits for Water Diverted from the Sacramento River

As part of the Settlement Contract, the City agreed to limit its rate of diversion from the Sacramento River to 225 cfs during all hydrologic conditions. The City also agreed to limit its annual diversion of Sacramento River water such that the total combined diversion from both the Sacramento and American Rivers does not exceed the total quantity specified in Schedule "A" of the Settlement Contract (see Appendix C).¹ The Settlement Contract recognizes the City's ability to divert Sacramento River water to the SRWTP² and potentially to other facilities that may in the future be constructed on the Sacramento River for this purpose.

For planning purposes, this UWMP assumes the City always uses its maximum annual diversion limit from the Sacramento River (81,800 afa), since diversions from the Sacramento River are not subject to any additional limitations, and can be treated at either the SRWTP and at future Sacramento River facilities (subject to applicable regulatory approvals).

Limits to Water Diverted from the American River

Under the Settlement Contract, the City agreed to limit its rate of diversion from the American River to 675 cfs. The City also agreed to limit its annual diversion from the American River to Schedule "B" of the Settlement Contract and/or the total combined diversion from both rivers



specified in Schedule “A” of the Settlement Contract (see Appendix C).³ The maximum diversions specified in the Settlement Contract were previously presented in Chapter 4 (see Table 4-2). As discussed below, the City’s American River diversions to the FWTP are also limited in the WFA.

Water Forum Agreement

The Water Forum was started in 1993 by a group of water managers, local governments, business leaders, agricultural leaders, environmentalists, and citizen groups with two “co-equal” goals: to provide a reliable and safe water supply through the year 2030, and to preserve the wildlife, fishery, recreational, and aesthetic values of the Lower American River.⁴ In 1999, after six years of intense interest-based negotiation, the Water Forum participants approved the 2000 Water Forum Agreement (WFA).⁵

As part of the WFA, each purveyor signed a purveyor specific agreement (PSA) that specified that purveyor’s Water Forum commitments; a copy of the City’s PSA is provided in Appendix C. The City’s PSA limits the quantity of water diverted from the American River to the FWTP during two conditions: extremely dry years (i.e., “Conference Years”) and periods when river flows are below the so-called “Hodge Flow Criteria” issued by Judge Richard Hodge in the *Environmental Defense Fund v. East Bay Municipal Utility District* litigation.⁶ A copy of the Hodge Flow Criteria is presented in Appendix C. These two conditions, collectively referred to as the “PSA Limitations,” are described in more detail below.

The terms of the City’s PSA were negotiated prior to approval of the WFA based on a common understanding among the Water Forum participants that the existing flow standard applicable to operation of the Bureau’s water storage facilities above the lower American River was outdated and inadequate to preserve and protect the river’s instream resources. These terms were agreed to before the approval of the WFA because there was no flow standard assuring adequate flow releases from the Bureau’s upstream facilities, nor was the Bureau a party to the Water Forum.

The Water Forum parties agreed to use the Hodge Flow Criteria as a surrogate for minimum flows necessary to preserve and protect the instream resources of the lower American River. The PSA negotiated by the City restricted the City from using a portion of the FWTP diversion capacity during periods when these flows were not met. Although the Hodge Flow Criteria were developed largely upon the basis of instream resources and uses occurring upstream of the City’s FWTP, these criteria were the most fully developed instream flow criteria available when the City’s PSA was negotiated.

Since that time, much progress has been made through the Water Forum Successor Effort toward the development of an updated flow management plan for the lower American River. As part of this process, additional study and analysis has determined that minimum flow levels lower than the Hodge Flow Criteria, in some cases significantly lower, are fully protective of the instream resources of the lower American River. If a flow management plan based on these minimum flow levels is ultimately adopted by the State Water Resources Control Board, assuring that the Bureau will provide flow releases adequate to protect the lower American River’s instream resources, then there should be no further need to restrict the City’s diversions at the FWTP on the basis of separate higher flow criteria.



As indicated in Appendix C, the City's PSA includes provisions recognizing that the City may seek modification to the PSA limitations and/or approval for the construction of additional FWTP diversion and treatment capacity, if justified by future analysis showing that increased diversions will not have significant adverse impacts on the American River below the FWTP. This could be the case, for example, if the State Water Resources Control Board adopts an improved flow management plan governing releases of water from the Bureau's American River facilities, or if instream flow needs downstream of the FWTP are determined to be different than flow requirements that should apply upstream of the FWTP.

Based on the City's current PSA, during periods when the PSA Limitations do not apply, the City can utilize its FWTP facilities to divert up to 310 cfs of American River water, which represents the full capacity of the City's present FWTP facilities. The 310 cfs is approximately equal to 205,000 afa assuming the FWTP is down for one month during the year for maintenance, and can only operate for 334 days continuously. Limitations when the PSA Limitations apply are discussed in more detail below, followed by a discussion of the City's plans to build a new water treatment plant to improve surface water supply reliability.

Extremely Dry Years (Conference Years)

The PSA defines extremely dry years (i.e., "Conference Years") as years in which the DWR projects an annual unimpaired flow into Folsom Reservoir of 550,000 afa or less, or the projected March through November unimpaired flow into Folsom Reservoir is less than 400,000 afa. During extremely dry years, the City has agreed to limit its diversions for water treated at the FWTP to 155 cfs and 50,000 afa.

Conference Years have occurred on the American River only twice over the 72 year period of record historical hydrology. These years were water year 1924, and water year 1977; a water year is the 12-month period, starting October 1 and ending on September 30. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months. For example, the year ending September 30, 1992 is called the "1992 water year".

Hodge Flow Conditions

As noted above, the City agreed (in its PSA) to restrict its diversions of American River water to the FWTP during periods when flows in the Lower American River are less than the Hodge Flow Criteria. Appendix C of the WFA defines these criteria, which is provided in Appendix C of this UWMP.

Specifically, the PSA allows the diversion of American River water to the FWTP of up to 310 cfs (200 million gallons per day (mgd)), provided the flow passing the FWTP is greater than the Hodge Flow Criteria and extremely dry year conditions do not exist. During periods when the flow passing the FWTP is less than the Hodge Flow Criteria, diversions to the FWTP are limited as shown in Table 5-1.



Table 5-1. Maximum Rate of Diversion to the FWTP During Hodge Flow Years^(a)

Period	Maximum Diversion, cfs	Maximum Diversion, mgd
January through May	120	77.6
June through August	155	100.2
September	120	77.6
October through December	100	64.6

^(a) Diversion limits obtained from the City’s PSA, which is included in Section 5 of the WFA.

As shown in Table 5-2, the total annual diversion to the FWTP during a year when flows passing the FWTP are below Hodge Flow Criteria every day of the year (a hypothetical Hodge Flow year), and assuming the FWTP is down for maintenance one month of the year, is approximately 82,260 afa.

Table 5-2. Monthly Diversion Limit During Hodge Flow Years at the FWTP^(a)

Month	Hodge Year Flow Condition, mgd	Days in the Month	Total Diversion, MG	Total Diversion, af
January	Assumed FWTP is down for Maintenance			
February	77.6	28	2,173	6,669
March	77.6	31	2,406	7,384
April	77.6	30	2,328	7,145
May	77.6	31	2,406	7,384
June	100.2	30	3,006	9,226
July	100.2	31	3,106	9,533
August	100.2	31	3,106	9,533
September	77.6	30	2,328	7,145
October	64.6	31	2,003	6,147
November	64.6	30	1,938	5,948
December	64.6	31	2,003	6,147
Total		334	26,800	82,260

^(a) For planning purposes in this Urban Water Management Plan, it was assumed that the FWTP is shutdown for one month during the winter for maintenance, and can only operate for 334 days per year. Shutdowns of City’s water treatment are not planned to occur every year.

New Water Treatment Plant to Increase Surface Water Supply Reliability

Currently, the rate and volume of American River water that can be diverted and treated at the City’s FWTP is significantly limited during periods when the City’s PSA Limitations apply. For



example, in 2030, the City's total water entitlement will include 81,800 af of Sacramento River water and 245,000 af of American River water (based on Schedule A of the Settlement Contract). The present PSA Limitations would limit the City's diversions to the FWTP during a Conference Year to 50,000 af of water, leaving, in a Conference Year, an additional 195,000 af of American River entitlement that is either not used, or might be treated downstream at the SRWTP.

Assuming the SRWTP is shutdown for one month during the winter for maintenance, it can only treat approximately 164,000 af at its current capacity of 160 mgd (i.e., operates at 160 mgd continuously for 334 days). If the SRWTP treats the City's entire Sacramento River entitlement (81,800 af), then only 82,200 af of the remaining 195,000 af of American River entitlement could be treated at the SRWTP. Under this future Conference Year scenario, the City would lack the facilities necessary to divert and treat 112,800 afa of its American River entitlement.

The City is planning to construct a new water treatment plant on the Sacramento River in Natomas, north of the City's present SRWTP, to address the need for additional facility capacity to meet future needs. This proposed facility (referred to in this UWMP as the "proposed Natomas Water Treatment Plant", or "NWTP") presently is included in the Sacramento River Water Reliability Study project, a multi-agency project proceeding under the authority of the Bureau of Reclamation to develop new surface water supply facilities on the Sacramento River. City staff anticipates that the NWTP may be operational within the next six to ten years.

It is also anticipated that the proposed NWTP will treat raw water diverted from the Sacramento River using the City's existing Sacramento River entitlements, subject to applicable regulatory approvals. Using the proposed NWTP for this purpose will allow the City to divert and treat additional water at the SRWTP under the City's American River entitlements to improve the City's surface water supply reliability.

For planning purposes in this UWMP, it was assumed that the proposed NWTP would be available for treating raw water diverted from the Sacramento River by the year 2012. This UWMP also assumes that the proposed NWTP would be constructed with sufficient capacity to treat the City's entire entitlement on the Sacramento River, or 81,800 afa, and that the SRWTP would be available to treat up to 164,000 af of water from the American River. The water supply treated at the NWTP would be available under all hydrologic conditions. The proposed NWTP capacity could be reduced if the City's PSA limitations are modified to remove or reduce the FWTP diversion limitations discussed above.

Summary of Surface Water Supply Reliability for this UWMP

As discussed previously, limits specified in the City-Bureau Settlement Contract set the City's maximum allowed diversions under the City water right permits (both rate of diversion and annual diversion), while limits presently in the PSA only affect diversions of American River water to the FWTP during specified conditions, and may change from year to year depending on hydrologic conditions (Normal, Normal with Hodge Flow, and Extremely Dry). The City also plans to construct the proposed NWTP so that additional diversions from the American River can be treated at the SRWTP.



The locations and treatment capacities of the City's two existing water treatment plants (the FWTP and SRWTP) and the assumptions made regarding the City's future proposed water treatment plant (the proposed NWTP) allowed the following planning assumptions regarding the priority of diversions to each of the plants during each hydrologic condition:

- Before the proposed NWTP is completed in 2012, the City's Sacramento River entitlement will be treated at the SRWTP.
- Before the proposed NWTP is completed in 2012, available capacity at the SRWTP will be used to treat remaining American River entitlements not treated at the FWTP.
- After the proposed NWTP is completed in 2012, only the SRWTP and FWTP will be used to treat the City's American River entitlements if the City's entire Sacramento River entitlement is being treated at the proposed NWTP.

These assumptions maximize the City's use of existing surface water entitlements, and they are only assumed for planning purposes in this UWMP. The City may choose to operate the three water treatment plants differently. In addition, as discussed in Chapter 4, the City's present desire is to maintain flexibility to serve surface water only, or serve groundwater and surface water. As an alternative, the City could also achieve some increase of its water supply and water supply reliability by increasing reliance on groundwater.

The probable reliable surface water supply available during each hydrologic condition (Normal, Hodge Flow Conditions, and Extremely Dry) is discussed below, followed by a discussion of the 72-year annual hydrologic analysis completed to determine the ability of the City to meet its water demands under all hydrologic conditions.

Available Supply During Each Hydrologic Condition

The following describes the methodology used to determine the available surface water supply during each hydrologic condition (i.e., Normal Year, Hodge Flow Conditions, and Extremely Dry Year) using the year 2030 as an example. For planning purposes, it was assumed that both of the City's existing water treatment plants were shutdown for maintenance one month during the winter (alternating months), and can only operate 334 days per year. It was also assumed that the City would construct the proposed NWTP such that it could treat the entire Sacramento River entitlement (81,800 af) even when shutdown for short periods during the year for maintenance.

During a normal year (i.e., a year when the PSA Limitations do not apply during any month) the City could treat 81,800 afa of Sacramento River water at the proposed NWTP and 205,369 afa (310 cfs continuously for 334 days) of American River water at the FWTP. In 2030, the City's remaining American River diversion limit (245,000 afa – 205,369 afa, or 39,631 afa) could then be diverted to the SRWTP, bringing the City's total normal year surface water supply to 326,800 afa (81,800 afa of Sacramento River water and 245,000 afa of American River water).

During Hodge Flow Conditions, the City could treat 81,800 afa of Sacramento River water at the proposed NWTP and up to 82,260 afa (see Table 5-2) of American River water at the FWTP. In 2030, the City could then use the SRWTP to treat the remaining American River entitlement of



162,740 af (245,000 af – 82,260 af), bringing the City’s total supply to 326,800 afa (81,800 afa of Sacramento River water and 245,000 afa of American River water).

During an extremely dry year, the City could treat 81,800 afa of Sacramento River water at the proposed NWTP and up to 50,000 afa of American River water at the FWTP. In 2030, the City could then use the SRWTP to treat an additional 164,000 af of American River water, bringing the City’s total supply to 295,800 afa (81,800 afa of Sacramento River water and 214,000 afa of American River water).

Consequently, in 2030 with all three water treatment plants available, the City could divert 100 percent of its Settlement Agreement diversion limit during a normal year, 100 percent of its diversion limit during a Hodge Flow year, and 91 percent (295,800 afa divided by 326,800 afa) of its diversion limit during an extremely dry year. Table 5-3 summarizes the available surface water supply for 2010 through 2030 in five-year increments, using the same methodology.

72-Year Annual Hydrologic Analysis

MWH Global previously conducted a 72-year annual hydrologic analysis on a monthly time step, by water year. For planning purposes in this UWMP, this data was realigned on a calendar year basis to determine the ability of the City to meet its water demands under all hydrologic conditions, with the currently available surface water supply sources and three water treatment plants operational.⁷ Using hydrologic condition information (e.g., year type and Hodge year condition), the evaluation found that extremely dry years only occurred twice: once in 1924 and again in 1977.

The evaluation also found that normal conditions with Hodge Flow Criteria governing every month occurred six times (1926, 1929, 1931, 1933, 1934, and 1990). A summary of the City’s potential diversions during drought conditions is provided in Table 5-4; the historical 72-year annual (by month) hydrologic data developed and analyzed by the City and used in this UWMP is provided in Appendix E.

As shown in Table 5-3 and Table 5-4, the most severe limitations to the City’s surface water supply happens during an extremely dry year, which corresponds with drought conditions that occurred in 1924 and 1977. For planning purposes, this UWMP assumes that 1977 is representative of the single-year drought condition.

Table 5-4 also indicates that 1933 to 1934 was the only consecutive year period that Hodge Flow criteria governed every month. For planning purposes, it was assumed that during a 3-year multiple year drought, that the first two years would consist of Hodge Flows governing every month (i.e., 1933 to 1934 conditions) and that the third year would be an Extremely Dry Year (i.e., 1977 conditions). These reliability-planning assumptions provide the City with sufficient conservatism to ensure adequate supplies during extreme hydrologic conditions that may occur in the future.

Table 5-3. Available Surface Water Supply During Normal and Drought Conditions, acre-feet^(a,b,c,d,e)

Year	Normal Year ^(d)				Normal Year with Hodge Flow Criteria ^(e)				Extremely Dry Year (Single Dry Year)						
	Water Treated at the NWTP	Water Treated at the SRWTP	Water Treated at the FWTP	Total Diversion	% of Schedule A Delivered	Water Treated at the NWTP	Water Treated at the SRWTP	Water Treated at the FWTP	Total Diversion	% of Schedule A Delivered	Water Treated at the NWTP	Water Treated at the SRWTP	Water Treated at the FWTP	Total Diversion	% of Schedule A Delivered
2010	0	81,800	145,700	227,500	100%	0	145,240	82,260	227,500	100%	0	164,013	50,000	214,013	94%
2015	81,800	0	170,200	252,000	100%	81,800	87,940	82,260	252,000	100%	81,800	120,200	50,000	252,000	100%
2020	81,800	0	196,200	278,000	100%	81,800	113,940	82,260	278,000	100%	81,800	146,200	50,000	278,000	100%
2025	81,800	16,831	205,369	304,000	100%	81,800	139,940	82,260	304,000	100%	81,800	164,013	50,000	295,813	97%
2030	81,800	39,631	205,369	326,800	100%	81,800	162,740	82,260	326,800	100%	81,800	164,013	50,000	295,813	91%

^(a) Diversions presented in this Table are for planning purposes only; the City may operate its water treatment plants differently.

^(b) Assumes the SRWTP is down for 31 days per year for maintenance during the winter.

^(c) Assumes the FWTP is down for 31 days per year for maintenance during the winter.

^(d) FWTP production is limited to 82,260 acre-feet during Hodge Years.

^(e) FWTP production is limited 50,000 acre-feet during an extremely dry year.

^(f) A normal year in this UWMP is a year that is not extremely dry.

^(g) This UWMP assumes that Hodge Flow Criteria govern every month of the year.



Table 5-4. Occurrence of Historical Drought Conditions^(a)

Hydrologic Condition	Historical Drought Years
Normal with Hodge Flow Criteria Governing Every Month	1926, 1929, 1931, 1933, 1934 and 1990
Extremely Dry Year	1924 and 1977

^(a) Information in the table is based on monthly analysis data presented in Appendix E.

In hydrologic years when the City cannot meet its water demand with surface water due to diversion limits, supplemental water required to meet demands will be delivered from groundwater pumped from either the North or South American subbasins. The reliability of the groundwater supply is discussed below.

RELIABILITY OF THE CITY’S GROUNDWATER SUPPLIES

Existing regulations do not directly limit the use or expansion of groundwater pumping activities by the City; and as previously discussed in Chapter 4, the City desires to maintain the flexibility to utilize surface water, or a combination of surface water and groundwater to meet its potable water demands. For reliability planning purposes in this UWMP, it was assumed that the City would maximize the use of its surface water supplies, and use up to its maximum groundwater pumping capacity during drought periods.

The total firm pumping capacity of the City’s groundwater wells is approximately 30 mgd or about 33,600 afa, assuming that 90 percent of the City groundwater wells are available to operate continuously for 365 days per year. As will be discussed in Chapter 6, the City has historically pumped approximately 22,000 acre-feet; hence, it is assumed for purposes of this UWMP the City could pump anywhere from 22,000 afa to 33,600 afa. As noted previously, the City may use groundwater in the future, and retains the option to also increase its water supply and water supply reliability by increasing its groundwater pumping facilities.

Table 5-5 summarizes the City’s total future water supply (both surface and groundwater) during normal and drought years, and Table 5-6 summarizes the City’s total supply assuming the next three years are multiple dry years. The hydrologic conditions for 2006, 2007, and 2008, shown in Table 5-6, are indicative of a worst-case scenario, assuming hydrologic conditions in 2006 and 2007 are similar to actual historical conditions in 1933 and 1934, and hydrologic conditions in 2008 are a hypothetical extreme year (similar to actual conditions present in 1977). As shown in both tables, this UWMP assumes that the City diverts 81,800 afa from the Sacramento River. American River diversions were limited so that they were consistent with the total combined maximum diversion limit specified in Schedule A of the Settlement Contract (see Table 4-2).

Table 5-5. Assumed Total Future Water Supplies During Normal and Drought Conditions, acre-feet

Normal Years					
Supply Source	2010	2015	2020	2025	2030
Sacramento River	81,800	81,800	81,800	81,800	81,800
American River	145,700	170,200	196,200	222,200	245,000
Total Diversion	227,500	252,000	278,000	304,000	326,800
Groundwater	33,600	33,600	33,600	33,600	33,600
Total Water Supply	261,100	285,600	311,600	337,600	360,400

Normal Years with Hodge Flow Criteria Governing Every Month					
Supply Source	2010	2015	2020	2025	2030
Sacramento River	81,800	81,800	81,800	81,800	81,800
American River	145,700	170,200	196,200	222,200	245,000
Total Diversion	227,500	252,000	278,000	304,000	326,800
Groundwater	33,600	33,600	33,600	33,600	33,600
Total Water Supply	261,100	285,600	311,600	337,600	360,400

Single Drought Years (Extremely Dry)					
Supply Source	2010	2015	2020	2025	2030
Sacramento River	81,800	81,800	81,800	81,800	81,800
American River	132,213	170,200	196,200	214,013	214,013
Total Diversion	214,013	252,000	278,000	295,813	295,813
Groundwater	33,600	33,600	33,600	33,600	33,600
Total Water Supply	247,613	285,600	311,600	329,413	329,413



Table 5-6. Assumed Future Water Supplies Available During Multiple Dry Years, acre-feet

Supply Source	2006 (Year 1) ^(a)	2007 (Year 2) ^(a)	2008 (Year 3) ^(a)
Sacramento River ^(b)	81,800	81,800	81,800
American River ^(c)	127,700	132,200	132,213
Total Surface Water Diversion	209,500	214,000	214,013
Groundwater ^(d)	33,600	33,600	33,600
Total	243,100	247,600	247,613

- (a) Hydrologic conditions in Year 1, Year 2, and Year 3, are representative of actual conditions present in 1933, 1934, and 1977, respectively.
- (b) Maximum diversion is 81,800 afa from the Sacramento River per the 1957 Settlement Contract with the Bureau. For planning purposes, this UWMP assumes that the City uses this amount from the Sacramento River.
- (c) American River diversions limited to the difference between the diversion limit specified in Schedule A of the 1957 Settlement Contract with the Bureau and diversions taken from the Sacramento River.
- (d) Groundwater limited to 90% of the City’s existing 33 mgd pumping capacity, or 30 mgd, assuming the wells were operated continuously for 365 days. This UWMP assumes that actual pumpage will vary from historical averages (22,000 af) to the maximum firm pumping capacity (33,600 af).

WATER QUALITY IMPACTS ON RELIABILITY

The purpose of this section is to discuss the quality of the City’s surface water and groundwater supplies, and the potential impacts water quality may have on supply reliability. Water quality for each of the City’s sources of supply and its potential impact on reliability are discussed below.

Surface Water Quality

In May of 1991, the City, Sacramento County Water Resources Division, and the Sacramento Regional County Sanitation District (SRCSD) formed the Sacramento Coordinated Water Quality Monitoring Program (CMP).⁸ The CMP has monitored long-term ambient water quality in both the Sacramento and American Rivers since 1992.⁹ The latest water quality results from December 1992 to June 2003, show that water in both rivers consistently met applicable water quality regulations.¹⁰

Water quality in both rivers can be influenced by a combination of other factors, including higher turbidity during storm events, irrigated agriculture, livestock, urban runoff, and contamination due to other point sources. These influencing factors can impact water quality parameters (e.g., turbidity, coliforms, Giardia and Cryptosporidium, organic carbon, volatile and semi-volatile organic compounds, arsenic, and hexavalent chromium). However, raw water quality is routinely monitored by the City, and the water treatment plants are designed to produce drinking water that meets all applicable drinking water quality regulations.



The City does not expect any surface water supply changes prior to 2030 due to water quality.

Groundwater Quality

Groundwater underlying the City's service area generally meets primary and secondary drinking water standards for municipal water use, and is described as being a calcium-magnesium-bicarbonate type water, with minor fractions of sodium-magnesium-bicarbonate.¹¹ Due to high concentrations of iron and manganese in the lower aquifer system, the upper aquifer system is usually the preferred source of municipal groundwater supply.¹²

The lower aquifer system also contains higher concentrations of TDS than the upper aquifer. The TDS concentration in most wells is within secondary drinking water standards, but varies quite significantly throughout the area (from 21 to 657 mg/L, with an overall average of 221 mg/L).¹³ TDS concentrations exceed 2,000 mg/L at depths of approximately 1,200 feet or greater.¹⁴ However, most wells do not extend into this poorer quality groundwater.

There are also over 200 leaking underground storage tank (LUST) sites and several "principal" groundwater contaminant plumes near the City.¹⁵ The source for the principal plumes are the former Southern Pacific and Union Pacific Railyards (located about a half mile west of the Capitol Building), McClellan Air Force Base (AFB), the former Mather AFB, and the Aerojet site in Rancho Cordova.¹⁶ The combined primary contaminants of concern from these sites include: benzene; methyl-tertiary butyl ether (MTBE); trichloroethene (TCE); tetrachloroethene (PCE); cis-1,2-dichloroethene (DCE); 1,4-dioxane; 1,2-dichloroethane; carbon tetrachloride; perchlorate; and n-nitrosodimethylamine (NDMA).¹⁷

In addition to ambient water quality or potential contaminants, the City's groundwater supply is also subject to future regulation. Future regulations regarding arsenic, radon, or other chemicals of concern could potentially limit the City's groundwater supply in the future. As discussed previously in Chapter 4, the City is participating in several groups to help develop mechanisms to manage and protect the Sacramento area's groundwater resources.

There is no information available which identifies any groundwater supply changes prior to 2030 due to water quality.

OTHER POTENTIAL WATER SUPPLY OPPORTUNITIES

As will be shown in Chapter 7, the City has sufficient water supply entitlements to meet projected water demands during various hydrologic conditions to the year 2030 and therefore, is not currently seeking additional surface water supply. However, as discussed previously, the City does not have sufficient diversion or treatment capacity to use 100 percent of its ultimate surface water entitlements during all hydrologic conditions. In addition to planning for the construction of a new water treatment plant, the City is also evaluating the feasibility of recycled water. Both are discussed in more detail below.



New Water Treatment Plant

As discussed above, the City is currently planning to construct a new water treatment plant on the Sacramento River in Natomas. The proposed NWTP would treat raw water diverted from the Sacramento River using the City’s existing entitlements. Using the proposed NWTP to treat Sacramento River water will allow the City’s SRWTP to treat additional water diverted under the City’s American River entitlements that would not be diverted at the FWTP during periods when the City’s current PSA Limitations apply. As discussed previously, this UWMP assumes that the proposed NWTP will be operational by 2012, and will have the capacity to treat the City’s existing Sacramento River entitlement (81,800 af)¹. This entitlement is available under all hydrologic conditions. Table 5-7 presents the maximum water supply available from the NWTP during multiple-dry years.

Table 5-7. Available Supply from the NWTP during Multiple-Dry Years (DWR Table 17)

Project Name	Normal Year, af	Single-Dry Year, af	Multiple-Dry Year 1, af	Multiple-Dry Year 2, af	Multiple-Dry Year 3, af
NWTP	81,800	81,800	81,800	81,800	81,800

Potential Recycled Water Use

As will be discussed in more detail in Chapter 10, the SRCSD, in partnership with the SCWA began delivering recycled water to the Elk Grove/Laguna area in April 2003.¹⁸ The treatment facility can produce up to 5 mgd of recycled water to meet the irrigation needs of street medians, commercial landscaping, parks, and schools, and produced a total of 550 acre-feet of recycled water in 2004.¹⁹

The SRCSD is in the process of expanding this recycled water system, and looking for additional partners. The City is participating in an advisory committee developed by the SRCSD, which began meeting in December 2005. Participation in the committee provides the City the opportunity to consider the feasibility of a future partnership.

¹ As noted above, the proposed NWTP capacity could be reduced if the City’s PSA limitations are reduced.



REFERENCES

- ¹ 1957 United States Bureau of Reclamation and City of Sacramento Settlement Contract
- ² 1994 United States Bureau of Reclamation. Letter to Mr. William H. Edgar, City Manager.
- ³ 1957 United States Bureau of Reclamation and City of Sacramento Settlement Contract
- ⁴ Sacramento Groundwater Authority (SGA), *Groundwater Management Plan*. December 2003.
- ⁵ Water Forum, *Water Forum Website* (www.waterforum.org). January 2006.
- ⁶ Water Forum, *Water Forum Agreement – Section 5*. January 2000.
- ⁷ Information for the 72-year hydrologic analysis was provided to the City by SWRI, Inc., and is draft, subject to revisions.
- ⁸ EIP Associates, Mintier & Associates, Fehr & Peers, Economic and Planning Systems, Nolte Associates, Wallace Roberts & Todd, City of Sacramento, *General Plan Update – Technical Background Report*. June 2005.
- ⁹ EIP Associates, Mintier & Associates, Fehr & Peers, Economic and Planning Systems, Nolte Associates, Wallace Roberts & Todd, City of Sacramento, *General Plan Update – Technical Background Report*. June 2005.
- ¹⁰ EIP Associates, Mintier & Associates, Fehr & Peers, Economic and Planning Systems, Nolte Associates, Wallace Roberts & Todd, City of Sacramento, *General Plan Update – Technical Background Report*. June 2005.
- ¹¹ City of Sacramento, *General Plan Technical Background Report*. June 2005.
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- ¹³ City of Sacramento, *General Plan Technical Background Report*. June 2005.
- ¹⁴ City of Sacramento, *General Plan Technical Background Report*. June 2005.
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- ¹⁷ EIP Associates, Mintier & Associates, Fehr & Peers, Economic and Planning Systems, Nolte Associates, Wallace Roberts & Todd, City of Sacramento, *General Plan Update – Technical Background Report*. June 2005.
- ¹⁸ Sacramento Regional County Sanitation District, *SRCSD – Frequently Asked Questions: Water Recycling*. Downloaded from www.srcsd.com on December 28, 2005.
- ¹⁹ Sacramento Regional County Sanitation District, *SRCSD – Frequently Asked Questions: Water Recycling*. Downloaded from www.srcsd.com on December 28, 2005.