Attachment A to Resolution No. R16-010

Amendment to the Water Quality Control Plan for the Los Angeles Region to Incorporate a Program of Implementation Consisting of Groundwater Quality Management Measures for Salts and Nutrients in the Main San Gabriel Valley Basin

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Adopted by the California Regional Water Quality Control Board, Los Angeles Region on December 8, 2016.

Approved by:

The State Water Resources Control Board on [Insert Date].
The Office of Administrative Law on [Insert Date].

The program of implementation[1] described below is based on the Salt and Nutrient Management Plan (SNMP) for the Main San Gabriel Valley Basin[2] developed by the Main San Gabriel Basin Watermaster (Basin Watermaster) in conjunction with other agencies, including the Upper San Gabriel Valley Municipal Water District (Upper District), San Gabriel Valley Municipal Water District (San Gabriel District), Three Valley's Municipal Water District (Three Valley's District), the County of Los Angeles Department of Public Works (LACDPW), Metropolitan Water District of Southern California (MWD), and the Sanitation Districts of Los Angeles County (LACSD). The Salt and Nutrient Management Plan and this program of implementation satisfy the State Water Resources Control Board's Recycled Water Policy requirements for Salt and Nutrient Management Plans. This program of implementation applies to groundwater basin(s) with the designated beneficial use of municipal and domestic supply (MUN).

The SNMP was developed to provide the framework for water management practices in the San Gabriel Valley Basin, including the use of recycled water, to ensure protection of beneficial uses and allow for the sustainable use of groundwater resources, consistent with the Regional Board's water quality objectives.

[1] The Recycled Water Policy refers to "revised implementation plans" for adoption into regional basin plans pursuant to Water Code section 13242. Water Code section 13242 uses the term "program of implementation." Pursuant to Water Code section 13242, "[t]he program of implementation for achieving water quality objectives shall include, but not be limited to:
(a) A description of the nature of actions which are necessary to achieve the objectives, including recommendations for appropriate action by any entity, public or private.
(b) A time schedule for the actions to be taken.
(c) A description of surveillance to be undertaken to determine compliance with objectives."

[2] The Main San Gabriel Valley basin SNMP does not include the Puente Basin or the Six Basins both of which are subjects of separate court adjudications.

The following summarizes essential elements of the SNMP for the San Gabriel Basin. Further details may be found in the full document at: http://www.waterboards.ca.gov/losangeles/water_issues/programs/salt_and_nutrient_management/index.shtml

Background

The Main San Gabriel basin underlies the San Gabriel Valley located in southeastern Los Angeles County, and serves as the major source of water supply to about 1.4 million residents in the 19 cities overlying the basin. The basin covers a surface area of approximately 167 square miles. It is bounded by the San Gabriel Mountains on the north, the Raymond fault on the northeast, a system of low rolling hills (Repetto, Merced, Puente, and San Jose Hills) on the west and south, and by the bedrock high between San Dimas and La Verne on the east. The Whittier Narrows, a 1.5-mile gap between the Merced and Puente Hills, forms the only exit for the Basin surface water and groundwater. The Basin Plan identifies two subareas in the Main San Gabriel Basin: the Western Area, and the Eastern Area which are demarcated by a series of streams (Walnut Creek, Big Dalton Wash and Little Dalton Wash) in the overlying land area (Figure 8.6-1).

The Basin is filled with permeable alluvial deposits (water-bearing formations) and underlain and surrounded by relatively impermeable rocks (nonwater-bearing formations). It also contains many geological features and faults that may influence groundwater movement into, through, or within the Basin. The water-bearing formations extend to a maximum depth of more than 4,000 feet, and consist primarily of (i) the older alluvium, which constitutes the main valley fill material and is exposed around the margins of the entire Basin, (ii) the recent alluvium, which blankets the center of the valley floor, and (iii) the transition zone deposits, which lie along San Dimas Wash in the eastern part of the Basin.

The older alluvium deposits consist of unsorted yellowish to reddish-brown, angular to sub-rounded continental debris, derived from the surrounding mountains. These deposits vary from silt to boulders more than two feet in diameter. The thickness of the older alluvium deposits ranges from approximately 300 feet in the northern part of the Basin in the vicinity of the mouth of the San Gabriel River to approximately 4,100 feet in the vicinity of Whittier Narrows. Clay is also present in the older alluvium, likely due to the weathering process after the sediments were deposited. Clay layers of various thicknesses are embedded within the old alluvium at varying depths. These clay layers act as aquitards, i.e. semi-confining or confining layers, stratifying the water-bearing formations, i.e. aquifers, and restricting hydraulic communication between these aquifers. The presence and significance of these clay layers are dominant in the southern and western portions of the Basin – which coincides with the Western Area delineated in the Basin Plan.

The Recent alluvium deposits overlie the older alluvium along the front of the San Gabriel Mountains and in the central part of the Basin. These deposits consist of predominantly coarse boulders, gravels, and sands, ranging in thickness from a few inches to roughly 100 feet in Whittier Narrows. The thickest portions are found along the San Gabriel River channel and its adjacent floodplains. The transition zone deposits are limited in a zone of approximately two miles wide along San Dimas Wash from San Dimas to Baldwin Park. These deposits contain gravels found in both the older and recent alluvium. These deposits are thin (less than 30 feet thick) and lie above the water table.

The Basin ground surface slopes downward from approximately 1,200 feet above mean sea level (msl) in the San Dimas area, 850 feet msl in the Pomona area on the east, and 600 feet msl in the Alhambra area on the west to approximately 200 feet msl in the Whittier Narrows area on the southwest. The direction of groundwater movement in some areas of the Basin remains the same as that during earlier periods. In other portions of the Basin, the direction of groundwater movement is affected naturally by hydrologic conditions and geological features and artificially by groundwater resources management measures such as extraction and/or groundwater recharge. Prior to development, "the general direction of ground water movement across all of the San Gabriel Valley was from the perimeter of the valley toward Whittier Narrows. However, due to groundwater extraction for early development, a groundwater low was formed in the vicinity of the City of Alhambra, causing groundwater in the northwestern portion of the valley to flow towards this groundwater low (also known as the Alhambra pumping hole) rather than towards Whittier Narrows.

The Basin surface water system consists of two major streams: the San Gabriel River and the Rio Hondo. The San Gabriel River and its tributaries (Fish Canyon, Rogers Canyon, Big Dalton, Little Dalton, San Dimas, Walnut, and San Jose Creeks) drain the Eastern portion of the San Gabriel River watershed, and the Rio Hondo (which is a distributary of the San Gabriel River) and its tributaries (Alhambra, Rubio, Eaton, Arcadia, Santa Anita, and Sawpit Washes) drain the western portion of the San Gabriel River watershed. Surface water in the San Gabriel River and Rio Hondo exits the Basin at Whittier Narrows, a narrow gap between the Merced and Puente Hills. Surface water has been significantly modified by flood control reservoirs, dams, and channels (Cogswell, San Gabriel, Morris, Big Dalton, Eaton, and Puddingstone Reservoirs; Santa Fe Dam and Whittier Narrows Dam). Most stream channels have concrete-lined bottom and sides. However the San Gabriel River between Santa Fe Dam and Whittier Narrows Dam, and the San Jose Creek west of Elsah Avenue, have pervious bottoms allowing surface water percolation for groundwater recharge.

Local groundwater constitutes about 85 percent of the water demand for the basin. An additional 10 percent comes from treated imported water and 5 percent from other local supplies (recycled water and local surface water diversions). In addition, an average of about 40,000 acre-feet per year of untreated imported water is delivered for basin replenishment[3]. Land use in the Basin is approximately 84 percent urban, 16 percent open space and 1 percent agricultural.

[3] Annual Report 2014-2015. Main San Gabriel Basin Watermaster. http://media.wix.com/ugd/af1ff8_1d30b7f8d78e4e74878789c229b343e9.pdf

Basin Management

The Main San Gabriel Basin has been adjudicated and management of the local water resources within the Basin is based on Watermaster services under two Court Judgments: San Gabriel River Watermaster (River Watermaster)[4] and Main San Gabriel Basin Watermaster (Basin Watermaster)[5]. The Main Basin Watermaster was created in 1973 to resolve water issues that had arisen among water users in the San Gabriel Valley. The Watermaster is headed by a nine members board: six of those members are nominated by water producers (producer members) and three members (public members) are nominated by the Upper San Gabriel Valley Municipal Water District (Upper District) and the San Gabriel Valley Municipal Water District (SGVMWD), which overlie most of the Basin.

Initially, the Main Basin Watermaster's mission was to generally manage the water supply of the Main Basin. However, during the late 1970s and early 1980s, significant groundwater contamination was discovered in the Main Basin. The contamination was caused in part by past practices of local industries that had improperly disposed of industrial solvents referred to as Volatile Organic Compounds (VOCs) as well as by agricultural operations that infiltrated nitrates into the groundwater.

Therefore, in1989, local water agencies adopted a joint resolution regarding water quality issues that stated Main Basin Watermaster should coordinate local activities aimed at preserving and restoring the quality of groundwater in the Main Basin. The joint resolution also called for a cleanup plan. In 1991, the Court granted the Main Basin Watermaster the authority to control pumping for water quality purposes. The new responsibilities included development of a Five-Year Water Quality and Supply Plan, to be updated annually, submitted to the LARWQCB, and made available for public review by November 1 of each year.

The objective of the Five-Year Water Quality and Supply Plan is to coordinate groundwater-related activities so that both water supply and water quality in the Main Basin are protected and improved. Issues detailed in the Five-Year Plan include how Main Basin Watermaster plans to:

- Monitor groundwater supply and quality;
- Develop projections of future groundwater supply and quality;
- Review and cooperate on cleanup projects, and provide technical assistance to other agencies;
- Assure that pumping does not lead to further degradation of water quality in the Basin;
- Address Perchlorate, N-nitrosodimethylamine (NDMA), and other emerging contaminants in the Basin;
- Develop a cleanup and water supply program consistent with the U.S. Environmental Protection Agency (USEPA) plans for its San Gabriel Basin Superfund sites; and
- Coordinate and manage the design, permitting, construction, and performance evaluation of the Baldwin Park Operable Unit (BPOU) cleanup and water supply plan.

[4] Board of Water Commissioners of the City of Long Beach, et al., v. San Gabriel Valley Water Company, et al., Los Angeles County Case No. 722647, Judgment entered September 24, 1965.
[5] Upper San Gabriel Valley Municipal Water District v. City of Alhambra, et al., Los Angeles County Case No. 924128, Judgment entered January 4, 1973.

The Watermaster coordinates efforts with the Upper District, San Gabriel District, Three Valleys District, MWD, LACSD, and LACDPW to replenish the groundwater supplies to the basin with the greatest amount of high quality water as possible. In addition, the Main Basin Watermaster, in coordination with the Upper District, works with local water companies and state and federal regulatory agencies to clean up contaminated water supplies.

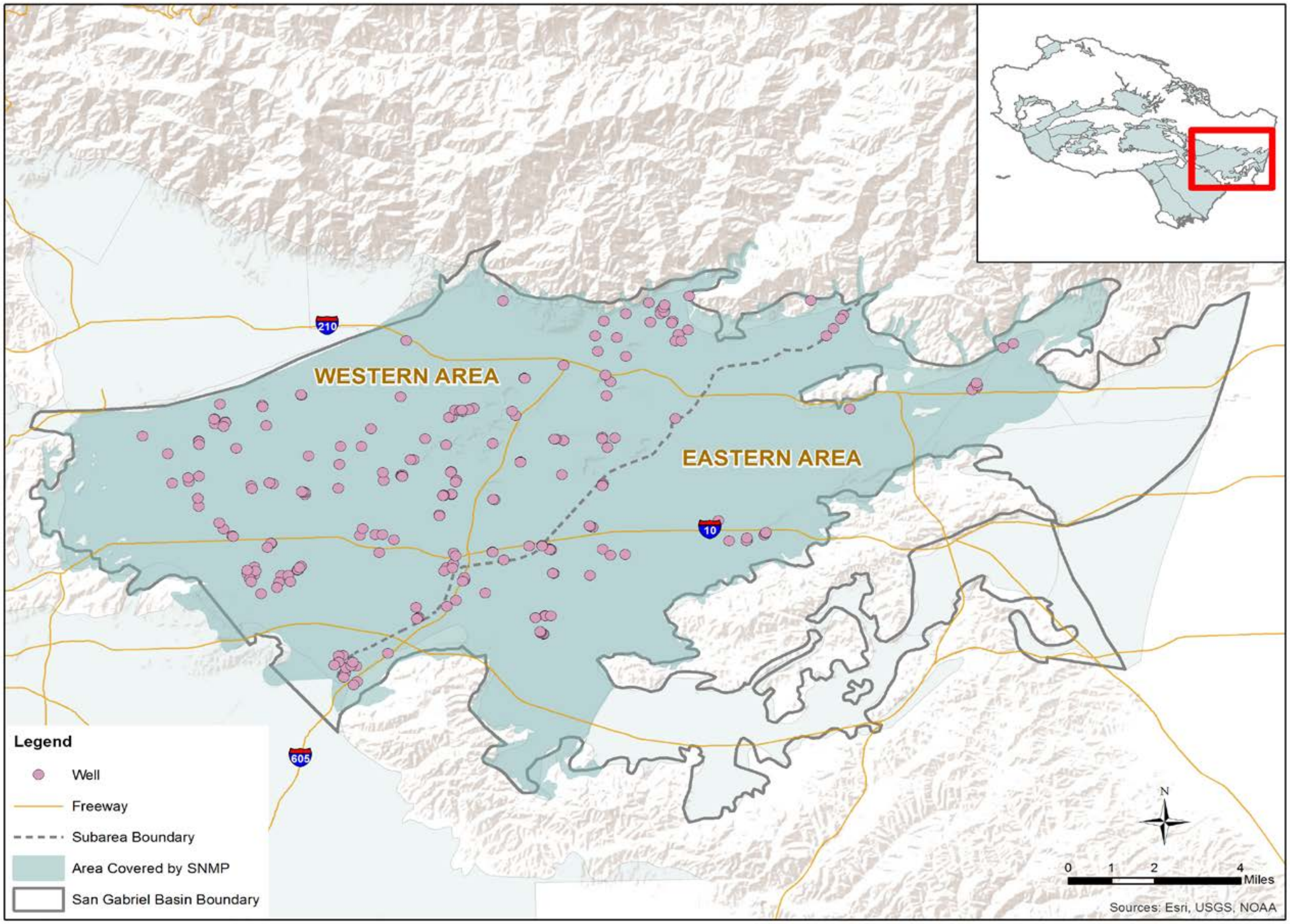

Figure 8.6-1: Main San Gabriel Basin Salt and Nutrient Management Planning Area

Participating Agencies

The Main San Gabriel Basin Watermaster (Watermaster) was the lead agency for the development of the SNMP for the San Gabriel Valley Groundwater Basin. Other major stakeholders included the Upper San Gabriel Valley Municipal Water District (Upper District), San Gabriel Valley Municipal Water District (San Gabriel District), Three Valley's Municipal Water District (Three Valley's District), the County of Los Angeles Department of Public Works (LACDPW) which is responsible for stormwater recharge; and Metropolitan Water District of Southern California (MWD) which collectively are responsible for the delivery and recharge of imported water in the Basin; and the Sanitation Districts of Los Angeles County (LACSD) which is responsible for the release of recycled water in the Basin. In addition, Watermaster staff regularly kept the Basin groundwater producers up to date with the planning process during Basin Water Management Committee meetings. Regional Water Board staff actively participated in the Main San Gabriel Basin SNMP development process.

Sources of Water in the San Gabriel Basin

Sources of water for use and recharge in the San Gabriel Basin include precipitation on the valley floor, percolation of water applied for irrigation (groundwater, local surface water, treated imported water, and recycled water), artificial recharge with local stormwater and untreated imported water, percolation of recycled water discharged from LACSD water reclamation plants to unlined portions of the San Gabriel River, San Jose Creek and Rio Hondo, and subsurface inflow.

TABLE 8.6-1: CONTRIBUTIONS OF SOURCE WATERS TO THE MAIN SAN GABRIEL BASINS

TYPE	SOURCE	CONTRIBUTION TO GROUNDWATER
Surface water	San Gabriel River, San Jose Creek and Rio Hondo	Infiltration of surface waters in unlined portions of the San Gabriel River, San Jose Creek and Rio Hondo.
Recycled Water	Tertiary-treated recycled water from Los Angeles County Sanitation District (LACSD) water reclamation plants.	Percolation to the groundwater basin from surface uses, such as irrigation. Incidental percolation of water discharged into the unlined portions of the San Gabriel River and San Jose Creek as recycled water from the San Jose Creek Wastewater Reclamation Plant and Pomona Wastewater Reclamation Plant comingles with local stormwater in the River.
Stormwater	Precipitation from overlying area	Percolation of precipitation on the Valley floor and percolation of runoff from surrounding watersheds. Artificial recharge of groundwater by direct spreading of local runoff to spreading grounds.
Imported water	State Water Project (SWP)	Surface water from the State Water Project is imported by the Upper District, the San Gabriel Valley Municipal Water District (San Gabriel District), and Three Valleys Municipal Water District (Three Valleys District) for artificial groundwater recharge through spreading grounds.
	Upper District and Three Valleys Municipal Water District (Three Valleys District)	Water supply in the Main San Gabriel Basin area
Groundwater	Imported from the Raymond Basin	Water supply and irrigation in the Main San Gabriel Basin area
	Puente Basin	Subsurface inflow from adjacent Puente Basin
	Raymond Basin	Subsurface inflow from the Raymond Basin
	San Gabriel Mountains	Subsurface inflow from the San Gabriel Mountains on the north, as a result of stored water moving out of fractures in the Basement Complex into the alluvial fill
	Hills south of the basin	A negligible quantity of water may enter the valley from the hills on the south

Groundwater outflow from the San Gabriel Valley Basin includes:

- Pumping, and
- Subsurface outflow to the Central Basin through Whittier Narrows.

Salt and Nutrient Loading to the Upper Santa Clara River Basin

The primary sources of salt loading are from stormwater recharge, untreated imported water replenished in the Basin in response to annual production which may exceed water rights, and incidental recharge of recycled water which is discharged into the San Gabriel River, Rio Hondo, and San Jose Creek by the LACSD. The mass balances (inputs and outflows) for total dissolved solids (TDS), chloride, nitrate-N and sulfate from the various water sources are presented below for the upper San Gabriel Valley Basin. These values were derived using a spreadsheet groundwater balance model that included components for recharge and discharge within the basin.

TABLE 8.6-2: SALT AND NUTRIENT BALANCE IN THE SAN GABRIEL RIVER BASIN (2001-02 THROUGH 2010-11)

Source Water	Nitrate		Chloride		Sulfate		TDS	
	(tons)	%	(tons)	%	(tons)	%	(tons)	%
Percolation from precipitation	1,134	17%	1,678	14%	2,903	27%	26,127	17%
Incidental streambed percolation	454	7%	1,451	12%	1,134	11%	8,074	5%
Irrigation return flow	998	15%	1,089	9%	3,175	30%	13,517	9%
Direct spreading	4,264	62%	7,394	63%	3,175	30%	101,741	68%
Underflow from Puente Basin	14	0%	45	0%	181	2%	635	0%
Total Inflow	**6,863**	**100%**	**11,657**	**100%**	**10,569**	**100%**	**150,094**	**100%**
Groundwater Production	6,713	96%	9,662	81%	16,103	81%	107,955	89%
Underflow to Central Basin	268	4%	2,277	19%	3,750	19%	13,616	11%
Total Outflow	**6,981**	**100%**	**11,938**	**100%**	**19,853**	**100%**	**121,571**	**100%**
Annual Change in Mass	**-118**		**-281**		**-9,284**		**28,523**	

Groundwater Quality and Assimilative Capacity in San Gabriel Valley Basin

Water quality conditions in each of the San Gabriel Valley Basin were evaluated from the period 2001-2002 through 2011-12, using groundwater quality data obtained from the Watermaster, the Los Angeles Regional Water Board and the US Environmental Protection Agency. Mean annual constituent concentrations were calculated as the arithmetic average concentration of all available water quality data at the production wells within each subarea as well as within the entire basin. Elevated concentrations of nitrate-N, chloride and sulfate were generally found in shallow wells, while low concentrations were found in wells adjacent to streams or spreading grounds. The average TDS, chloride, sulfate and nitrate-N concentrations for each of the subareas and the basin were compared to the applicable basin water quality objectives to determine the existing available assimilative capacity (Table 8.6-3). Assimilative capacity is estimated as the difference between the water quality objectives and the existing groundwater quality for each subarea.

TABLE 8.6-3: GROUNDWATER QUALITY IN THE SAN GABRIEL VALLEY BASIN (2001-2002 THROUGH 2011-12)

Parameter	Water Quality Objective (mg/L)	Water Quality (mg/L)	Assimilative Capacity (mg/L)
Western Area			
Nitrate-N	10	4.5	5.5
Chloride	100	27	73
Sulfate	100	45	55
TDS	450	330	120
Eastern Area			
Nitrate-N	10	5.4	4.6
Chloride	100	46	54
Sulfate	100	81	19
TDS	600	456	146
Basin wide			
Nitrate-N	10	4.8	5.2
Chloride	100	31	69
Sulfate	100	53	47
TDS	450*	357	93

* The water quality objective for TDS is 450 mg/L for the westerly portion of the San Gabriel Basin, and 600mg/L for the easterly portion of the San Gabriel Basin. However, as no geologic barrier exists between the eastern and western basin subarea, the more conservative value (450 mg/l) was used in determining the assimilative capacity and in completing the anti-degradation analysis.

In general, concentrations of nitrate, chloride, sulfate and TDS are all below the water quality objectives, and assimilative capacity is available for all constituents (Table 8-6-3). A review of available water quality data indicate a decreasing trend for nitrate concentrations within the basin, and increasing trends for trends for chloride, sulfate, and TDS. The water quality concentrations in the San Gabriel Basin appear to be inversely related to groundwater in storage, increasing as groundwater levels decrease, and vice versa.

Salt and Nutrient Management Measures in the San Gabriel Valley Basin

Existing programs to manage salts and nutrients in the Main San Gabriel Basin are broadly categorized into groundwater replenishment, recycled water treatment upgrades, imported water management, and institutional and regulatory measures (Table 9.6-4A)

TABLE 8.6-4A: CURRENT SALT AND NUTRIENT MANAGEMENT MEASURES IN THE SAN GABRIEL VALLEY BASIN

Category	Specific Measure	Description
Groundwater replenishment	Maintain Spreading Facilities	LACDPW maintains a complex system of dams, retention basins, storm channels and off-stream spreading grounds to control stormwater runoff and to maximize replenishment of the stormwater flow. The existing spreading grounds are conjunctively operated to enable both stormwater run-off and untreated imported water to be replenished into the Basin in an efficient and effective manner. The TDS, chloride, nitrate, and sulfate concentrations in local stormwater and SWP water (which historically have been used to replenish the water supplies of the Basin) are lower than the concentrations found in the groundwater extracted. Consequently, the quality of the Basin will be maintained over time assuming replenishment is greater than or equal to extractions. During drought conditions with little stormwater runoff, this may not be the case.
	Maintain Unlined Portions of Rivers and Streams	The San Gabriel River is unlined from Morris Dam to Whittier Narrows Dam, along with portions of the Rio Hondo, Walnut Creek, and San Jose Creek. Stormwater is released under a controlled manner into these unlined water bodies to augment groundwater replenishment that occurs in off-stream spreading grounds. Replenishment of high quality stormwater contributes to the long-term enhancement of groundwater quality.
	Groundwater Replenishment Coordinating Group	Representatives from the Watermaster, LACDPW, LACSD, and MWD meet approximately every two months to coordinate the planned replenishment of local and untreated imported water with the availability of the sources of supply and the availability of groundwater replenishment facilities. As the highest quality source of water, stormwater run-off is typically given the highest priority for replenishment activities.
	Optimize Delivery of SWP Water	SWP water typically contains the lowest concentration of TDS. Consequently, the Watermaster and MWD have

Category	Specific Measure	Description
		endeavored to maximize delivery of untreated SWP water to replenish the Basin in conjunction with groundwater basin management practices.
Recycled Water Treatment Upgrades	Nitrogen Treatment	Although recycled water is not a significant component of nitrate loading in the Basin, historical loading occurred from the discharge of recycled water into the San Jose Creek, San Gabriel River, and Rio Hondo, and the subsequent infiltration of a portion of that discharge. The LACSD has taken steps to reduce the nitrate (nitrogen) concentration in the recycled water through treatment process upgrades.
Imported Water Management	Control of State Water Project salt concentrations	Historically the Basin has used SWP water almost exclusively to replenish the groundwater supplies as the result of groundwater production in excess of water rights. This practice ensures reliable groundwater supplies and that the groundwater levels are operated within a historical range of about 100 feet. MWD has taken proactive steps in conjunction with the California Department of Water Resources (DWR) to ensure the TDS concentrations of the SWP water are maintained. Long-term replenishment of the Basin with high quality water will tend to improve Basin water quality over time
Institutional Measures	Main San Gabriel Basin Judgment	The Basin Watermaster was created by the court in 1973 to manage both the water quantity and quality of the Basin. These activities include the annual establishment of the Operating Safe Yield which limits the amount of groundwater that can be pumped from the groundwater basin without having to purchase untreated imported water from the SWP. Watermaster coordinates with the LACFCD and MWD to ensure available water supplies are replenished in an efficient manner. Watermaster maintains records of all groundwater produced for the Basin, maintains a database of groundwater quality from all municipal water supply wells, and keeps track of all water entering and leaving the Basin. In addition, the Watermaster also adopted the "Criteria for Delivery of Supplemental Water" (Criteria) by Resolution No.4-96-138. The Criteria sets forth procedures the Watermaster follows to ensure the highest quality untreated imported water is replenished in the Basin.
Regulatory Measures	Title 22 Water Quality Monitoring	All municipal water suppliers are required to adhere to the provisions of Title 22 regarding water quality monitoring of municipal water supply wells. In general TDS, chloride, and sulfate samples are collected once every three years and nitrate samples are collected annually. Based on water quality results, municipal water suppliers may need to construct groundwater treatment facilities and/or develop water quality blending plans to maintain production from wells. In those situations, DDW may require more frequent water quality monitoring than those noted above. Water quality data from Title 22 water quality sampling will be incorporated into the Basin-wide Salt and Nutrient Monitoring Program.

Category	Specific Measure	Description
Voluntary Measure	Supplemental Monitoring	Since fiscal year 1994-95, Watermaster has also implemented its Basinwide Groundwater Quality Monitoring Program (BGWQMP) to sample all production wells (both potable and non-potable) in the Basin at least once a year for VOCs, TDS, and nitrate (NO3), and once every three years for chloride and sulfate.

Planned implementation projects and programs include, development of new spreading facilities, development of an Indirect Reuse Replenishment Project (IRRP), and promotion of onsite stormwater capture and retention. Details of such measures are provided in Table 8.6-4B.

TABLE 8.6-4B: POTENTIAL FUTURE MANAGEMENT MEASURES

Category	Specific Measure	Description
Groundwater Recharge	Develop New Spreading Facilities	The Watermaster and LACDPW continually investigate opportunities to expand the network of spreading grounds. Potential new sites include sand and gravel pits.
	Develop an Indirect Reuse Replenishment Project	The Upper San Gabriel Valley Water District (Upper District) is developing an Indirect Reuse Replenishment Project (IRRP) which would provide up to 10,000 ac-ft/yr of recycled water from the San Jose Creek West Water Reclamation Plant (SJCWRP) for groundwater replenishment in the Main Basin. This will replace approximately 10,000 ac-ft/yr of untreated imported water previously used for groundwater replenishment.
Stormwater/Runoff Management	Reduce Stormwater Runoff	Cities within the Raymond Basin are co-permittees for the new MS4 permit. As such, cities are directed to take proactive steps, both individually and collectively, to implement stormwater Best Management Practices (BMPs) to reduce or eliminate stormwater runoff from facilities and consequently reduce flow in storm channels. These practices may result in increased stormwater replenishment.
Regulatory Measures	SNMP Monitoring	Watermaster will implement a proposed monitoring plan as required by the Recycled Water Policy.

Projected Impacts of Future Project on Water Quality

The impact of the Indirect Reuse Replenishment Project (IRRP) on water quality in the Main Basin was evaluated using a spreadsheet mixing model. The potential utilization of the assimilative capacity resulting from long term recharge of recycled water was analyzed. The constituent concentrations in the groundwater are predicted to eventually reach equilibrium after which there will be no further increases despite continued recharge of recycled water. The TDS concentration in the groundwater is estimated to reach equilibrium after more than 100 years of recycled water recharge under the same quality assumptions. Once equilibrium is reached, the TDS concentration in the groundwater will be 364 mg/L, an increase of 7 mg/L, which represents approximately 7.2 percent utilization of the available assimilative capacity. The IRRP utilizes a smaller percentage of the available assimilative capacity of the other constituents analyzed once equilibrium is reached. The detailed results of the analysis are presented in Table 8.6-5.

In addition to this analysis, three hypothetical scenarios presenting varied replenishment water quality for nitrate, chloride, sulfate, and TDS were evaluated to determine the maximum volume of new replenishment water under varied quality conditions that could be recharged annually without cumulatively exceeding 10 percent of the assimilative capacity.

The water quality selected for analysis in the hypothetical scenarios is representative of water quality from likely replenishment water sources. Historical supply sources for replenishment water have been primarily stormwater runoff and SWP, with Colorado River water and recycled water contributing to groundwater replenishment to a lesser extent.

Scenario 1 represents the likely water quality of potential replenishment water from the Colorado River with a high sulfate concentration.
Scenario 2 represents likely water quality of potential replenishment water from the State Water Project experiencing salt water intrusion with a high chloride concentration.
Scenario 3 represents likely water quality of potential replenishment water with a high sulfate concentration along with a lower nitrate concentration.

For all three scenarios, TDS is the most limiting of the constituents, reaching approximately 10 percent of the assimilative capacity with replenishment and subsequent production of 5,700, 5,300 and 5,800 acre feet of recycled water annually for scenario 1, 2 and 3, respectively (Table 8.6-5).

TABLE 8.6-5: PROJECTED IMPACT OF THE IRRP ON ASSIMILATIVE CAPACITY FOR VARIOUS SCENARIOS

	Assimilative Capacity Used (%)			
	TDS	**Chloride**	**Nitrate**	**Sulfate**
Current Conditions *Replenishment water : primarily stormwater runoff and* State Water Project *Volume of replenishment water: 10000 AF*				
after 5yr	1.4	0.9	0.2	0.5
after 10yr	2.6	1.6	0.4	1
after 20yr	4.2	2.7	0.7	1.6
after reaching equilibrium	7.2	4.6	1.2	2.7
Scenario 1 *Replenishment water : Colorado River (high sulfate concentration)* *Volume of replenishment water: 5700 AF*				
after 5yr	2	0.1	0	1.9
after 10yr	3.5	0.2	0	3.4
after 20yr	5.8	0.4	0.1	5.6
after reaching equilibrium	10	0.6	0.1	9.6
Scenario 2 *Replenishment water : State Water Project with salt water intrusion (high chloride concentration)* *Volume of replenishment water: 5300 AF*				
after 5yr	2	1.3	-0.3	0.1
after 10yr	3.5	2.4	-0.5	0.1
after 20yr	5.8	4	-0.9	0.2
after reaching equilibrium	10.1	6.8	-1.5	0.3
Scenario 3 *Replenishment water : high sulfate concentration and lower nitrate concentration* *Volume of replenishment water: 5800 AF*				
after 5yr	2	0.2	-0.3	1.9
after 10yr	3.6	0.4	-0.6	3.5
after 20yr	5.9	0.6	-0.9	5.7
after reaching equilibrium	10.1	1	-1.5	9.8

These scenarios only evaluated the impacts resulting from direct spreading of replenishment water; therefore, indirect use of replenishment water (such as would be likely with recycled water reuse) would allow recharge of a significantly greater volume of replenishment water before resulting in an equivalent utilization of the assimilative capacity.

No Project Scenario

An evaluation of the compiled historical water data for the period 1973-74 to 2010-11 was conducted to project future groundwater quality assuming no hypothetical scenarios or additional recycled water projects are implemented. First, the linear interpolation of the annual mean extraction well quality was determined for each subarea over the long term time period (1973-74 through 2010-11) to determine the historical trend. Next, the linear interpolation was extrapolated from 2011-12 to 2030-31 to plot the future predictive trends without taking into consideration any additional projects, future implementation measures, or changes in hydrology. The results of the trend analyses indicated that nitrate concentration trends will gradually decreasing. Chloride, sulfate, and TDS concentrations will gradually increasing but would remain below the water quality objectives through the year 2030.

Salt and Nutrient Load Limits

Salt and nutrient loads to the Main San Gabriel Basin will be managed with the existing and planned programs/projects discussed above, in conjunction with other potential water quality management measures described in Table 8.6-4. These measures are expected to maintain water quality that is protective of beneficial uses. Assignment of allocations for salt and nutrient loading is not warranted at this time.

Monitoring Program

Groundwater monitoring for salt and nutrient management plan implementation will rely on water quality monitoring conducted as part of (i) the State Department of Drinking Water's Title 22 Water Quality Monitoring Program, (for which water samples are collected from potable supply wells throughout the basin and analyzed for a variety of parameters including TDS, chloride, sulfate and nitrate-N), and (ii) the Basinwide Groundwater Elevation Monitoring Program (BGWEMP) which supplements the Title 22 monitoring program with increased frequency of TDS monitoring as well as TDS and nitrate monitoring for non-potable supply wells that are not covered under Title 22 requirements. There are about 200 potable water supply wells in the Main San Gabriel Basin, and about 50 non-potable (irrigation and industrial) supply wells. The SNMP monitoring program will take advantage of water quality data collected from these wells. Elements of the program are laid out in Table 8.6-6.

TABLE 8.6-6: MONITORING PROGRAM ELEMENTS

<table>
<tr><th>Element</th><th>Description</th></tr>
<tr><td>Responsible Agency</td><td>Main San Gabriel Basin Watermaster</td></tr>
<tr><td>Program Origin</td><td>Title 22 water quality monitoring program</td></tr>
<tr><td>Parameters and Monitoring Frequency</td><td><table>
<tr><th>Parameter</th><th>Monitoring Frequency</th></tr>
<tr><td>Nitrate</td><td rowspan="2">Annually</td></tr>
<tr><td>Total Dissolved Solids</td></tr>
<tr><td>Chloride</td><td rowspan="2">Triennially</td></tr>
<tr><td>Sulfate</td></tr>
</table></td></tr>
<tr><td>Monitoring locations</td><td>Water quality sampling for TDS and nitrate will be conducted annually for nitrate and TDS, and at least once every three years for sulfate and chloride at all production wells.</td></tr>
<tr><td>Reporting Requirements</td><td>Monitoring results will be reported at least every three years. All data collected from the SNMP monitoring wells will be uploaded to the State Water Board's online GeoTracker database.</td></tr>
<tr><td>Additional Resources</td><td>Watermaster prepares a "Five-year Water Quality and Supply Plan" pursuant to Section 28 of Watermaster's Rules and Regulations. The Five-year Plan identifies existing and planned activities to enhance water quality through the Basin, including a summary of cleanup programs to remove contaminants from the Basin. Although these cleanup programs do not contribute or remove salts and nutrients, they are included as added information in the SNMP.</td></tr>
<tr><td>Review Period and Re-opener</td><td>Data collected from the SNMP monitoring wells and other monitoring programs will be reviewed periodically to validate model predictions regarding changes to basin water quality.</td></tr>
</table>

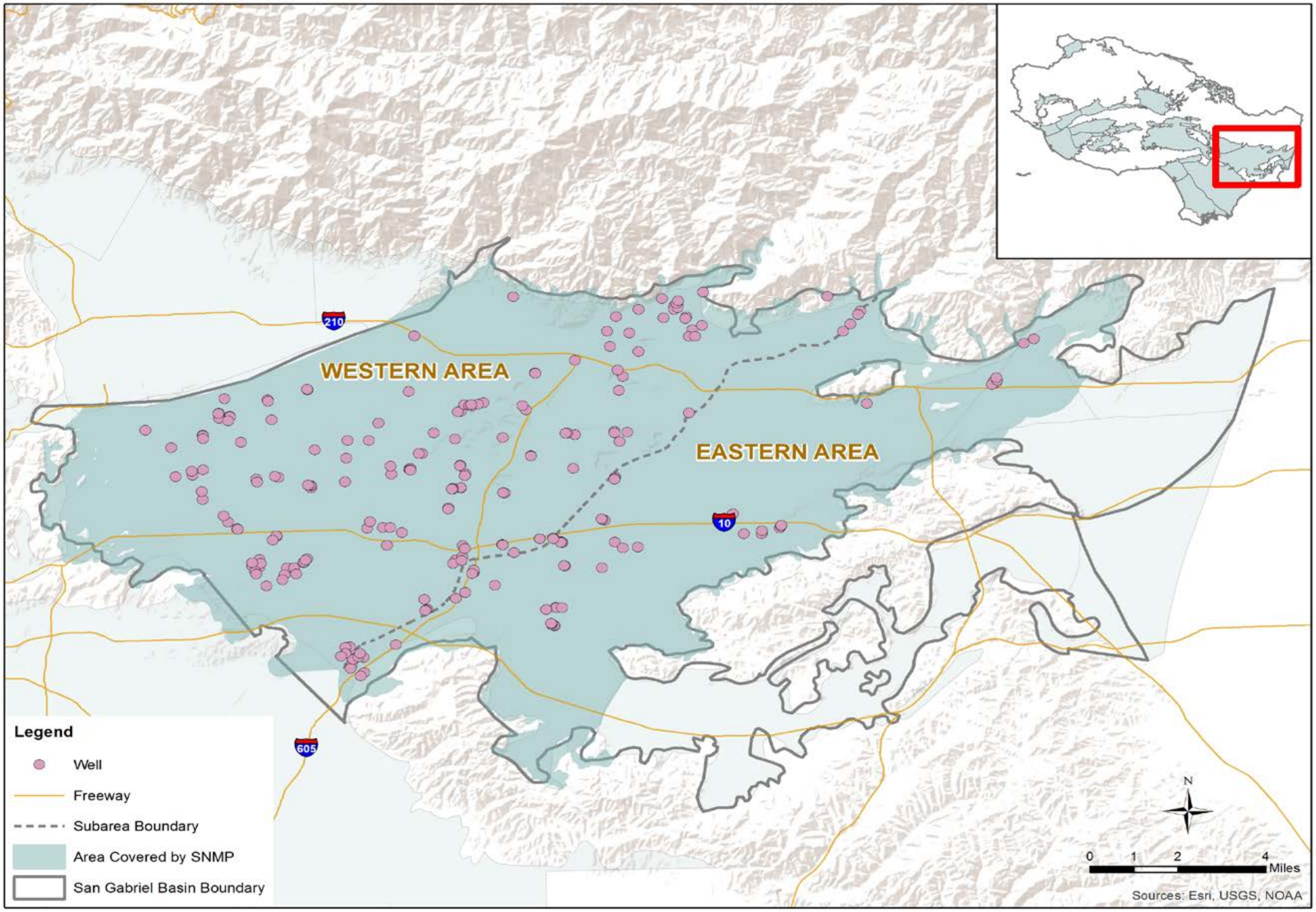

Figure 8.6-2. Location of production wells for SNMP Monitoring in the Main San Gabriel Basin.

Updates to the Salt and Nutrient Management Measures

Salt and nutrient management measures will be updated (i) as necessary to reflect changing conditions in the San Gabriel Valley Basin (i.e. in accordance with actions that have been taken or in response to proposed actions not taken), (ii) where results from the SNMP Monitoring Program indicate that revisions/modifications are warranted, and/or (iii) at the end of a 10-year planning horizon.

Regulatory Implications

The salt and nutrient management strategies developed by local water entities in the San Gabriel Valley Basin are voluntary measures that are designed to maintain water quality that is protective of beneficial uses, while increasing recycled water use and supporting the sustainable use of groundwater. These strategies will be applied in conjunction with already existing water quality protection measures in the planning area (e.g. cleanup operations).

Where projects have the potential to impact salt and/or nutrient loads to a basin, consideration will be given to water quality conditions and the corresponding assimilative capacity in localized areas during the permitting process or the development of other Regional Water Board regulatory actions.