CHAPTER 5. SURFACE WATER SUPPLIES

5.1 Introduction

This chapter describes the City of Lincoln's existing and planned surface water assets through build out of the City's current projects. The water supplies that are used within the City and its Sphere of Influence (SOI) are derived from PCWA, NID, groundwater and recycled water. All water supplies derived from these sources are managed in order to best meet the City's demands in different year types, reduce delivery costs, manage water quality issues, and handle drought and emergency situations. As such, water deliveries from each identified source may fluctuate in any given year because of management decisions, regulatory constraints, and hydrological conditions.

The water derived from these sources constitutes the City's surface water supply portfolio and are described in more detail in the subsections below. Each asset is derived from specific water rights, contracts, and planning arrangements that are subject to specific regulatory rules and contractual constraints. Some water assets that enter the City and its SOI are not controlled by the City yet may influence the City's water management activities among the water assets that the City does control. Nevertheless, the diversity of surface water assets available to the City in its water supply portfolio as well as the volumes of water controlled by its wholesale providers, make the City of Lincoln's surface water supplies, in combination with the City's groundwater supplies (discussed in **Chapter 6**), available to meet its demands in normal years, a single-dry year, and multiple-dry years.

5.2 Historical Potable Water Supplies

The City's potable water supplies have historically included water supplies that are treated and delivered through PCWA's treatment and conveyance system. Today, the surface water that is treated and delivered to the City consists of PCWA surface water rights and entitlements as well as Nevada Irrigation District (NID) water rights and entitlements. Under current contractual and operational conditions, PCWA's and NID's wholesale water assets are commingled in PCWA's treatment and conveyance system before they are delivered to the City. The City also uses groundwater during periods where treated surface water through PCWA's system is reduced as well as to manage seasonal summer maximum day and peak hour water demands. **Table 5-1** shows the City's annual surface water and groundwater potable water supply volumes that are used to meet the City's treated water demands.

Table 5-1 – City of Lincoln Historic Water Supplies

Supply (AF)			
Year	Ground Water	Surface Water	Total Supply
2006	623	8,753	9,376
2007	924	9,396	10,320
2008	1,085	9,443	10,528
2009	836	9,326	10,162
2010	962	8,253	9,215
2011	2,686	6,795	9,481
2012	2,620	7,471	10,091
2013	1,113	9,745	10,858
2014	691	8,257	8,948
2015	707	6,922	7,629

The City generally only purchases and delivers water that is required to meet the City's customers' demands on a daily basis. **Chapter 6** provides a comprehensive overview of the City's groundwater assets. Although the City may have the capability to access and use additional supplies from its various water sources, its operational relationships with its wholesale providers as well as its groundwater management foster a tempered approach – where the City acquires only those water assets that the City needs to meet its demands.

5.3 Existing Water Supplies and Entitlements

There are five primary surface water contracts and entitlements (collectively, "water supplies") that are used within the City's existing service area and SOI. All five of these water supplies are used to meet the water demands for the City's residents. And, in several areas within the City and its SOI, the water supplies can be interchanged for deliveries to certain water users. The water supplies are:

- PCWA contract entitlement
- NID contract entitlement
- PCWA raw water entitlements
- NID raw water entitlements
- Recycled water rights

Each of these water supplies are subject to a unique set of conditions based upon their underlying water rights, the regulatory environment, the contractual limitations, and the City's ability to access and deliver the supplies to meet targeted end-user needs. Within

this structural framework, the City manages its water assets to meet its customer's needs. Importantly, the structural framework morphs and changes requiring the City's water managers to adjust water asset management and system operations.[1]

5.3.1 PCWA Treated Water Supply Contract

In 2012, the City entered into an updated water supply contract with PCWA for delivery of treated surface water.[2] The PCWA Contract entitles the City to a Maximum Delivery Entitlement of 18,501,424.5 gallons (or 18.5 million gallons) of treated water supply.[3] The contract distinguishes between regulated and unregulated deliveries as follows:

- Maximum day Regulated Deliveries of **17,774,452** gallons per day; and
- Maximum day Unregulated Deliveries of **726,972.5** gallons per day.

Regulated water deliveries are those deliveries where water is delivered at a set (regulated) flow rate from PCWA and the City uses its storage infrastructure to deliver water on a demand pattern for certain uses within the City. Specifically, the City uses its storage facilities to compensate for variances in demand over the course of a day/week to accommodate peak demands. Unregulated water deliveries are those water deliveries that are made to the City where PCWA uses its system storage to manage the water deliveries and maintain pressures. Supplies from PCWA in this zone are available "on demand" to meet customers' instantaneous needs without first entering City owned storage infrastructure. PCWA's unregulated deliveries currently serve the City's "high elevation lots" generally in the Catta Verdera area.[4] The PCWA Contract also contains opportunities for the City to purchase additional supplies beyond the Maximum Delivery Entitlement identified in the contract.

The City's PCWA Contract provisions require PCWA to deliver water up to the max day delivery amount to the City for use in the City's service area. The contract contemplates delivery of water supplies derived from PCWA's water rights and entitlements as the basis for the supplies coming to the City. Water from PCWA is treated at PCWA's Foothill Water Treatment Plant and is then delivered to the City. The PCWA Contract has a term of 20 years and a right of renewal for successive 20-year periods.

The maximum day water supply delivered to the City from PCWA's system is measured at the Lincoln Metering Station. In 2013, the most recent year without mandatory

[1] The City is investigating additional water assets that may be included in its water supply portfolio.
[2] The Contract is titled: "Contract between Placer County Water Agency and the City of Lincoln for a Treated Water Supply" dated November 13, 2012. (Hereafter, "PCWA Contract").
[3] Article 5(b) PCWA Contract.
[4] Article 5(c) PCWA Contract.

drought reductions, the City's max day regulated use under the contract was 13,944,160 gallons and the maximum day unregulated water use was 605,716 gallons.[5] This delivery included water derived from NID's water assets – which is described in more detail below.[6] The maximum day measurement – is just that – the single day in the calendar year when the City uses the most water as measured at the Lincoln Metering Station. As such, the max day water use can be modified depending upon which sources of water are used during specific times of the year and managing the timing of peak demand on the City's system.

In 2015, PCWA indicated that the City's remaining unused peak flow capacity under its contract was approximately 3.8 million gallons on the regulated side and 0.12 mgd on the unregulated side.[7] PCWA estimated this amount based upon 2013 demand figures – the last normal water year where demand reductions were not mandated by the State of California. The PCWA Letter indicates that PCWA has additional future treatment and delivery capacity of approximately 3.86 million gallons per day (mgd) of unallocated capacity at its Foothill Water Treatment Plant and Sunset Water Treatment Plant.[8] The recent treated water supply quantities delivered by PCWA to the City are shown in **Table 5-2**.

Table 5-2 – Historic PCWA Treated Water Supplies Delivered to the City of Lincoln

Year	Supply (AF)
2006	6,940
2007	7,736
2008	7,779
2009	7,724
2010	6,772
2011	5,672
2012	6,173
2013	7,825
2014	6,617
2015	5,425

5.3.2 PCWA Water Rights

Importantly, the City's treated water supplies contemplated in the PCWA Contract for delivery to the City are grounded in PCWA's water rights and contracts. In other words,

[5] Letter to Matthew Brower from Brent Smith dated March 1, 2016 at page 2. (Hereafter, "PCWA Letter").
[6] PCWA Letter at page 1.
[7] PCWA Letter at page 2.
[8] PCWA Letter at page 2.

the reliability of water supply delivery to the City is grounded in the underlying water rights and contracts held by PCWA.

PCWA's surface water supplies consist of water from the North Fork American River and its tributaries – including water stored in its Middle Fork Project (MFP) – under water right Permits 13856 and 13858; Central Valley Project (CVP) project supply under CVP Contract 14-060200-5082A from the American River; and water purchased from Pacific Gas & Electric Company (PG&E) from the Yuba and Bear Rivers under two contracts: the 1982 Zone 3 Contract Purchase Agreement and the February 27, 2015 Water Supply Agreement. PCWA uses a limited amount of surface water from small creeks under its pre-1914 appropriative water rights.

5.3.2.1 Permits 13856 and 13858

PCWA's Permits 13856 and 13858 are post-1914 appropriative water rights subject to State Water Resources Control Board (SWRCB) jurisdiction. Post-1914 water rights are those water rights created after the formation of the SWRCB (in 1914) and are regulated by the SWRCB as an administrative body within California's Executive Branch. California's SWRCB-governed water rights system consists of a three step water right staged process – application, permit and license stages. PCWA's water rights are in the permit stage, meaning that PCWA has not yet put the water supplies it applied for under its applications and was granted to use under its permits to full beneficial use.[9] PCWA is engaged in a "permit renewal process" whereby it is working with SWRCB to extend the time limitations placed upon it to fully utilize the water.

Permits 13856 and 13858 have diversion priority dates of April 7, 1958 and April 8, 1958, respectively. These priority dates are generally junior in priority to many other water rights on the American River system and are junior in priority to the Central Valley Project (CVP) water rights that constitute the Folsom Reservoir diversions to serve CVP customers throughout California. PCWA diverts water under these rights to its Middle Fork Project storage reservoirs for use throughout the year. In 2014 and 2015, two of the driest years on record, PCWA's water rights were curtailed from direct diversion or diversion to storage through SWRCB orders.

PCWA may use water under its permitted water rights in western Placer County, as well as portions of northern Sacramento County, including San Juan Water District, Sacramento Suburban Water District, and Rio Linda/Elverta Community Water District service areas. PCWA's wholesale customers include the City of Roseville, San Juan Water District, and the Sacramento Suburban Water District. PCWA has signed an agreement with the United States Bureau of Reclamation (Reclamation) limiting its

[9] In addition to Permits 13856 and 13858, PCWA also possesses permits 13855, 20754, and 13857. However 13855 and 13857 report cumulative shared water used for power and recreation activities in 2015.

diversions under PCWA's permitted rights to 120,000 af/yr off of the American River for use within the current PCWA place of use.

The Water Forum Agreement (WFA) may reduce the water available under these Permits in certain years. The WFA requires PCWA to release up to 47,000 acre-feet of additional water in drier years through reoperation of MFP reservoirs (27,000 acre-feet for PCWA and 20,000 acre-feet for the City of Roseville) to replace water diverted above the WFA 1995 baseline volumes.[10] When projected March through November Unimpaired Inflow to Folsom Reservoir (UIFR) is between 950,000 acre-feet and 400,000 acre-feet, the amount of these additional water releases is linearly interpolated between 0 acre-feet and 47,000 acre-feet. When projected March through November UIFR is less than 400,000 acre-feet, it is considered a "conference year" where Water Forum participants meet to determine how best to manage the available water, recognizing that there may not be sufficient water to meet both deliveries and environmental release requirements specified in the agreement. Both 2014 and 2015 were "conference years" under the WFA.

Several additions to PCWA's diversion and conveyance infrastructure will need to be made in order to acquire all of PCWA's MFP water supplies under its Permits. The American River Pump Station will need to be expanded and Ophir Water Treatment Plant would need to be built. Assuming that these items move forward, watershed modeling indicates that Middle Fork Project water supplies could be reduced by as little 33 percent in dry years based on PCWA's water storage capabilities. Thus, PCWA anticipates the reliable dry year supply under Permits 13856 and 13858 to be 80,400 af/yr.

5.3.2.2 Permits 13855, 20754, and 13857

PCWA holds the rights to permits 13855, 20754, and 13857, in addition to Permits 13858 and 13856 discussed above. Based on the 2015 progress reports submitted to the State, 2,852 af/yr was reported for Permit 20754 and 138,494 af/yr was reported for Permit 13855. It should be noted that no water use was reported under Permit 13875, since Permit 13855 reported water use is representative of the cumulative water used for both Permit 13855 and 13857. Permit 13855 is the only permit with a diversion storage (up to 65,604 af/yr) and has recreation listed as a beneficial use in addition to power which is the only beneficial use listed for both Permit 13857 and Permit 20754. Furthermore, Permit 20754 supplements PCWA's License 12644 through direct diversion through the Hell Hole Power Plant for up to 17,640 af/yr. Combined, under these two rights, PCWA is able to divert 40 cfs year around up to 29,140 af/yr.

[10] PCWA's baseline volume is 8,500 af/yr. The City of Roseville's baseline volume is 19,800 af/yr.

5.3.2.3 Central Valley Project Contract

PCWA has a Central Valley Project (CVP) water contract with the United States Bureau of Reclamation (Reclamation) for delivery of up to 35,000 af/yr for Municipal and Industrial purposes, including groundwater recharge programs that are consistent with applicable State law. The term of the CVP contract, Amendatory Contract 14-060200-5082A, was through 2011, but included a long-term renewal provision. The contract has been extended through three two-year interim renewal contracts since 2011 until a long-term renewal contract can be implemented by Reclamation. The long-term renewal is pending resolution of issues regarding environmental documentation associated with the CVP. The current interim contract is good through February 28, 2018. [11]

PCWA's point of diversion for CVP water is Folsom Dam, but the contract could also include the potential for other diversions, including the Sacramento River, if the Contracting Officer agrees to the points of diversion. PCWA does not currently own or control facilities that are capable of conveying CVP water from Folsom Dam or the Sacramento River to the PCWA service area. As such, the availability of the water supply is currently affected by physical limitations. PCWA is engaged in negotiations with the City of Roseville and other regional entities to potentially utilize existing facilities to divert and deliver PCWA's CVP project water supplies. The CVP contract identifies only a portion of PCWA's Zone 1 service area as the area available for water deliveries from CVP Project supplies.

Article 3(b) of the CVP contract indicates that of the 35,000 af/yr identified in the contract, the amount of water that would likely be delivered in normal years is 32,000 acre-feet.[12] Reclamation reserves the right to apportion the available CVP water supply between PCWA and other CVP water contractors under Reclamation's Municipal and Industrial Water Shortage Policy (M&I WSP). The M&I WSP generally defines water service terms and conditions under drought conditions. The M&I WSP is valid through 2030. Generally, reductions in M&I deliveries should not exceed 25 percent, unless conditions are severe. In 2015, M&I WSP allocations on the American River watershed were 25 percent of the historical use – meaning 25 percent of the last three normal years average use adjusted for identified variables.

PCWA anticipates that in dry years its CVP Project Supply would be reduced by approximately 50 percent. Accordingly, the dry year supply is approximately 16,000 acre-feet per year.

[11] Contract No. 14-06-200-5082A-IR3 dated March 1, 2016.
[12] Contract No. 14-06-200-5082A-IR3.

5.3.2.4 PCWA Pacific Gas & Electric Contracts

PCWA has two water supply contracts with PG&E that provide opportunity to purchase up to 125,400 af/yr for irrigation and domestic purposes. For practical purposes, the delivered supply has historically peaked at 110,400 af/yr. The underlying rights for the PG&E supply are PG&E's pre-1914 appropriative rights to water in the Yuba and Bear Rivers, which were established prior to the time that PG&E developed hydroelectric facilities throughout the Yuba and Bear River watersheds.

PG&E Drum-Spaulding Project

Image Couteasy 2014 FERC EIS

The water supply that PCWA purchases from PG&E is used to meet both treated and raw water demands within PCWA's Western Water System. In 1968, PCWA purchased PG&E's lower Placer Water System, including its distribution canals and treated water systems as well as rights to delivery of 100,400 af/yr of water from PG&E's Drum-Spaulding Project to serve PCWA customers in the Western Water System area. This supply generally serves PCWA customers in Western Placer County.[13]

PCWA and PG&E entered a new Water Supply Agreement on February 29, 2015. In Article II of the Agreement, PG&E will continue to deliver 100,400 acre-feet of water to PCWA from the Drum-Spaulding Project. PCWA will purchase this water during a water contract year from (Oct 1 to Sept 30 of the following year). PCWA is also entitled to purchase additional water if made available by PG&E. In the Agreement, however, PG&E:

- Grants PCWA and NID right of first refusal for surplus water[14]
- Has no obligation to deliver water of a particular quality[15]
- Takes no responsibility for defects in its water rights[16]

[13] The demarcation for Western Placer County is the service area line separating PCWA's Zone 3 from Zone 1 customers seen in PCWA's 2015 UWMP.
[14] 2015 Water Supply Agreement, Article II, paragraph 2.3.
[15] 2015 Water Supply Agreement, Article II, paragraph 2.4.
[16] 2015 Water Supply Agreement, Article III, paragraph 3.4(c).

- May suspend deliveries in case of "any stoppage and/or impairment in the flow of water except to the extent such stoppage and/or impairment results from a breach of…under this Agreement."[17]

The 2015 Water Supply Agreement terminates upon "the expiration date of the New FERC License…."[18]

The Drum-Spaulding Project consists of 29 reservoirs, 6 major water conduits, 12 powerhouses as well as other water infrastructure, power, and recreation related facilities. In 2014, the Drum-Spaulding Project was divided into three distinct projects for purposes of Federal Energy Regulatory Commission (FERC): Upper Drum-Spaulding, Lower Drum, and Deer Creek hydroelectric projects.[19] Although the systems are currently operating on annual FERC license renewals, when the final FERC licenses are issued they will have a term between 30 and 50 years.

The Upper Drum-Spaulding, Lower Drum, and Deer Creek hydroelectric projects are FERC licensed facilities and are subject to the terms and conditions of the three FERC Licenses affecting their operations. In concert with the terms of these licenses, PG&E provides wholesale water to PCWA for consumptive uses in PCWA's service area. While federal law allows for FERC to adopt permit conditions that mandate minimum flows, reservoir levels or set temperature limitations related to operation of a hydroelectric facility, these provisions should not affect the appropriation and distribution of water for consumptive purposes at this time.[20] Future conditions in the FERC License renewal process could impact deliveries for consumptive purposes.

In 1982, PCWA purchased the remainder of PG&E's Upper Placer Water System.[21] In the PG&E and PCWA Purchase Agreement, PG&E agreed to deliver as much as 25,000 acre-feet per year from PG&E's Drum Spaulding Project as part of the Upper Placer Water System conveyance.[22] PCWA typically acquires 10,000 acre-feet during normal years. PCWA generally delivers water under this Agreement to customers in its Zone 3 service area – outside the boundaries of the City of Lincoln or its sphere of influence.

PG&E's pre-1914 water rights and supplies delivered through its system under these water rights are highly reliable during normal, single-dry, and multiple-dry year periods. Between 1987 and 1992, when the State of California experienced a 5-year drought,

[17] 2015 Water Supply Agreement, Article IX, paragraph 9.1.
[18] 2015 Water Supply Agreement, Article I, paragraph 1.2.
[19] NID's Yuba-Bear hydroelectric project is also incorporated into the Final FERC EIS.
[20] 16 U.S.C. § 821.
[21] Purchase Agreement between Pacific Gas and Electric Company and Placer County Water Agency dated November 17, 1982 (hereafter "PG&E and PCWA Purchase Agreement").
[22] PG&E and PCWA Purchase Agreement at Exhibit A.

PCWA had a full Yuba/Bear river supply each year. In the 2015 water year, one of the driest years in California's history, PG&E delivered 76,119 acre-feet of water to PCWA – 68.9 percent of the 110,400 acre-feet that PCWA anticipates each year. This reduction represents significant supply reliability as compared to other sources of water in California in 2015 where supplies were reduced to a much greater extent (even zero in some cases). Nevertheless, for conservative long-term planning purposes, PCWA anticipates that it will experience a 50 percent reduction in its PG&E supply in single dry years and a 25 percent reduction in multiple dry years equating to 55,200 acre-feet and 82,808 acre-feet respectively.[23]

5.3.2.5 PCWA Pre-1914 Appropriative Water Rights

PCWA also possesses four pre-1914 appropriative water rights for diversion of water from various small creeks and their tributaries in western Placer County. These rights are generally for agricultural purposes – including stockwatering and irrigation. In 2014, the combined diversion for all four water rights approximated 2,500 acre-feet. These water supplies are not used in PCWA's treated water system. It is unclear whether they are used in PCWA's raw water conveyance through the Caperton Canal

5.3.2.6 PCWA Water Supply Summary

PCWA anticipates that it will have approximately 252,000 acre-feet of surface water available in normal years and approximately 146,000 acre-feet of surface water available in dry years for its wholesale, retail, and raw water deliveries. **Table 5-3** below depicts PCWA's available supplies for the City of Lincoln.

Table 5-3 – PCWA Available Surface Supplies[24]

Supply	Average/ Normal	Single Dry Year	Multiple Dry Water Years		
			Year 1	Year 2	Year 3
	af/yr	af/yr	af/yr	af/yr	af/yr
Pacific Gas & Electric	110,400	55,200	82,800	82,800	82,800
Middle Fork Project	120,000	80,400	120,000	120,000	120,000
Central Valley Project	32,000	16,000	24,000	24,000	24,000
Pre-1914	3,400	850	1,700	1,700	1,700
Total	265,800	152,450	228,500	228,500	228,500

At build-out, the City anticipates relying upon as much as 37,000 acre-feet per year of water from PCWA as part of its water supply portfolio necessary to meet its municipal and industrial demands. Although the City's contract with PCWA does not guarantee

[23] These numbers represent the combined PCWA PG&E contract supplies taken from the 2015 UWMP. The same reduction percentages as applied to the Zone 1 supplies only. These numbers are shown in **Table 5-3**.

[24] As described in Section 5.3.2, availability of CVP supply requires necessary diversion and conveyance infrastructure to be built. And full diversion of the MFP requires additional conveyance capacity at the American River Pump Station as well as construction of Ophir Water Treatment Plant.

that this amount will be available, PCWA's 2015 UWMP as well as its MFP Permit renewal efforts indicate that the quantity desired by the City will be available at build-out of the City's general plan area as defined by the Adopted 2008 General Plan Update.

5.3.3 NID Surface Water Contract and PCWA Delivery Contract

NID supplies irrigation, wholesale, and retail water to Nevada County and Placer County customers. Agricultural water use accounts for nearly 90 percent of the total demand on NID water supply. The remaining water supplied to Placer County residential customers by NID is primarily delivered directly through PCWA's system to single-family residential accounts. NID's mountain watersheds cover 70,000 acres and include the upper portions of the Middle Yuba River above Milton Diversion, Canyon Creek above Bowman Reservoir, and Deer Creek.

The City and Nevada Irrigation District (NID) entered a temporary water supply contract for water deliveries to NID customers and developments that will be incorporated into the City's service area upon annexation. Through this agreement, NID provides additional surface water to the City for deliveries into the NID service area. The water contemplated in this agreement is provided by NID to PCWA for treatment and delivery to the City.

The amount of water available to the City from NID at build out is quantified as approximately 12,000 acre-feet based on the City's long-term demand estimates. Historically, NID has delivered through PCWA's system as much as 1,920 acre-feet of water to NID's service area within the City's boundaries. The actual amount of water that will be available to the City in the future, however, has not been finalized and the existing agreement has no clause expressly quantifying the available supply.[25]

Nevertheless, NID's 2015 UWMP posits that water shortages to its overall water supply would only occur in the driest of years. In 2015, the driest year in California's history, NID experienced no water shortages. All reductions in deliveries to end-users were mandated by SWRCB regulations requiring reductions in consumptive use. However, in the event that shortages were to occur, NID would equally reduce water supplies between its domestic water customers and the City.

[25] Paragraph 6 of the NID-Lincoln contract states: "Raw water delivered by NID under this agreement is subject to scheduled and unscheduled outages. It will be PCWA and/or Lincoln's responsibility to provide an alternate treated water supply during such outages so that deliveries to Lincoln's customers by NID will not be disrupted." Paragraph 10 of the contract states: "This agreement is intended to be a temporary agreement to be in effect until such time as NID constructs a treatment plant and other facilities sufficient to enable NID to supply treated water to Lincoln for those customers within Lincoln that are also within NID's boundary."

In September 2004, the City, PCWA and the Nevada Irrigation District (NID) entered into temporary raw water sales agreement pursuant to which NID supplied raw water to PCWA treatment facilities for delivery within the City's water service area. **Table 5-4** below summarizes NID water deliveries into the City's service area from 2008 until present. The delivery mechanism for these supplies has been PCWA's treatment and delivery systems.

Table 5-4 – Historic NID Water Supplies Delivered to the City of Lincoln[26]

Year	Supply (AF)
2008	1,664
2009	1,602
2010	1,481
2011	1,123
2012	1,298
2013	1,920
2014	1,640
2015	1,497

The City and NID are jointly planning a regional water treatment plant that would serve NID water and potentially PCWA water to various areas in Lincoln and Lincoln's SOI. This proposed facility could deliver approximately 17,500 acre-feet of water per year. The City negotiated a Water Facilities/Planning Phase agreement with NID in 2007 to establish a conceptual framework for the design and construction of a new $265.7 million water treatment facility.[27] The preferred location for the new plant is near NID's Valley View site located northeast of the City, as identified in the *Lincoln Area Water Treatment Plant Planning and Site Study* (2005). The proposed treatment facility would allow NID to serve treated water within the NID service area to customers in the Lincoln SOI rather than wheeling that water through PCWA's system.

NID is currently working on completing the planning, design studies, environmental review, and engineering details necessary to better define the project and its alternatives. In 2005, NID had planned to start operating the plant by 2015 but the economic downturn slowed growth. NID expects the planning, design, engineering, environmental review, and permitting to take many years. However, in the interim, the existing agreement to route NID water through PCWA treatment facilities for delivery to the City will serve as the mechanism for NID to provide water to its service area within the City.

[26] Historic NID water supplies delivered to the City of Lincoln include 10 percent above metered amounts to account for delivery losses. Actual water use in the NID service area within the City and SOI has been higher than total NID water deliveries through the PCWA system because of other NID raw water deliveries to those locations. NID water shortages are anticipated to be made up through the use of well water.

[27] This can be found on the City of Lincoln's website.

5.3.4 NID Water Supplies

NID's water supplies consist of a variety of water rights and contracts that implicate the reliability of these supplies for current and future deliveries to the City. Specifically, NID has numerous pre-1914 appropriative water rights to waters in the Yuba River, Bear River and Deer Creek watersheds as well as post-1914 appropriative water rights to waters in the same watersheds. Collectively, these appropriative water rights allow for water diversions and collections to storage approximating 450,000 acre-feet of water each year. In addition to these rights, NID has a water supply contract with Pacific Gas & Electric Company for as much as 54,000 acre-feet of water as well as riparian rights that can be used for riparian purposes.[28] All of the relevant assets are described in more detail below.

5.3.4.1 NID Watershed Runoff Supplies

Nevada Irrigation District holds 25 pre-1914 appropriative water rights (pre-1914 rights) to the waters of the Yuba River, Bear River and Deer Creek watersheds.[29] Pre-1914 appropriative water rights are not subject to the jurisdiction of the State Water Resources Control Board (SWRCB). In other words, SWRCB does not have the authority to determine where the pre-1914 rights are diverted, how they are used, or where they are used so long as those uses (or changes to those uses) do not injure other legal users of water. Moreover, the senior nature of these water rights under California's water rights system makes them extraordinarily valuable. Specifically, water rights junior in priority to NID Pre-1914 rights on these watersheds (all post-1914 appropriative rights) must be curtailed before a single pre-1914 water right is curtailed. The water rights senior status makes them highly reliable during drought conditions.

NID also holds 28 post-1914 appropriative water rights to the waters of the Yuba River, Bear River, and Deer Creek watersheds. Post-1914 appropriative water rights are subject to SWRCB jurisdiction. The rights generally identify a point of diversion, purpose(s) of use, and place of use in order to assure other users about the availability of their water supplies. Changes in the use of these water assets are not permitted without SWRCB's consent.

Some of NID's pre-1914 and post-1914 appropriative water right assets are for power production purposes. This non-consumptive use of water essentially allows for the diversion and storage of water so that releases can be made for power generation

[28] This document will not assess the NID's riparian water rights as those water rights cannot be diverted to storage nor can they be used on lands within the City's service area. Although they are an important component of NID's water supply portfolio, they are not particularly relevant for assessing supply reliability to NID's deliveries to the City.

[29] NID's 2015 UWMP says that NID has 25 pre-14 rights but there are only 22 Statement of Diversion and Use filings with the SWRCB.

purposes through surface water reservoirs. Reviewing the filings submitted to the State, NID has 25 pre-14 rights, licenses and permits that list power generation as one of the beneficial uses. Of those 25, eight licenses exclusively list power as the beneficial use for an overall total volume of 112,787 AFY in 2015. Additionally, power is the only beneficial use for five of NID's permits for an overall total of 203,821AFY and one pre-1914 right which had no water reported.[30] The rest of NID's water reports to the State list a variety of beneficial uses including domestic, irrigation, industrial, municipal and recreation. The total volume of reported under all rights that included consumptive uses was 254,444 AFY. Non-consumptive water rights are relevant to this analysis only in that they determine the amount of water that can be held in storage and released for consumptive purposes within and outside of NID's service area.

Collectively, NID refers to all of its appropriative water rights as "watershed runoff."[31] Watershed runoff is NID's primary water supply. The amount of watershed runoff depends on the annual snowpack and the rate of snowmelt. In 2015, the total runoff available to NID was 77,378 acre-feet while in wet years watershed runoff has neared 470,000 acre-feet. Average runoff is approximately 221,500 acre-feet per year.

5.3.4.2 NID Carryover Storage

NID operates a system of surface water storage reservoirs directly related to its appropriative water rights. The nine reservoirs, with a combined storage capacity of 279,985 acre-feet include: Jackson Meadows, Bowman, Jackson Lake, Sawmill, Faucherie, French, Rollins, Scotts Flat, and Combie. **Table 5-5** shows the reservoirs and their storage capacity.

Table 5-5 – Water Supply Reservoirs

Reservoir	Capacity, ac-ft
Jackson Meadows	69,205
Bowman	68,510
Jackson Lake	1,330
Sawmill	3,030
Faucherie	3,980
French	13,840
Rollins	65,988
Scotts Flat	48,547
Combie	5,555
Total Capacity	279,985

[30] A summary table of PCWA's and NID's rights, reported beneficial uses, and total volume reported based on 2015 progress reports filed with the State is available upon request.
[31] Nevada Irrigation District 2015 Urban Water Management Plan.

NID holds its total carryover storage in its reservoir system to not less than 78,000 acre-feet annually. NID's carryover storage average is 129,400 acre-feet per year.

5.3.4.3 NID Pacific Gas & Electric Contract

NID and PG&E have water supplies that commingle in the context of both entities power production systems in the Yuba-Bear River watershed. PG&E has agreed to supply NID as much as 54,361 acre-feet of water per year from its water rights water in the Yuba-Bear system. This supply, however, is underutilized because there are significant conveyance restrictions in the delivery system. Specifically, conveyance restrictions reduce the available supply to approximately 8,000 acre-feet per year.

5.3.4.4 NID Water Supply Summary

NID anticipates that it will have approximately 477,000 acre-feet of water available in normal years and approximately 359,000 acre-feet available in dry years for its wholesale, retail, and raw water deliveries. **Table 5-6** below shows NID's normal year, single dry year, and multiple dry year supply reliability forecast.

Table 5-6 – NID Available Water Supplies

Supply	Average/ Normal	Single Dry	Multiple Dry Water Years		
			Year 1	Year 2	Year 3
	af/yr	af/yr	af/yr	af/yr	af/yr
Watershed Runoff	221,500	221,500	221,500	221,500	221,500
Carryover Storage	201,985	129,400	129,400	129,400	129,400
PG&E Contract	54,361	8,000	8,000	8,000	8,000
Total	477,846	358,900	358,900	358,900	358,900

5.3.5 PCWA Raw Water

The City receives PCWA raw water for irrigation purposes through the Caperton Canal. This delivery manifests through a raw water contract paid for by the City of Lincoln. The PCWA raw water offsets potential potable water use within the City of Lincoln. PCWA raw water is utilized for irrigation purposes in addition to the Del Webb Golf Course and maintaining wetlands, for areas within the City and its Sphere of Influence.

5.3.6 NID Raw Water

Areas within the City and its Sphere of Influence receive NID raw water for irrigation purposes. This includes Turkey Creek Golf Course area as well as Lincoln Crossing. The City does not control the water deliveries and payment obligations. The raw water offsets potential potable water use within the City of Lincoln.

5.4 Recycled Water

The City of Lincoln has been utilizing recycled water since Lincoln's Wastewater Treatment and Reclamation Facility (WWTRF) became operational in 2004. To provide a complete picture of the City's recycled water program and assets this section will: (1) describe the basic policy framework for recycled water in California; (2) describe the City's water treatment facility and reclaimed water delivery plans; (3) assess the City's water reclamation and discharge permits; and (4) provide the basis for securing water rights to the treated water produced from the City's water system.

5.4.1 Recycled Water Policy Framework

Water recycling is widely recognized in California as a critical component in supplementing the state's existing surface water and underground water supplies. Recycled water use is mandated under the state's applicable statutory and constitutional requirements, as well as certain state policies designed to promote and facilitate water recycling projects to the maximum extent feasible. Specifically, the California Constitution requires that the waters of the state be put to beneficial use to the maximum extent feasible. Thus, although the actions required to produce recycled water are not mandated under law, they are strongly encouraged and incentivized. However, the water derived from water recycling efforts, once produced, should be put to beneficial use and in some cases, *must* be put to beneficial use.

California's Water Recycling Law encourages water recycling and mandates use of recycled water under certain conditions. Water Code section 13510 states:

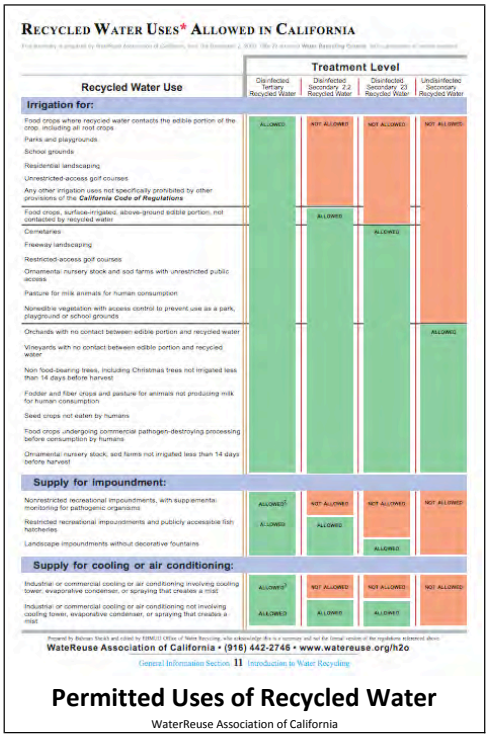
> It is hereby declared that the people of the state have a primary interest in the development of facilities to recycle water containing waste to supplement existing surface and underground water supplies to assist in meeting the future water requirements of the state.

The legislature and the state regulatory agencies provide funding to develop water reclamation and recycling facilities in support of this policy. The City of Lincoln has received funding from the State of California to develop its water reclamation and recycling facilities.

Not only has the State Legislature enacted policies encouraging the creation of water recycling facilities, it has also enacted statutes mandating the use of recycled water where certain conditions are met. This mandate is based on the fundamental tenets of beneficial, reasonable use in California water law. For instance, Water Code section 13550(a) states:

> The Legislature hereby finds and declares that the use of potable domestic water for nonpotable uses, including, but not limited to, cemeteries, golf courses, parks, highway landscaped areas, and industrial and irrigation uses, is a waste or an unreasonable use of the water within the meaning of Section 2 of Article X of the California Constitution if recycled water is available….

The Legislature clarified its mandate by creating exceptions. For instance, recycled water need not be used in lieu of potable water if it is not of "adequate quality," is costly, "detrimental to public health," or will harm other water rights users or fish and wildlife. Neither the mandate nor these exceptions have been legally challenged in any venue. But the potential to require recycled water use – especially in light of state water bond and grant programs that could help alleviate financial burdens – will likely arise in the future as exceptions may be politically expedient to dismiss.



Permitted Uses of Recycled Water
WaterReuse Association of California

These legislative commitments in the Water Code that mandate recycled water use were also developed for land use planning efforts affecting land use planning agencies, like the City of Lincoln. For instance, Government Code section 65602(e) says:

> The Legislature finds and declares all of the following: (e) The use of potable domestic water for landscaped areas is considered a waste or unreasonable use of water within the meaning of Section 2 of Article X of the California Constitution if recycled water is available that meets the conditions described in Section 13550 of the Water Code.

This mandate is part of the key land use planning laws contained in the Government Code. Thus, the emphasis on water recycling is concurrently aimed at land use planning agencies and as rapidly growing as those addressed to water planning agencies. As another example, mandates for installation of recycled water delivery systems ("Purple Pipe") is now required under the California Government Code as a component of the specific plan land planning process. Essentially, the California Legislature has mandated that reclaimed water be used in lieu of potable water – to the extent feasible – and it is requiring the installation of infrastructure in land use developments so that use of recycled water becomes inevitable.

In furtherance of these Legislative policy declarations, local land use agencies must adopt ordinances designating areas where recycled water is determined to be available within the next ten years and how it will be used. If recycled water is available in the City, Government Code Section 65605 requires that the City adopt and enforce a recycled water ordinance. The ordinance shall include to following provisions:

> (1) State that it is the policy of the local agency that recycled water determined to be available pursuant to Section 13550 of the Water Code shall be used for nonpotable uses within the designated recycled water use area set forth by the local agency when the local agency determines that there is not an alternative higher or better use for the recycled water, its use is economically justified, and its use is financially and technically feasible for projects under consideration by the local agency.
>
> (2) Designate the areas within the boundaries of the local agency that can or may in the future use recycled water, including, but not limited to, existing urban areas in lieu of potable water.
>
> (3) Establish general rules and regulations governing the use and distribution of recycled water in accordance with applicable laws and regulations.
>
> (4) Establish that the use of the recycled water is determined to be available pursuant to Section 13550 of the Water Code in new industrial, commercial, or residential subdivisions located within the designated recycled water use areas for which a tentative map or parcel map is required pursuant to Section 66426. These provisions shall require a separate plumbing system to serve nonpotable uses in the common areas of the subdivision, including, but not limited to, golf courses, parks, greenbelts, landscaped streets, and landscaped medians. The separate plumbing system to serve nonpotable uses shall be independent of the plumbing system provided to serve domestic, residential, and other potable water uses in the subdivision.
>
> (5) Require that recycled water service shall not commence within the designated recycled water use area in any service area of a private utility, as defined in Section 1502 of the Public Utilities Code, or to any service area of a public agency retail water supplier that is not a local agency, as defined in subdivision (b) of Section 65603, except in accordance with a written agreement between the recycled water producer and the private utility or public agency retail water supplier that shall be made available in

a timely manner by the recycled water producer to the local agency adopting the ordinance pursuant to this article.

In summary, properties located within the designated recycled water service area are required to use recycled water in lieu of potable water if recycled water is determined to be available pursuant to section 13550 of the Water Code, unless they qualify for a limited exception. In addition, new industrial, commercial or residential subdivisions located within the designated area are required to provide separate recycled water plumbing systems to serve their onsite irrigation needs to meet the objectives of the City's ordinance. These legislative and regulatory trends will undoubtedly require more recycled water use that will necessitate more recycled water investment and infrastructure.

5.4.2 Lincoln's Recycled Water System

The City of Lincoln owns and operates the Wastewater Treatment and Reclamation Facility (WWTRF) south west of the City, located in Sections 29 and 30, T11N, R6E, MDB&M. The WWTRF was designed to process and treat domestic sewerage to Title 22 compliant "disinfected tertiary recycled water" (nearly unrestricted re-use) standards. Title 22 of the California Code of Regulations defines the quality standards for recycled water and its uses. The WWTRF operates under a Master Reclamation Permit from the California Regional Water Quality Control Board – Central Valley Region (RWCQB) under Order R5-2005-0040-01 and a Waste Discharge Permit under Order R5-2014-0007 (NPDES No. CA0084476). Both of these permits are relevant to the City's long-term management and use of its recycled water assets. The City's use of its recycled water assets is also governed by a water right order (WR0066) issued by the State Water Resources Control Board (SWRCB) in 2013. These documents are discussed in later sections of this chapter.


Recycled Water Line Crossing Auburn Ravine

The WWTRF began operation in 2004 and discharges wastewater to Auburn Ravine Creek. Auburn Ravine Creek is classified as "a water of the United States" subject to Clean Water Act jurisdiction because the Creek is tributary to the Sacramento River. Auburn Ravine flows into the East Side Canal and then the Natomas Cross Canal, which finally discharges to the Lower Sacramento River. The WWTRF has been master planned to achieve up to 12 million gallons per day (mgd) average dry weather flow

(adwf) capacity and will be incrementally expanded at approximately 2.1 million gallons per day (MGD) intervals. Final capacity of the WWTRF could be as much as 25 MGD dependent on the wastewater treatment technology used at the plant.

The City provides sewerage service for the City of Lincoln serving a population of approximately 43,000. The current design ADWF capacity of the WWTRF is 5.9 MGD. The City recently completed a WWTRF expansion and upgrade to increase the design ADWF from 4.2 MGD up to 5.9 MGD to accommodate regionalization with the Placer County Sewer Maintenance District 1 (SMD#1) Wastewater Treatment Plant. The City's Master Permit (described in later sections) allows for an increase in the permitted ADWF up to 8.4 MGD (or some smaller increase) to accommodate growth within the City's service area and additional regionalization projects.

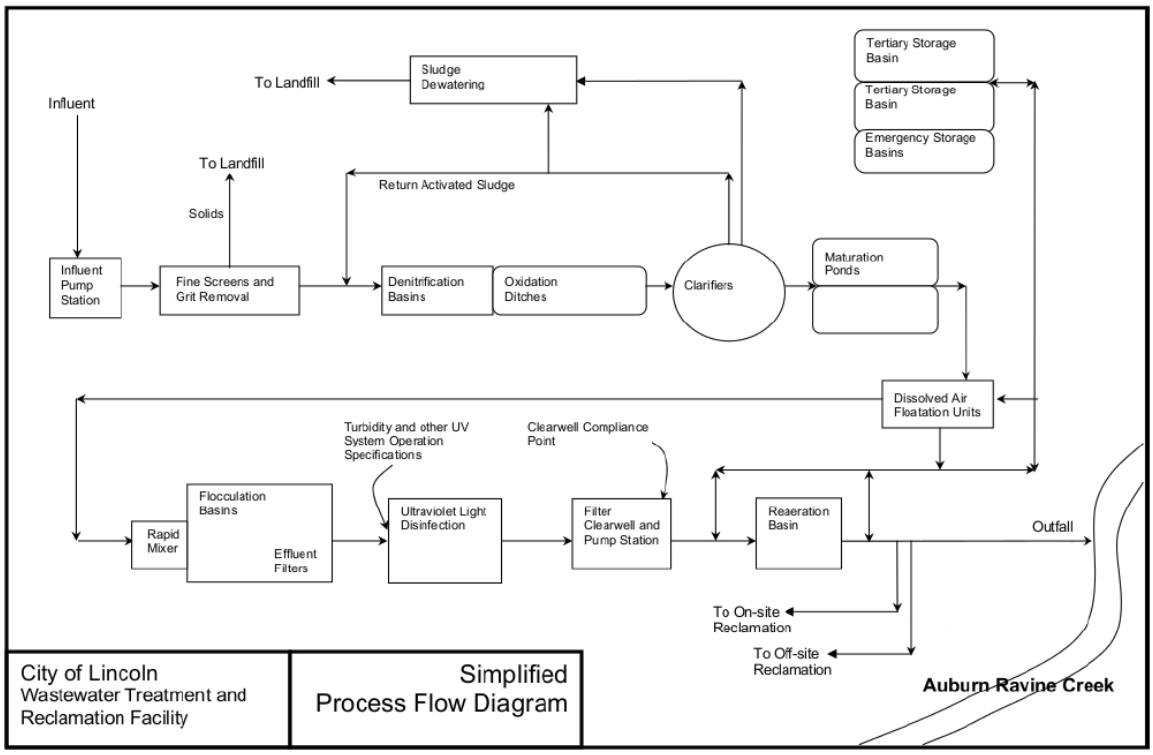
Historically, all wastewater treated by the Lincoln WWTRF has originated from the residential, municipal, industrial, and commercial water users within the City of Lincoln. Recently, inflow from other areas in Placer County were included in the influent and treatment at the WWTRF. The primary sources of the future flows to the WWTRF will continue to be residential, municipal, industrial and commercial water users both within and outside the City. The WWTRF does not receive stormwater or combined sewer flows from the City's collection system.

Raw sewerage flows by gravity to the influent pump station from the sewer collection system. An influent pump station with a hydraulic capacity of 39.5 MGD lifts the raw sewerage to a sufficient height in the plant headwork's to flow the rest of the way through the treatment process by gravity.

The treatment system at the WWTRF produces "disinfected tertiary recycled water" – the highest wastewater treatment level under Title 22. The produced water is available for all non-potable uses including irrigation of public access areas like parks. The treatment process consists of solids screening, oxidation ditches with anoxic zones, secondary clarification, maturation ponds, dissolved air flotation (DAF), coagulation, flocculation, sand filtration, and ultraviolet light (UV) disinfection. Downstream of the UV disinfection process, the flow passes through a clear well and the reaeration basin and into the effluent pump station. From the effluent pump station, the plant effluent can be pumped to Auburn Ravine Creek or to the storage basins. The WWTRF includes a lined emergency storage basin and two tertiary storage basins. The WWTRF has over 20 days of storage in an 86 million gallon emergency storage basin as required by long-term storage provisions in Title 22, Section 60431(b). The tertiary storage basins have a total volume of 190 million gallons that is available if there is a problem with the recycled water system or other discharge issues. **Figure 5-1** provides a flow schematic of the WWTRF.

The tertiary treated recycled water is either discharged to Auburn Ravine Creek at discharge point just downstream of the Moore Road creek crossing, or to on-site and off-site reclamation areas. The City has the ability to divert tertiary treated effluent to the tertiary storage basins to store recycled water, store final effluent during downstream flood events, and to store effluent that does not meet regulatory permit requirements (e.g., receiving water temperature limits). Since the WWTRF is able to temporarily store tertiary treated effluent and discharge for delivery or discharge at a later date, there are times when no discharge to surface water at the Auburn Ravine Creek discharge point is occurring and there are times when the discharge to surface water at the discharge point on Auburn Ravine Creek is higher than the regulated flow capacity of the WWTRF (e.g., flow is being discharged directly from the treatment process and stored, treated effluent is being discharged from the tertiary storage basins). The City's outfall at the Auburn Ravine Creek discharge point possesses a maximum hydraulic capacity of 13 MGD.

Figure 5-1 – City of Lincoln Wastewater Treatment and Reclamation Facility Flow Process



Health related water quality requirements for recycled water are defined in Title 22. Title 22 also defines the allowable uses of recycled water based on the level of treatment provided by the wastewater treatment process. The effluent produced by the Lincoln WWTRF is being oxidized, coagulated, clarified, filtered, and disinfected to 2.2 mpn/100

ml conforming to Title 22 unrestricted reuse criteria. According to Title 22, such effluent can be used for all available non-potable uses, including:

- Irrigation of food crops, including all edible root crops, where the recycled water comes into contact with edible portion of the crop.
- Irrigation of parks and playgrounds.
- Irrigation of schoolyards.
- Irrigation of residential landscaping and unrestricted access golf courses.
- And as a source of water supply for non-restricted recreational impoundments.[32]
- Under sections 60306 through 60307 of Title 22, recycled water of lesser quality can be used for the following:
- Irrigation of food crops, including crops with edible portion produced above groundwater and not contacted by the recycled water.
- Irrigation of cemeteries, freeway landscaping, restricted access golf courses, ornamental nursery stock and sod farms, pastures for animals producing milk for human consumption, and nonedible vegetation with controlled access.
- Irrigation of orchards, vineyards, non-food-bearing trees, fodder and fiber crops for non-milk producing animals, seed crops not eaten by humans, food crops that undergo commercial pathogen-destroying processing, ornamental nursery stock, and farms with limited public access.
- As a source of water supply for restricted recreational impoundments and publicly accessible impoundments at fish hatcheries.
- As a source of water supply for landscape impoundments without decorative fountains.
- Cooling and other purposes.
- Title 22 places a number of restrictions on use of the tertiary oxidized wastewater to protect other water users from potential harmful issues. These restrictions include:
- No irrigation with recycled water shall take place within 50 feet of any domestic water supply well, unless conditions specified in Section 60310 of Title 22 are met.
- No impoundment of tertiary recycled water shall occur within 100 feet of any domestic water supply well.

[32] Irrigation of Title 22 unrestricted reuse water (disinfected tertiary) may by spray irrigation for all beneficial uses.

- All areas where recycled water is used shall be properly signed to alert the public regarding the use of recycled water.
- Any irrigation recycled water runoff shall be confined to the recycled water use area, unless the runoff does not pose a public health threat and is authorized by the regulatory agency.
- No connections shall be made between recycled water system and potable water system, except as defined in Title 17, Section 7604.
- Hose bibs are not allowed in portions of the recycled water piping system that is accessible to the general public.
- The producer of the recycled water shall prepare an Engineering Report to cover production, distribution and reuse of recycled water. The Engineering Report shall identify the means of compliance with Title 22 regulation and "any other features specified by the regulatory agency," e.g., RWQCB permit requirements. The Engineering Report is also required to provide "a contingency plan which will assure that no untreated or inadequately treated wastewater will be delivered to the use area."

Since the 2004 startup of the WWTRF, the City has provided tertiary treated reclaimed water to agricultural demands on adjacent and neighboring lands. About 400 acres are currently provided with recycled water from the WWTRF facility. The 2012 assessment estimated a potential current annual demand for the 400 acres of 1,676 af/yr. Treated effluent not provided to the current agricultural operations is discharged to Auburn Ravine, in compliance with the City's NPDES permit.

As an example of things to come, an expansion of the WWTRF to 6.3 MGD Average Day Wastewater Flow (ADWF) would be able to generate a recycled water supply of about 7,000 af/yr. While this is more than the total demand for all planned City and surrounding area recycled water uses (about 6,800 af/year as identified in the City's Recycled Water Master Plan), the demand timing for different identified uses might mean there are deficient supplies in the peak demand summer months and surplus supplies in the winter months. The anticipated recycled water uses within the City has been projected to account for as much as 6,822 acre-feet per year of the anticipated build-out water demand. Thus, during some months, potable or raw water would be necessary to make up the difference between the identified recycled water demand and the available recycled water supply. To generate as much as 7,000 af/yr in treated wastewater, total treated water demand would need to be about 14,000 af/yr, assuming 50 percent of treated water demand results in wastewater influent flows. The City's wastewater permits and Order WW0066, described more fully below, place limitations on the usability of all water produced at the treatment facility.

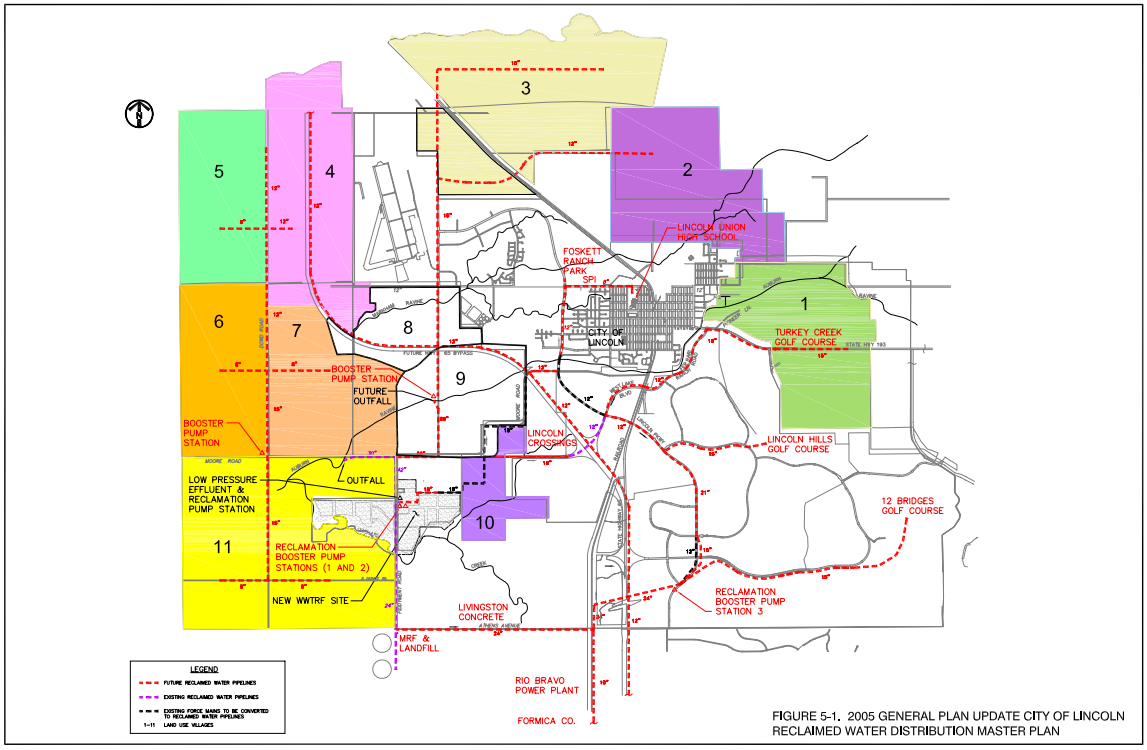
In 2003 and 2004 the City completed studies regarding the use of tertiary treated, reclaimed water in and around the City as provided from its WWTRF. The City has also implemented design standards for the construction of recycled water systems using "purple pipe" and "purple hydrants."

Once produced at the WWTRF, the recycled water is conveyed from the reclamation booster pump station for agricultural irrigation on property owned by Placer County (WPWMA property) to the south via a 24-inch force main running parallel to Fiddyment Road and ending at Athens Road. The reclamation booster station has been designed to allow for expansion to convey additional recycled water from the WWTRF to the areas within the City of Lincoln. A pipeline project completed by the City in 2015 will allow delivery of recycled water to at least four off-site locations along Nicolaus Road that are currently using potable water and to the "purple pipe" irrigation system of the Lincoln Crossing development currently using raw water.

The City has entered into two contracts for reclaimed water deliveries with Auburn Ravine Ranch and with Machado Ranch. The terms and conditions of these contracts are not the subject of this analysis but essentially allow the users to claim a substantial portion of the water assets for use in their areas.

Figure 5-2 below depicts the planned extent of the City's Recycled Water Infrastructure. This figure is taken from the City's 2008 General Plan illustrates the City's proposed recycled "purple" pipeline main infrastructure network with selected prospective customers at the time. As noted below, and in subsequent sections of this analysis, some of the areas depicted in the map are beyond the place of use of the current water right associated with the City's recycled water and some areas lack economic feasibility to deliver water where other sources of water may be available.

Figure 5-2 – City of Lincoln's Recycled Water Infrastructure



5.4.3 City Water Reclamation and Discharge Permits

In California, recycled water use permits are granted by the State Water Resources Control Board and its nine Regional Water Quality Control Boards (RWQCB). The California Department of Public Health (CDPH) reviews and establishes water recycling criteria and regulations. CDPH has been subsumed into SWRCB per the 2014 water legislation package. The RWQCB issues permits for water reclamation and wastewater discharges.

The City of Lincoln has two separate wastewater related permits. The first is the Master Reclamation Permit (Order No. R5-2005-0040-01 and amended Order No. R5-2012-0052) which governs recycled water distribution within and around the City of Lincoln and the second is the City's NPDES Permit (Order R5-2014-0007, NPDES No. CA0084476) that governs discharges of water to Auburn Ravine Creek ("Auburn Ravine"). Both of these permits are relevant to the City's long-term management and use of its recycled water assets. The City's use of its recycled water assets is also governed by a water right order (WR0066) issued by the State Water Resources Control Board (SWRCB) in 2013.

5.4.3.1 Master Reclamation Permit

The City's Master Reclamation Permit (Master Permit) is the primary document granting the City the authority to utilize its recycled water assets within the City and surrounding areas. Originally issued in 2005, the Master Permit identifies the treatment requirements, treatment methodologies, system operations, reclaimed water uses (subject to the Engineer's Report), and regulatory requirements for complying with the Permit terms.

The treatment requirements and methodologies were described in previous sections of this chapter. However, the treatment requirements must be maintained to achieve the tertiary level of treatment under Title 22 in order to deliver water for the applicable uses described in those regulations and fully incorporated into the Master Permit. The City has, however, planned for potential contingencies in the operations of its facilities by addressing how it might manage secondary levels of treated effluent in the event of system failures.

The use of reclaimed water is not only governed by the type of treatment and the allowable regulatory structure, but also by the places of use of the water asset and issues assessed in the Engineer's report. As noted below, the place of use for reclaimed water incorporates nearly all of the City and its Sphere of Influence as well as areas beyond the City and SOI boundaries. The issue remains, however, how much analysis must be completed in the context of providing service to each identified location. The current Engineer's Report indicates that the analyzed places of use include only small areas in and around the WWTRF. Three specific locations are called out in the Engineer's report: a two acre parcel connected to the WWTRF, a 96 acre parcel at Antonio Mountain Ranch, and a 115 acre parcel at Warm Springs.[33] All three parcels utilize the water for spray or flood irrigation. The City, however, may be delivering water to areas beyond that area through the above-identified contracts and reporting water uses associated with those deliveries. Accordingly, water reclamation deliveries under the Master Permit deserve further investigation.

The regulatory requirements in the Master Permit include very specific items for specific types of water application as well as general requirements applicable to all forms of application. For instance, rice irrigation is permitted in the Order so long as:

- The discharge from the WWTF to the irrigation area is in full compliance with the California Toxics Rule, National Toxics Rule, Basin Plan Water Quality Objectives and the NPDES permit for that facility;
- The irrigated rice areas are in full compliance with the Regional Board's Irrigated Land Regulatory Program;

[33] City of Lincoln Production, Distribution and Use of Recycled Water Engineering Report (2003) at p. 25.

- The irrigation of rice does not exacerbate vector control problems or cause a nuisance; and
- The reclaimed water is treated to a tertiary level and adequately disinfected.

Moreover, "excessive irrigation" or "irrigation that results in excessive runoff" is prohibited. "Overspray" must be minimized and spray irrigation is prohibited if "wind velocities exceed 30 mph." And an application of water within 50 feet of any domestic well is also prohibited. All of these specific criteria must be complied with in the delivery and use of water for irrigated rice.

General regulatory requirements apply to all uses identified in the Permit. For instance, the City must "continue groundwater monitoring" and comply with its reporting schedule in the "Monitoring Reporting Program" (which is part of the Master Permit). Moreover, the discharges of water "requires the discharge to not degrade groundwater quality." And, importantly, the order prohibits the "co-mingling of recycled water with stormwater in the regional control basin."[34]

All applications of recycled water for identified uses within the City must comply with the specific regulatory criteria identified for that type of use in both the Master Permit as well as the Title 22 Regulations (where those regulations are more stringent than the terms of the Permit). It is incumbent upon the discharger, in this case the City of Lincoln, to comply with the terms of the Master Permit in all circumstances.

5.4.3.2 NPDES Permit

The City's NPDES Permit issued by the RWQCB determines the recycled water discharge requirements from the WWTRP into waters of the United States. Specifically, this permit outlines the waste discharge requirements for the City of Lincoln in discharging water to Auburn Ravine Creek – the only direct discharge point allowed for the City's recycled water assets. The Permit does not define any specific distinction between discharge and use, as the permit language exclusively focuses on discharge. This Permit rescinded Order R5-2008-0156 making the 2014 Order the primary compliance item for discharges to Auburn Ravine. WW0066, described below, is also applicable to the terms of this Permit.

City of Lincoln WWTP Treated Effluent Outfall

[34] Lincoln Master Permit Order No. R5-2005-0040-01 at p.5.

Indirect discharges of recycled water that return to natural water bodies – both surface water and groundwater – after application for other uses, like irrigation, are governed by the City's Master Permit described above. The Master Permit governs these uses through the Basin Plan and general regulatory compliance issues – like groundwater monitoring stations and regulatory restrictions on the application of recycled water through irrigation. Purposeful discharges of reclaimed water from irrigated lands or through direct discharge to a point other than the one identified in the permit may be in violation of both regulatory constructs.

This temporary permit that expires on February 1, 2019, complies with the Clean Water Act as implemented by the State of California through California Water Code section 13260. The primary responsibility for compliance with this order lies with the discharger – the City of Lincoln. The City has contracted its responsibility for operations of the facilities to Stantec Consulting Services, Inc. As described above, Stantec runs the day-to-day operations of the project and provides infrastructure operations and regulatory compliance with both orders.

Like the Master Permit, the NPDES Permit essentially requires treatment of water to a tertiary level of treatment before discharge into Auburn Ravine. The NPDES Permit outlines a number of specific criteria that must be adhered to before the water may be discharged. Moreover, the NPDES is subject to the RWQCB anti-degradation policy for discharge of waters. This policy is contained in SWRCB Resolution 68-16 as well as Federal regulation 40 CFR 131.12. Specifically, the "release of waste…shall not cause the underlying groundwater to contain waste constituents in concentrations greater than background water quality or water quality objectives, whichever is greater." Last, the NPDES prohibits commingling of "pollutant-free wastewater" with the actual wastewater. As defined in the NPDES Permit, pollutant free wastewater is: "rainfall, groundwater, cooling waters, and condensates that are essentially free of pollutants."

The NPDES Permit also requires the City to have contingency plans in case the facility has operational problems or there are other issues that may affect the treatment and discharge of reclaimed water. And the City must comply with Monitoring and Reporting Requirements and special conditions that are applicable exclusively to the City.

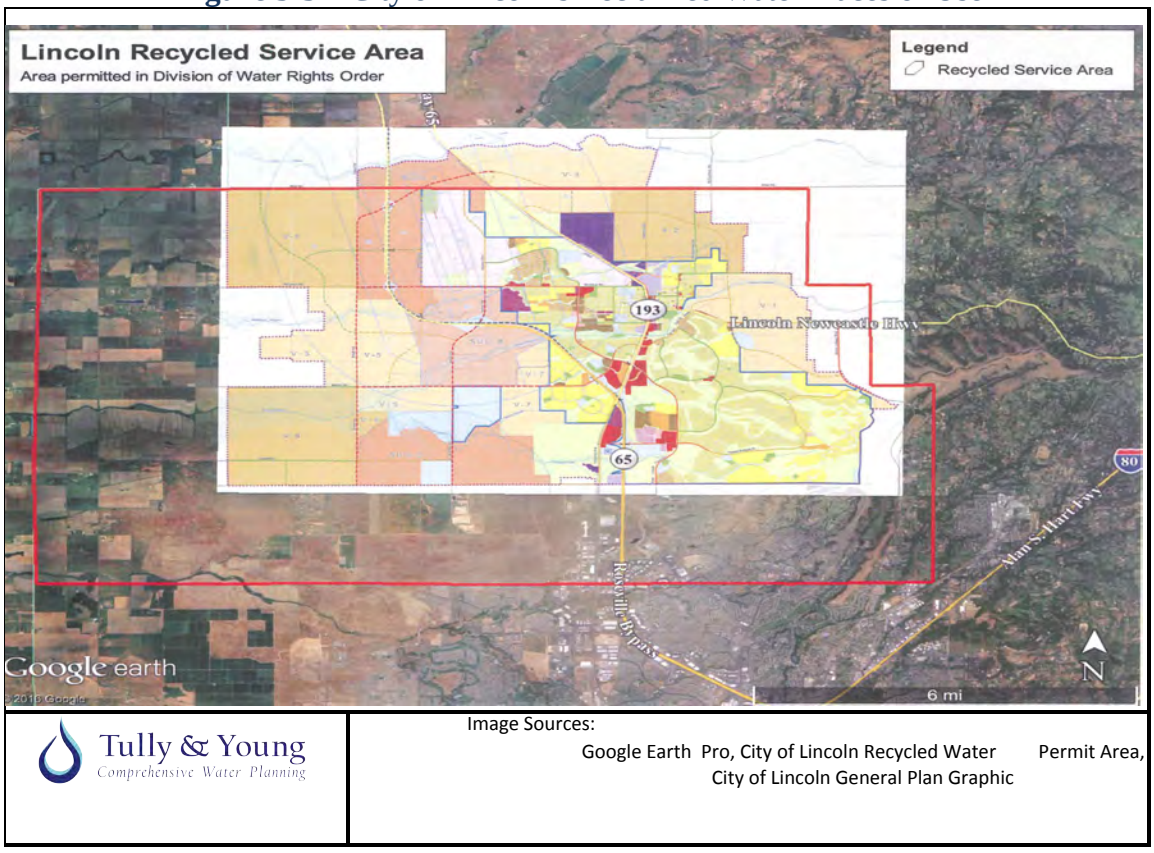
The City must also "establish interagency agreements" with other users that may convey waste streams to the WWTRF. The interagency agreements must contain "requirements for implementation of an industrial pretreatment program that meets the minimum requirements of this permit." The City must submit the interagency agreements for new connections to the RWQCB 30 days prior to connection to the WWTRF system. Last, the City is covered under Order 2006-0003-DWQ for operation of its wastewater collection system and must comply with that Order as modified in the future.

5.4.3.3 WW0066

WW0066 resulted in an Order Approving Change in Purpose of Use and Place of Use of reclaimed water in the City of Lincoln. A copy of this order can be found in **Appendix B**. WW0066 cites the City's Master Reclamation Permit as well as its *former* Waste Discharge Requirements Order No. R5-2008-0156. This Order was rescinded by the City's now Order R5-2014-0007. It is unclear if the requirements in WW0066 are applicable to Order R5-2014-0007 or not.

The Order greatly expanded the Place of Use of reclaimed water in the City. Specifically, the Order created an authorized place of use that incorporates all of the existing City, a majority of the City's Sphere of Influence, and a large area of land that is beyond the City's General Plan boundaries. A map depicting the authorized Place of Use is shown in **Figure 5-3** below.

Figure 5-3 – City of Lincoln's Reclaimed Water Places of Use



Tully & Young
Comprehensive Water Planning

Image Sources:
Google Earth Pro, City of Lincoln Recycled Water Permit Area, City of Lincoln General Plan Graphic

The Order requires the City to coordinate ("discuss and confer") with PG&E, NID, PCWA and SSWD in the management of Auburn Ravine. The Order further requires the City to maximize the treated effluent discharge into Auburn Ravine from "October 1 through November 30 and March 1 through April 15" each year.

The Order declares that the treated wastewater may be used for "irrigation and industrial purposes" and may be used for these purposes from January 1 to December 31 of each year. However, it clarifies that "no water shall be used under this wastewater change petition until petitioner has filed a report of waste discharge with the Regional Board… and the Regional Board…has prescribed waste discharge requirements or has indicated that waste discharge requirements are not required." The City has filed a report with the Regional Board since the issuance of the Order, allowing the City to utilize its treated wastewater. Discharges to groundwater may be permitted if certain conditions are met. A report on the waste discharge under this permit has been filed with the Regional Board, allowing the treated wastewater to be used for irrigation and industrial purposes.

5.4.4 Recycled Water Rights

Rights to recycled water or rights to water foregone when recycled water is used should be pursued by the City. There are numerous forms of water rights that the City may wish to utilize to secure its reclaimed water assets for use in its service area or for export to areas that can access water from Auburn Ravine or any waters that Auburn Ravine is tributary to. The four primary mechanisms for the City of Lincoln to secure water rights are related to:

- Foreign Water
- Salvaged and Developed Water
- Water Code Section 1211 petition process; and
- Water Code Section 1212 instream dedication process

As a preliminary matter, the City's ability to gain water rights to reclaimed and recycled water generated at the WWTRF requires assessing compliance with Water Code section 1210. Water Code section 1210 states:

> The owner of a waste water treatment plant operated for the purpose of treating wastes from a sanitary sewer system shall hold the exclusive right to the treated waste water as against anyone who has supplied the water discharged into the waste water collection and treatment system, including a person using water under a water service contract, unless otherwise provided by agreement.

In other words, if no agreement exists between the provider and the recycled water producer expressly retaining the water provided for the provider's use, then the water belongs exclusively to the owner of the waste water treatment plant.

The City's 2012 water supply contract with PCWA, titled "Contract Between Placer County Water Agency and City of Lincoln For A Treated Water Supply," is informative on the issues of whether an agreement exists preserving PCWA water at the City's WWTRF. Article 22 of the contract provides that without the prior written consent of PCWA, the City may not sell or dispose of PCWA water, for use outside the City's limits. The contract further states though that PCWA may not unreasonably withhold consent, and its refusal may only be based on the lack of water or capacity in PCWA facilities or PCWA's intention to provide service to the area outside the City's sphere of influence. This provision is intended to address the sale of treated and potable water delivered to the City from PCWA under the terms of this agreement rather than reclaimed water. The City has not provided any information that would indicate that PCWA claims recycled water that is derived from treated water sold to the City of Lincoln.

The City also receives potable water derived from Nevada Irrigation District. These water assets are provided to the City through a temporary water sales contract. The supplies are delivered to the City through a wheeling agreement entered into between PCWA and NID. Nothing in those agreements indicates that NID intended to reserve rights to water supplied to the City of Lincoln.

5.4.4.1 Foreign Water

Foreign water is water that is brought into an area from a different watershed. The unique geography of the City of Lincoln shows that it is neither a part of the American River Watershed nor part of the Yuba/Bear River watershed because waters that flow through its landscape are not tributary to either of those two bigger water systems. Specifically, Auburn Ravine, Markham Ravine, and Coon Creek all originate in the foothills to the east of the City and derive their natural water supplies from overland flow and surface water runoff in small watersheds. The City's surface water supplies are derived from the American River and Yuba/Bear River watersheds – both of which lie beyond the watersheds that lie within the City's place of use. Accordingly, because the surface water components of the City's recycled water assets originate outside the watershed surrounding the City, they are accorded protection under California Water Law as foreign water rights.

The City's surface water supplies are also considered "foreign water" because they are "foreign in time" as compared to water that flows through a system as part of the natural flow. Specifically, the water delivered to the City from PCWA and NID is derived from stored water in the American River and Yuba/Bear watershed systems. Stored water is water that would not otherwise be present in a system but for the reservoirs that hold the water from running down the system. Thus, the modified timing of the release of the water creates an additional foreign water component in water delivered to the City.

Foreign water rights afford the City with an absolute right to manipulate and re-use the water regardless of the impact on downstream water right holders. An "absolute right" means that the City is able to utilize the water regardless of any usage by any other water users that derive benefit from the imported water. In other words, no other legal user of water may claim a right to the use of foreign waters against the importer of those foreign waters so long as the foreign waters are put to reasonable and beneficial use. Those rights extend to the discharge of water as well. The City may cease discharging water and use the discharged water for any purposes even if a downstream user has developed a dependence on the discharged water supply being present.

Currently, over 90 percent of the City's delivered water supplies are derived from surface water sources that are imported into the City. The amount of water that flows through the wastewater system is thus assumed to be the same percentage – meaning 90 percent of the wastewater effluent discharged into the City's sewer system is considered wastewater derived from imported surface water sources.

In addition, the City derives the remaining 10 percent of its water supplies from groundwater. This groundwater supply, and the policies behind it, is discussed in greater detail in **Chapter 6.** The SWRCB has previously concluded that "return flow of groundwater should be treated as foreign water if the groundwater does not naturally flow into the watercourse and is only present because it was extracted from the ground." Recent hydrogeological analyses, described subsequently in **Chapter 6**, indicate that the groundwater resources extracted by the City are separated from Auburn Ravine and Markham Ravine through hydrogeological barriers. Some groundwater used by the City may be derived from Coon Creek which appears to be hydrologically connected but as a recharge system only (the stream is not a "gaining stream" – meaning groundwater does not feed the stream's natural flow. As such, groundwater is considered legally distinct from surface water, and thus, no downstream appropriator or riparian user of surface waters can claim a right to the recycled water discharges that are derived from groundwater extractions. So long as the water is used for reasonable, beneficial purposes, the City has the exclusive rights to its treated wastewater derived from groundwater extractions.

In summary, the City's surface and groundwater resources appear to all be foreign water sources subject to the rules applicable to foreign water rights under California Water Law. Foreign water rights accord the water right holder substantial deference in how it uses and manipulates its foreign water assets both for uses within its service area and in areas where it may wish to export supplies. By claiming foreign water rights as the basis for the City's ownership to its water supplies, the City will maintain the most flexibility over that water to protect those water rights for current and future uses.

5.4.4.2 Salvaged and Developed Waters

Salvaged and developed waters are an area of California Water Law that is not well developed in the recycled water arena. Salvaged water is defined as water that is "saved" or "restored" to the supply within a particular area by artificial means. Developed Waters are "not present in the area until they are brought there by means of artificial devices."

Reclaiming and recycling water is a process that produces a usable product out of an unusable product. Surface water is consumed by end users in the City of Lincoln. These users eat, drink, wash, irrigate, and otherwise use water in a number of different ways. This consumption eventually finds its way to the City's sewer system. In other words, raw sewage and other wastewater that has been consumed by people is captured in the City's sewer system. Normally raw sewage is not useful for any purpose normally associated with usable water sources. Raw sewage must be treated with specific industrial processes that require the expense of time, money and energy. These industrial processes create a new product out of a formally unusable one.

Under the definition of "salvaged", reclaimed water assets are "saved" and "restored" through industrial processes that take an unusable product, raw sewage, and make a usable product, tertiary treated reclaimed water. This reclamation of water by its own definition indicates that the act of reclaiming does not infringe on rights of others because the usable resource did not exist before the treatment process was undertaken. In other words, the act of reclamation created a new water asset.

Similarly, under the definition of "developed", reclaimed water assets were brought to the location by artificial devices and methods. Sewer systems collected the raw sewage and delivered that sewage to the treatment facility. The reclaimed water was never present in the area until the reclaimed water process created the water from the raw sewage. In other words, the treatment processes again created a new resource that can be used for identified purposes.

Both developed and salvaged water rights are accorded substantial protection under California Water Law. Specifically, the person who by his own efforts makes such waters available is entitled to use them, so long as he is not infringing on the prior rights of others. It would be difficult for any other legal user of water to claim reliance or injury on a source of water that is essentially consumed as it is converted into sewage. The development of a usable water source from unusable sewage is the key to understanding the water rights principles of developed and salvaged water.

5.4.4.3 Water Code Section 1211

Water Code section 1211 provides another mechanism for securing a water right. This statutory section allows a recycled water asset producer to secure the ability to deliver that water to a point of discharge, defined place of use, and for a new purpose of use. In developing this water right, a recycled water producer may petition the SWRCB for this modification. In order to petition the SWRCB, the recycled water producer would likely need to already possess a Reclamation Permit for discharges to recycled water uses or an NPDES Permit for discharges to water bodies. The RWQCB regulates wastewater discharges but does not possess full authority to regulate all uses available for recycled water.

PETITION FOR CHANGE

Water Code 1211 Change Petition

Water Code section 1211 reads:

(a) Prior to making any change in the point of discharge, place of use, or purpose of use of treated wastewater, the owner of any wastewater treatment plant shall obtain approval of the board for that change. The board shall review the changes pursuant to the provisions of Chapter 10 (commencing with Section 1700) of Part 2 of Division 2.

(b) Subdivision (a) does not apply to changes in the discharge or use of treated wastewater that do not result in decreasing the flow in any portion of a watercourse.

The exception listed in paragraph (b) indicates that where water has not been discharged to a watercourse, SWRCB approval is not required for a change in items listed in paragraph (a). Moreover, it is unclear whether the decrease in flow is attributed to "natural flow" or "any flow" in a water system. If it is natural flow, then any water imported into the watershed does not require compliance with section 1211. But if "flow" means "any flow" then waters that originate in the watershed may qualify as well as water originally discharged and then reduced. The legislative intent behind these provisions requires further analysis.

The City already uses a portion of its treated wastewater to irrigate crops within the City limits. If the City wished instead to transfer that water to alternative uses it would not need to obtain SWRCB approval under Section 1211 because its change in the use of

treated wastewater would not result in a decreased flow in the Creek. However, the change in use of the wastewater must comply with the requirements of its Master Reclamation Permit.

5.4.4.4 Water Code Section 1212

Water Code section 1212 affords the City another mechanism to assert control over its water assets. Under this section of the Water Code, a recycled water producer need only state its intent to reserve the water asset to protect the asset against other users. Section 1212 states:

> The board shall not grant any permit or license to any person other than the treated waste water producer for the appropriation of treated waste water where the producer has introduced such water into the watercourse with the prior stated intention of maintaining or enhancing fishery, wildlife, recreational, or other instream beneficial uses. Holders of existing rights may not use or claim such water.

The question arises as to what the Legislature meant by "prior stated intention." There is no judicial interpretation of this issue. From a practical perspective, it seems evident that a formal public agency resolution or other formal public act would suffice to show the intent to commit the water to an instream beneficial purpose. Developing the discharger's intent to protect instream sources generally protects the water asset from other legal users.

But a second issue arises in utilizing this statutory section if the discharger decides to alter the recycled water discharge to the natural water body. It is possible that the instream beneficial use that received the water from the discharging agency may be dependent on that source of water for survival or other purpose (recreation). It is unclear whether a permanent right vests in that dependent user or whether the discharger has the ability to retract that water asset in the future. Again, this legal provision has not been tested.

5.4.4.5 Abdication of Water Rights

The City's fundamental position should be that the sewage it delivers to the WWTRF is derived from foreign water sources and that the water in that facility is salvaged and developed water because it is unusable in any form without the City's industrial efforts and monetary expenditures. As such, the City possesses a complete water right to the water assets produced at the WWTRF.

However, because the recycled water is essentially treated and then discharged to lands and waters in the United States, it is subject to the waste discharge requirements

established under the Clean Water Act and subsequent California Water Law. As such, the discharge of this water to any land or water source requires Master Reclamation Permit and NPDES Permit compliance, respectively. Thus, although the water right belongs to the City, the use and application disposal of that water is subject to the jurisdiction of the RWQCB.

The City also possesses the ability to abdicate its water rights to conditions set upon it by the SWRCB in obtaining permits. For instance, in WW0066, the City agreed to discharge water to Auburn Ravine during certain times of year in exchange for the expansion in the place of use. The City may not have needed to obtain this approval from the SWRCB since the water was derived from foreign water sources as well as developed and salvaged through expensive water reclamation processes. Thus, the City may have abdicated a portion of its water asset by agreeing to terms of the Order. The City certainly has the ability to contract away its water rights but it should be hesitant to do so. The mandated discharges to Auburn Ravine under WW0066 may be permanent as fisheries, recreation, and other instream uses may depend on that water and coordination with regional agencies in maintaining Auburn Ravine is required

5.4.4.6 Moving Recycled Water to Alternate Locations

The City's recycled water right may be moved to alternative locations beyond the City boundary through delivery in natural watercourses. In other words, the foreign, developed and salvaged water supplies may have utility and value to places that are removed from the City and its Sphere of Influence. Water Code section 7075 is the key provision applied to transport of water in natural water bodies. That section states:

> Water which has been appropriated may be turned into the channel of another stream, mingled with its water, and then reclaimed; but in reclaiming it the water already appropriated by another shall not be diminished.

Accordingly, the City may reclaim water that is foreign, discharge that water into the stream system, and redivert the water at a point downstream of the discharge. The City must account for the water it discharges and that is later diverted downstream and adjust the amount of water available for conveyance, evaporation and other wheeling losses. The City's existing NPDES Permit does not prevent nor expressly authorize rediversion of the foreign water at downstream locations.

Again, although this action is applicable to all water rights, recycled and reclaimed water may have more restrictions because of its regulated status as wastewater. However, so long as the discharge is permitted under the NPDES Permit, the extraction of the water at a lower point in a stream system should not be problematic so long as: (a) the City has

not abdicated its right to the water in some way; (b) it accounts for water losses in delivery of water to the new destination; and (c) there is adequate authority to divert the water from the stream channel at a new location. The characterization of the City's water as foreign, developed, and salvaged water makes all of these opportunities more likely. Full utilization of these opportunities will require coordination in the timing of the diversion as it relates to downstream users.

CHAPTER 6. GROUNDWATER TECHNICAL ASSESSMENT

6.1 Introduction

The purposes of this chapter are to (1) define the North American Subbasin and its current groundwater conditions; (2) explain the City's existing well system and groundwater rights; (3) describe the governance structure and existing plans as related to the groundwater system; and (4) assess future governance issues, groundwater banking and long-term strategy objectives.

6.2 Groundwater Basin Description

The City of Lincoln is located in the northeastern part of California's Central Valley, bordering the foothills of the Sierra Nevada Mountain Range. The Central Valley Groundwater Basin, geotechnically named the Great Valley Geomorphic Province, is a large structural depression underlain and bounded on the east by the gently westward-dipping Sierra Nevada and on the west by the complexly folded and faulted Coast Ranges. The surrounding mountains are generally composed of non-water bearing rocks, while the Central Valley is filled with water-bearing sediments accumulating from the Valley's formation and depositional activity derived from the surrounding mountains. Most of the surface water within the Central Valley originates in rivers and streams that descend from the surrounding mountains and uplands.

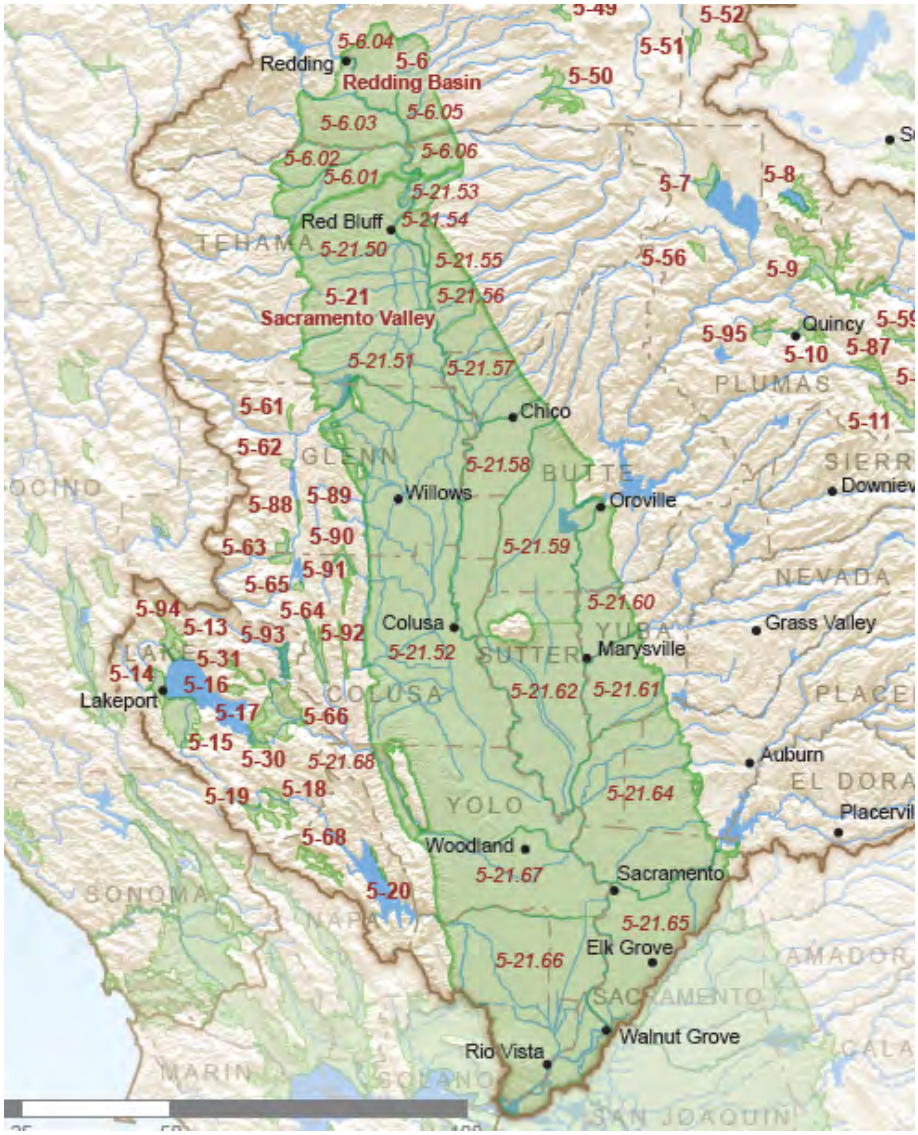
The large sediment accumulation in the Central Valley began in a marine environment over 60 million years ago, during the Cretaceous period. These marine sediments compose the Sacramento Valley's lower layers and are saturated with predominantly brackish or saline water. As late as 6.7 million years ago, volcanic eruptions in the Sierra Nevada deposited pyroclastic rocks, lava flows, and mudflows down the mountain range's western slopes. These volcanic rocks were eroded and deposited in marine and continental environments within the Central Valley. The Sacramento Valley area was almost fully formed about 3.4 million years ago with fluvial – river and stream – processes dominating the sedimentary deposition landscape since then. These younger volcanogenic and fluvial sediments are the key depositionary materials that constitute the Sacramento Valley's freshwater aquifer system.

The Central Valley Groundwater Basin is an important resource, estimated to contain approximately 114 million acre-feet of water under approximately 15,500 square miles of land surface.[1] Several fresh water aquifers are present beneath the Basin ranging in depth from near the soil surface to 3,000 feet below ground. The Sacramento Valley Groundwater

[1] Sacramento Valley Groundwater Basin, Hydrologic Region Sacramento River, DWR Bulletin 118, p. 1-5.

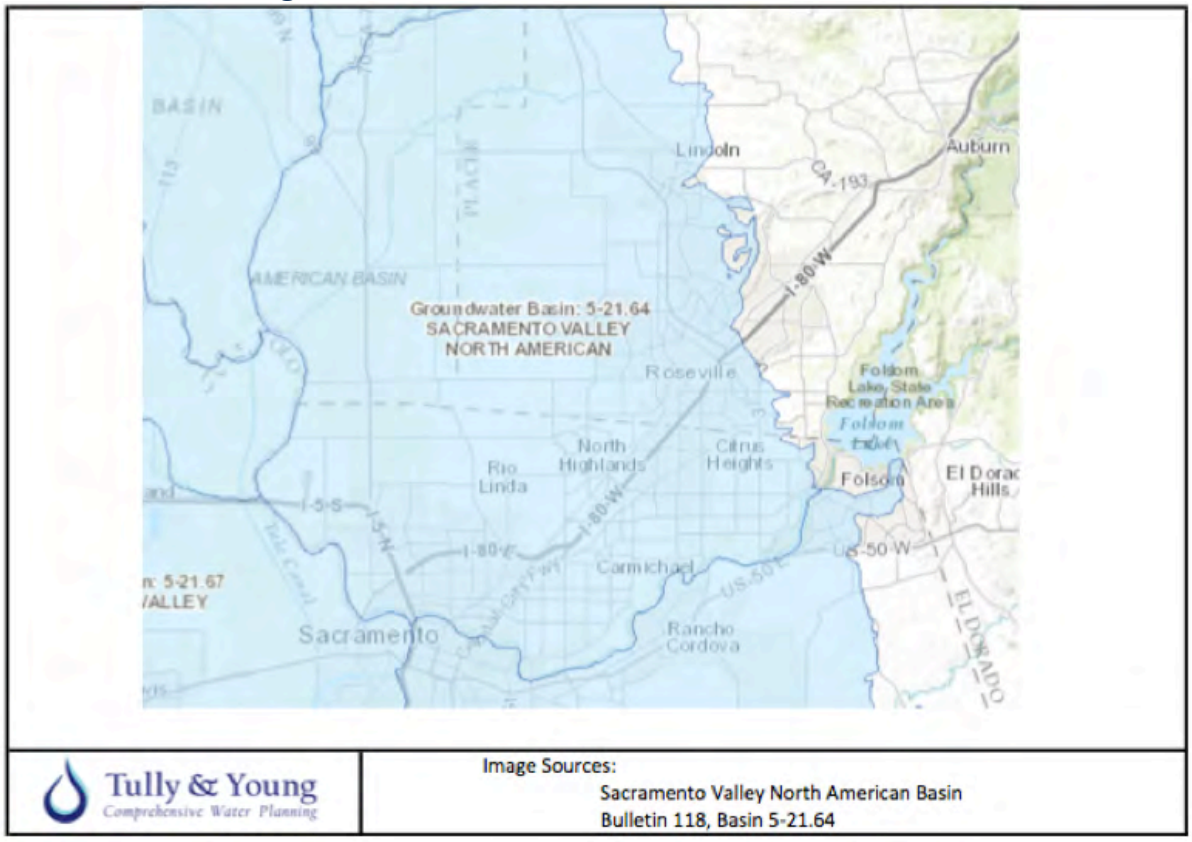
Basin is one of the several large categorical areas that makes up the Central Valley Groundwater Basin. The Sacramento Valley Groundwater Basin covers nearly 7,900 square miles. The Sacramento Valley Groundwater Basin is comprised of numerous sub-basins with hydrogeological and political delineations. The Sacramento Valley comprises the northern one-third of the Central Valley. **Figure 6-1** depicts the Sacramento Valley and its groundwater basins.

Figure 6-1 – Sacramento Valley Groundwater Basins[2]



[2] Bulletin 118, Sacramento River Hydrologic Map found at http://www.water.ca.gov/groundwater /bulletin118/ maps/SR.pdf.

Figure 6-2 – North American Groundwater Subbasin[3]



The North American Groundwater Subbasin ("Subbasin" – **Figure 6-2**, above) is one of 18 subbasins that comprise the Sacramento Valley Groundwater Basin. The Subbasin lies within portions of Sutter, Placer, and Sacramento Counties. The Subbasin is identified by the California Department of Water Resources (DWR) in Bulletin 118-2003 as Basin No. 5-21.64.[4] The approximate total storage of the North American Subbasin is 4.9 million acre-feet of water, across a surface land area of approximately 351,000 acres. This Subbasin is the primary groundwater zone of the City's concern.

The Subbasin is delimited by the Bear River on the north, the Feather River and the Sacramento River on the west, the American River on the south, and the Sierra Nevada foothills on the east. The eastern boundary, characterized by low rolling dissected uplands, represents the approximate edge of the alluvial basin – a boundary where percolating recharge from the Sierra Nevada generally ceases. Beyond this eastern border, some fractured rock groundwater systems may recharge the Subbasin but percolation directly to the basin is generally absent. The northern, western, and southern portions are flood basins for the Bear, Feather, Sacramento and American rivers, interspersed with several small tributary

[3] City of Lincoln Groundwater Management Plan, 2003, p. 16.
[4] Bulletin 118 Sacramento Valley Groundwater Basin North American Subbasin, p.1-6.

streams. These major boundaries – all the major perennial rivers – represent partial groundwater divides, where at shallow depths there is little groundwater flow from the aquifer system on one side of the river to the aquifer system on the other side. At greater depths, however, there is groundwater flow across these hydrogeological boundaries.

The general direction of drainage – land surface slope – is west-southwest. Naturally occurring subsurface groundwater movement generally follows this drainage direction, except where isolated lenses or barrier layers impede water movement through the soil profile. The base of freshwater deepens moving westward from about 400 feet below sea level near the Sierra Nevada foothills to over 1200 feet at the axis of the valley (approximately the location of the Sacramento River).

The City of Lincoln's current boundary is located wholly within the North American Subbasin. The City is lies approximately two miles to the west of the demarcated hydrogeological boundary at the Sierra Nevada foothills. Lincoln's Sphere of Influence (SOI) is mostly located within the North American Groundwater Subbasin. But the SOI's eastern expanse, as described in the Lincoln 2008 General Plan, extends beyond the water-bearing sediments of the Subbasin into the western reaches of the Sierra Nevada foothills. As described in subsequent sections of this analysis, the City's location and future SOI boundary coupled with the region's diverse hydrogeology, require further investigation before the City undertakes future groundwater development and management actions.

6.2.1 North American Subbasin Hydrogeology

The hydrogeologic units of the North American Subbasin can be grouped into two aquifer units in the City of Lincoln area. The upper aquifer includes the saturated Laguna Formation and younger unconfined sediments consisting of generally thin and laterally discontinuous sands and gravels separated by thick sequences of clay strata. The lower aquifer consists of Mehrten Formation continental deposits, including a significant amount of fine-grained materials. These two systems constitute the major water producing aquifers in the City of Lincoln area. Both systems are composed of lenses of sand, silt, and clay, inter-bedded with coarse-grained stream channel deposits that store water.

Groundwater aquifers can be confined, semi-confined, or unconfined. A fully confined aquifer is generally bounded by impervious layers on all sides and has no direct connection with an overlying aquifer or soil surface. A semi-confined aquifer is bounded by confining strata but is partially connected to an overlying aquifer or soil surface. An unconfined aquifer has direct interaction with the soil surface.

The fresh water bearing deposits of the North American Groundwater Subbasin in and around the City of Lincoln are divided into two broad aquifer systems with lithologic and hydrologic differences. The division between the two systems is not clearly demarcated

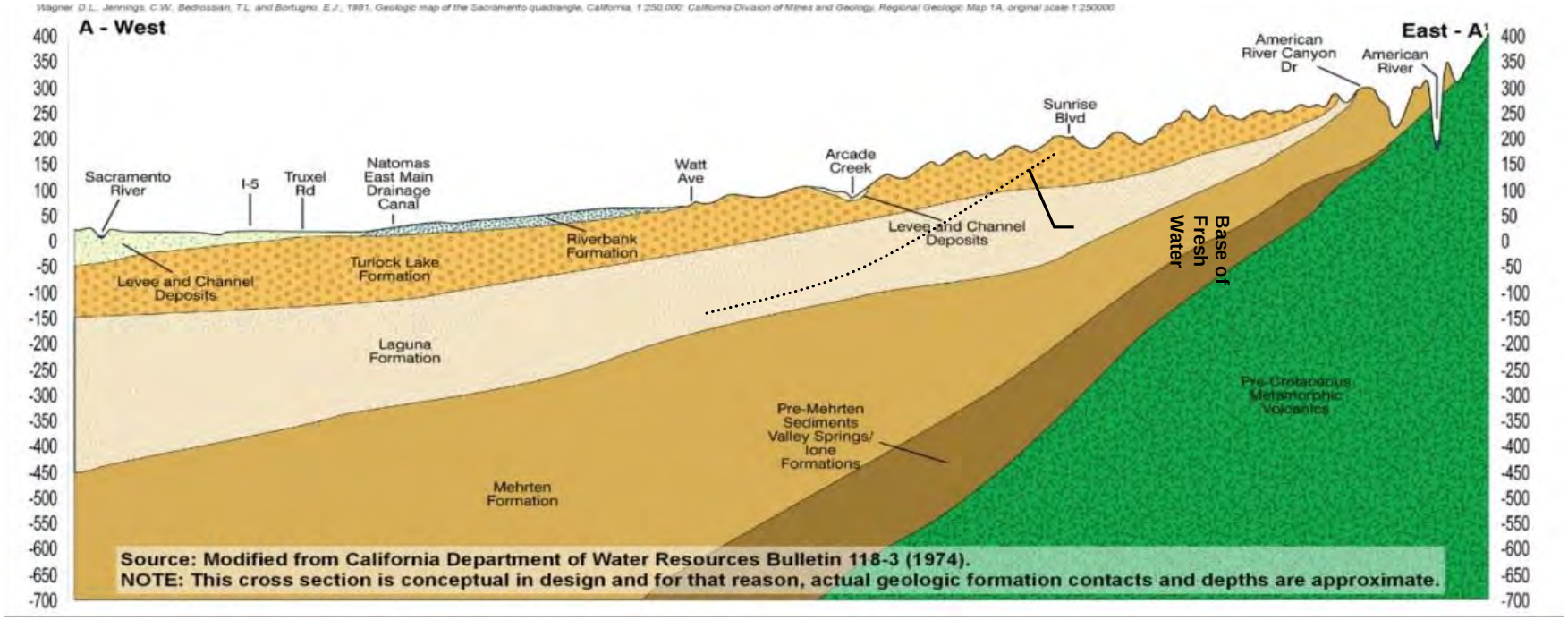
because the subsurface geology and groundwater conditions have not been fully mapped. The aquifer systems themselves are quite variable – the aquifer thickness, the horizontal and vertical extent of individual geologic layers, and the presence of semi-confining layers, dividing lenses, and physical anomalies all vary throughout the two systems hydrogeological profile.

6.2.2 Upper Unconfined and Semi-Confined Aquifer System

The upper unconfined and semi-confined aquifer system lies directly below the land surface and is composed of alluvium deposits. The system varies in thickness from as much as 300 feet in the western part of the Lincoln SOI to essentially zero feet in the eastern part where the aquifers end in the Sierra Nevada foothills. The aquifer system contains generally thin sands and gravels that are laterally discontinuous, separated by low permeability clay and silt. Aquifer conditions are known to be unconfined and semi-confined based on the direct response of groundwater levels to imposed stresses, like aggressive pumping. Throughout much of the Lincoln area, however, except near creeks and ravines, a low permeability clay soil or "hardpan" layer exists near the soil surface that restricts vertical water flow and deep percolation into the aquifer. This less permeable geological horizon may act as an upper semi-confining layer to the aquifer in some places.

From youngest to oldest, the three hydrogeologic units that comprise the upper aquifer system include Holocene alluvium ("Alluvium"), the Pleistocene Riverbank Formation ("Riverbank Formation"), and the Pliocene-Pleistocene Laguna Formation ("Laguna Formation"). All of these hydrogeological units are described below. **Figure 6-3** depicts a cross-section of the groundwater basin formations.

Figure 6-3 – Groundwater Basin Cross-Section[5]



[5] Sacramento Groundwater Authority Groundwater Management Plan (2014), p. 28.

6.2.2.1 Alluvium

The youngest alluvium consists of unweathered gravel, sand, and silt deposited by present-day water flow through creeks and drainages. These deposits are primarily located along the surface streams in the area and spread out based upon the historical flood plain of the surface system. The Alluvium's depositional thickness and areal coverage is not significant because of the limited hydrology of the local surface water systems. Accordingly, the Alluvium does not yield appreciable quantities of groundwater.

6.2.2.2 Riverbank and Turlock Lake Formations

These two formations overlie the Laguna Formation and have been laid down along the American River lower watershed. These formations are geologically young (Pleistocene) and largely unconsolidated. Formation sediments are primarily derived from decomposed granite and metamorphic rock of the western Sierra.[6] The Riverbank Formation contains a heterogeneous mixture of silt, sand, gravel, and clay – exhibiting extreme grain size variability over short lateral and vertical distances. The Riverbank Formation overlies the Turlock Lake Formation yet is interspersed with it in areas. The Riverbank Formation often is differentiated into two members:

- Upper Member – an unconsolidated, dark brown to reddish-colored alluvium deposit composed of gravels, sands and silt with minor amounts of clay.
- Lower Member – a semi-consolidated, red-colored alluvium deposit composed of gravels, sands and siltstone that represent remnants of dissected alluvial fans.

The Riverbank Formation deposits are widespread throughout western Placer and northern Sacramento counties along foothills and often considered an important aggregate resource. The deposits thickness varies, with a maximum thickness of 50 to 75 feet. The formation is moderately permeable overall, with highly permeable coarse-grained zones. Where saturated, these deposits can yield appreciable quantities of groundwater.

6.2.2.3 Laguna Formation

The Laguna Formation geologic unit is composed of a heterogeneous mixture of tan and brown interbedded alluvial sand, silt, and clay, with some gravel lenses – deposited by ancestral rivers and streams that drained the Sierra Nevada. The formation generally increases in thickness toward the west and has a maximum thickness of about 200 feet. In certain portions of Placer and Sacramento Counties, the Laguna Formation is similar in depth, thickness and composition to the overlying Riverbank Formation – but generally it is more fine-grained than the other overlying formations. Where this unit is saturated,

[6] Sacramento Groundwater Authority Groundwater Management Plan, 2008 at p. 9.

appreciable quantities of groundwater can be produced, although most wells within the unit have low to moderate yields.

6.2.3 Lower Semi-Confined Aquifer System

The Lower Semi-Confined aquifer system occurs below the upper unconfined and semi-confined aquifer system, and is composed of clastic deposits of volcanic origin that vary in thickness from greater than 200 feet in the western part of the area to less than 10 feet in the eastern part. These deposits are known as the Mehrten Formation. The semi-confining layer dividing the upper and lower aquifer systems consists of a clay layer and a hard, consolidated volcanic tuff-breccia layer.

Aquifer conditions in this lower system appear to be at least partially confined based on the limited response of groundwater levels to imposed stresses at shallow depths. The base of the lower aquifer system is defined by the base of the fresh water-bearing zone or the top of the regional geologic basement complex of the Sierra Nevada foothills, the former in the western part of the Lincoln area and the latter in the eastern part. The lower system also contains significant amounts of low permeability clay and silt, but the coarse zones, although laterally discontinuous, appear to be somewhat thicker than those of the upper aquifer system.

6.2.3.1 Mehrten Formation

The Mehrten Formation is composed of a sequence of fragmental volcanic rocks that overlie marine and brackish water sediments. The formation consists of two distinct units:

- A sedimentary unit containing fluvial deposits composed of gray to black well-sorted sands with associated lenses of stream gravels containing cobbles and boulders, interbedded with blue to brown silts and clays.
- A dense, hard gray andesitic tuff-breccia formed by the solidification of ash mudflows emanating from volcanic eruptions to the east.

The sand and gravel beds within the sedimentary unit, which are individually 5 to over 20 feet thick, are highly permeable and saturated with primarily fresh water. Consequently, the sedimentary unit of the Mehrten Formation is recognized as an important aquifer in much of the Sacramento Valley, producing significant fresh groundwater supplies throughout much of the Placer, Sutter, and Sacramento County regions.

6.2.3.2 Ione Formation

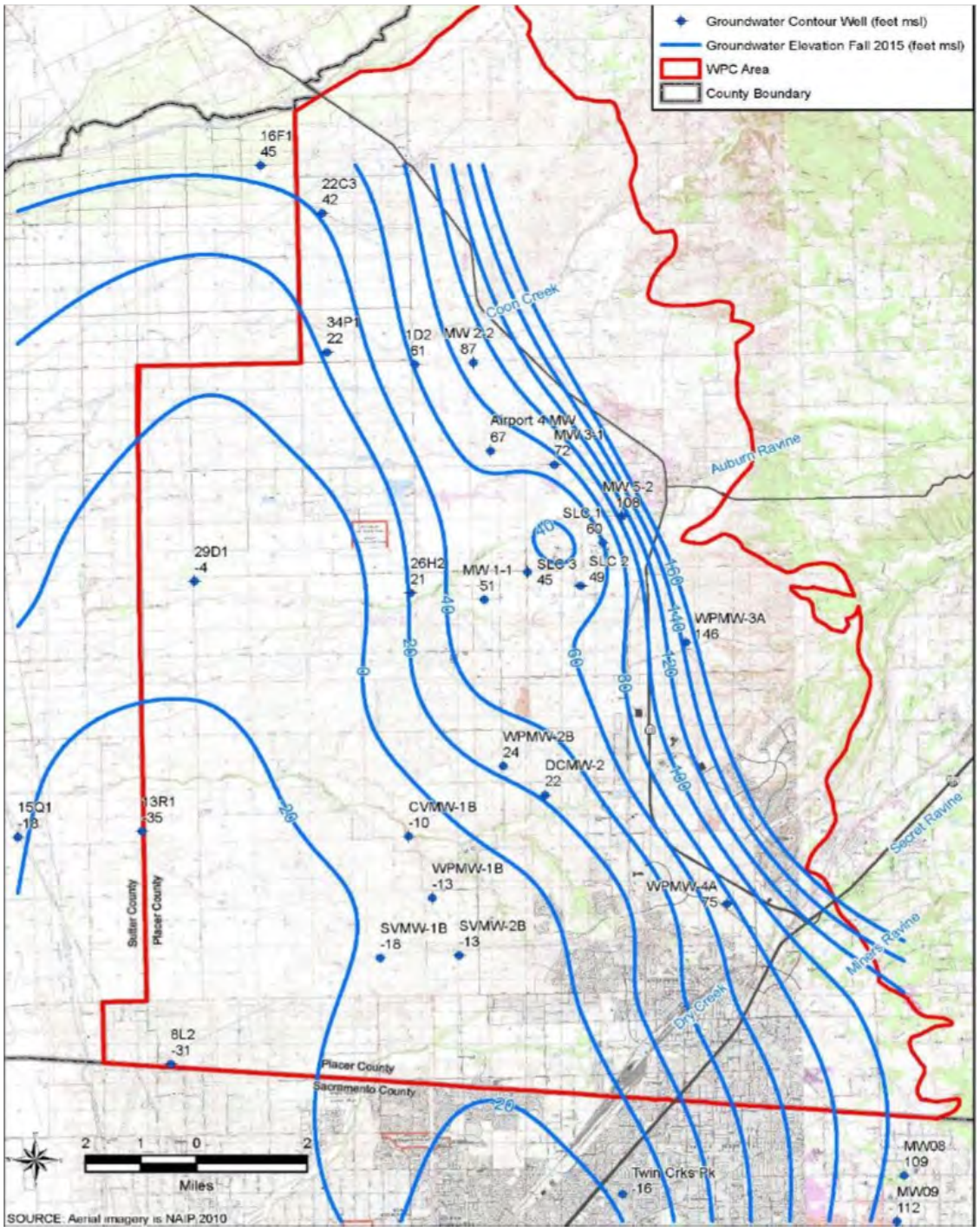
The Ione Formation lies below the Mehrten Formation. This hydrogeological unit contains marine deposits consisting of white to light yellow colored conglomerate, sandstone, and claystone. The Ione is recognized as the light colored clay visible in the Gladding-McBean quarry north of Lincoln. As the depth of the Ione Formation increases it has been recognized

that water quality in this formation becomes degrades becoming more brackish and eventually saline. The Ione Formation has not been used extensively for groundwater production due to its generally low water yield and mostly poor water quality.

6.2.4 Groundwater Movement

Groundwater levels and flow direction in the Lincoln area have remained relatively stable since 1950. The regional groundwater flow direction is west-southwest, approximately parallel to Coon Creek in the northern part of the Lincoln area and southwesterly through most of the Lincoln Sphere of Influence. The sedimentary section comprising the aquifer systems dips to the west-southwest as well, at about five degrees or less – suggesting the unstressed groundwater flow direction is parallel to the slope of geologic bedding. Below in **Figure 6-4** is an historical groundwater contour map indicating the direction of groundwater flow.

Figure 6-4 – Groundwater Contour Map



Tully & Young
Comprehensive Water Planning

Image Sources:
GEI- Western Placer County Groundwater Level Summary

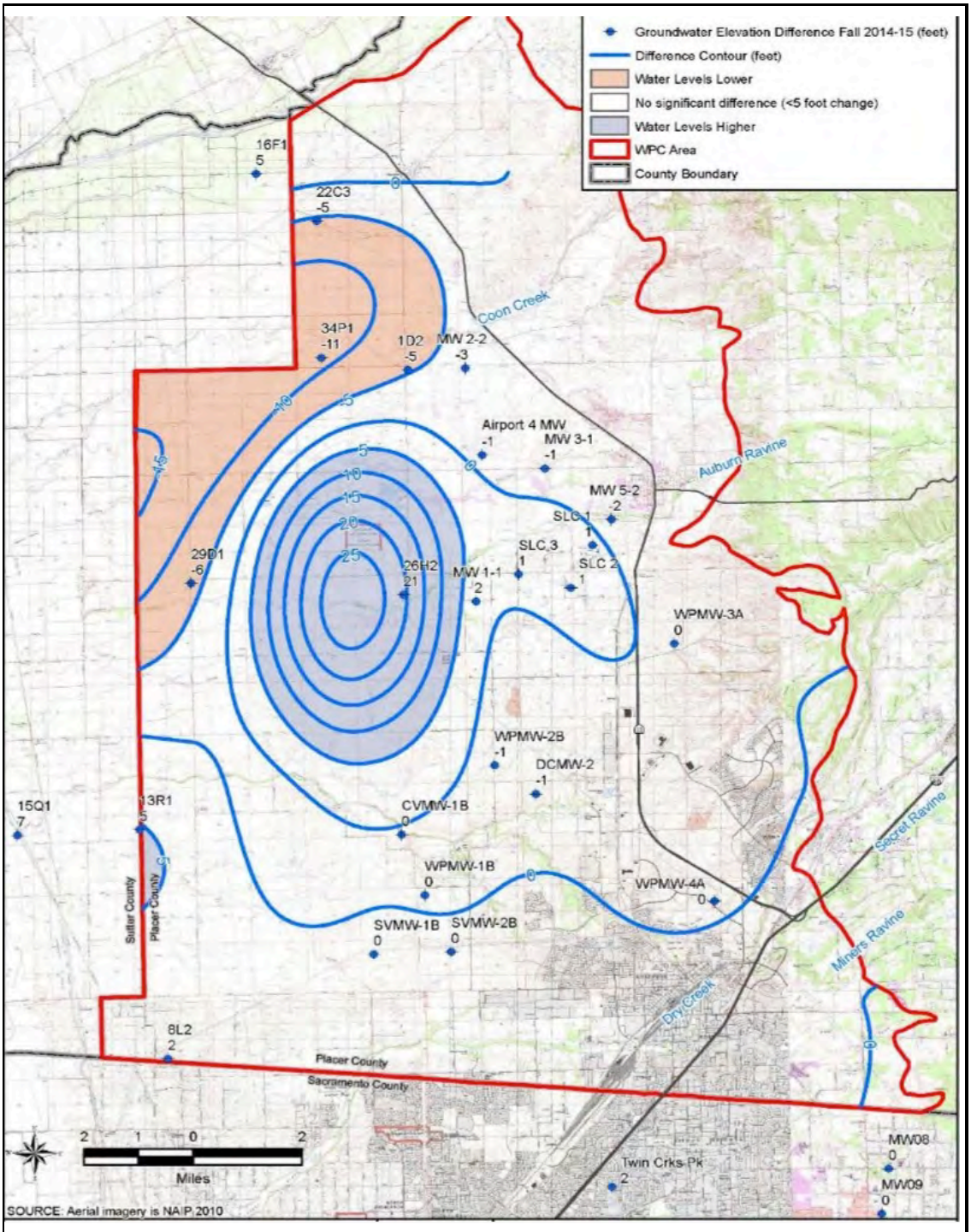
6.3 Current Subbasin Physical Condition

The stability of groundwater levels in the Lincoln area over historical hydrologic conditions is demonstrated by the worked performed by the West Placer County Groundwater Management Plan workgroup. Over the course of the last several decades, the City of Lincoln has successfully converted most of its water usage to surface water sources rather than using groundwater sources. This conversion has resulted in improved groundwater supply conditions in and around the City of Lincoln.

However, other areas of the North American Groundwater Subbasin have experienced significant declines in groundwater levels due to pumping extraction from the Subbasin's aquifer systems. In particular, there are two pumping depressions. The first is centered in northern Sacramento County near McClellan Air Force Base that extends into southwestern Placer County. The second is located in Sutter County as groundwater pumping has increased with cropping pattern changes and the lack of reliable surface supplies during the course of this drought. Although the pumping depressions do not appear to extend to or impact the Lincoln SOI at this time, the implications of aggressive groundwater pumping may manifest into denuded groundwater supply conditions in broader areas of the North American Subbasin.

The current groundwater elevations in the Western Placer County portions of the Subbasin are shown in **Figure 6-5**. The elevations below depict a recovery in groundwater levels in the area just west of the City of Lincoln. This recovery is likely due to the City's efforts to reduce groundwater pumping by better utilizing surface sources of water from PCWA and NID. However, in the most western portion of the basin, groundwater levels are declining. The additional use of groundwater for irrigation during drought conditions – such as those over the course of the last 4 years – have taxed the groundwater basin beyond its normal use in an average year. If the additional groundwater pumping is permanent, the Subbasin will likely continue to witness a growing groundwater depression in that location.

Figure 6-5 – Groundwater Elevation Difference Fall 2014-15



Tully & Young
Comprehensive Water Planning

Image Sources:
GEI - Western Placer County Groundwater Level Summary

6.3.1 City of Lincoln Groundwater Levels

Prior to the 1960's, groundwater was the sole source of water supply in most parts of the North American Subbasin, including the City of Lincoln. A strong dependence on groundwater existed in the southern central portion of the Subbasin, resulting in groundwater declines at an average rate of up to about one and a half feet per year for about 50 years, through the 1980s to mid-1990s. The introduction of surface water sources throughout the North American Subbasin has subsequently resulted in stabilization and some recovery of groundwater levels. Nevertheless, throughout the North American Subbasin, groundwater levels continue to fluctuate seasonally and through varying climatic and regulatory conditions. As discussed later in this report, regional groundwater pumping may accelerate in the future as regulatory restrictions and streamflow requirements inhibit surface water diversions for human uses.

Groundwater level data was downloaded from the DWR Water Data Library (http://well.water.ca.gov) for all wells monitored by DWR within the City of Lincoln's designated Sphere of Influence. **Figure 6-6** displays the location of each current DWR well within and around the City of Lincoln. DWR provided 620 different groundwater logs in the subbasin region some of which had been abandoned and others lacked adequate records. After sorting all of the data, the following wells were chosen to represent City groundwater elevations as they have an unbroken record of well information: Well A- 388974N1213665W001; Well B- 389011N121354W001; Well C- 388971N1213301W001; Well D- 388963N1213206W001; Well E- 388704N1213544W003; Well F- 388603N1213502W001; Well G- 388637N1213222W001; and Well H- 388607N1213177W001.

The City of Lincoln also manages an array of monitoring wells. These wells are shown below in **Figure 6-7** with selected characteristics as: MW-1, MW-2, MW-3, MW-4, MW-5, SLC-1, SLC-2, and SLC-3.

Figure 6-6 – Groundwater Wells in City of Lincoln and SOI

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Image Sources:
DWR Groundwater Well Location Map

Figure 6-7 – Lincoln Monitoring Wells

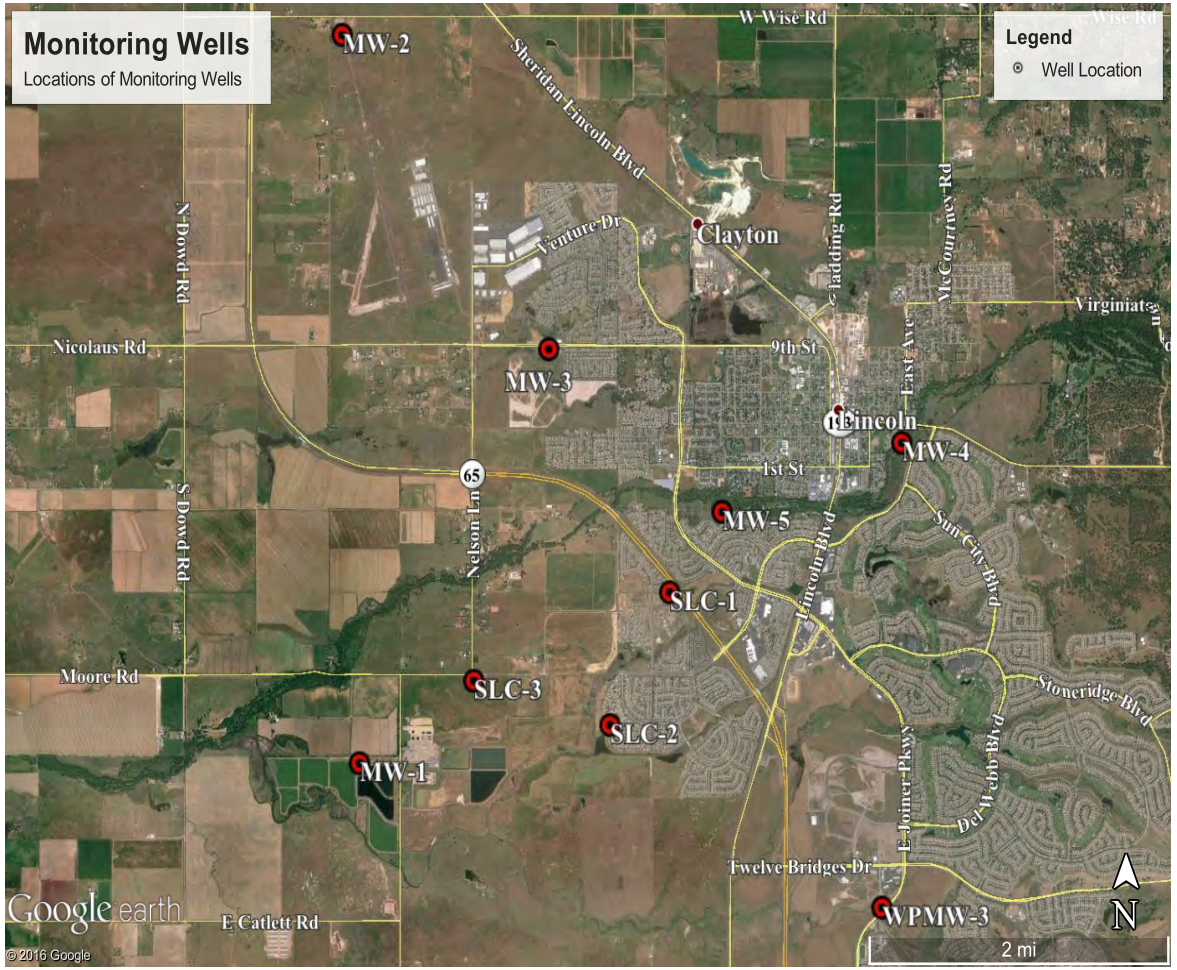

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Image Sources:
Google Earth Pro

Figures 6-8 through **6-11** below, display the historical groundwater elevations for each monitoring well. As shown in the figures, groundwater elevations underlying Lincoln have remained relatively stable.

Figure 6-8 – Groundwater Elevation Tracking (East)

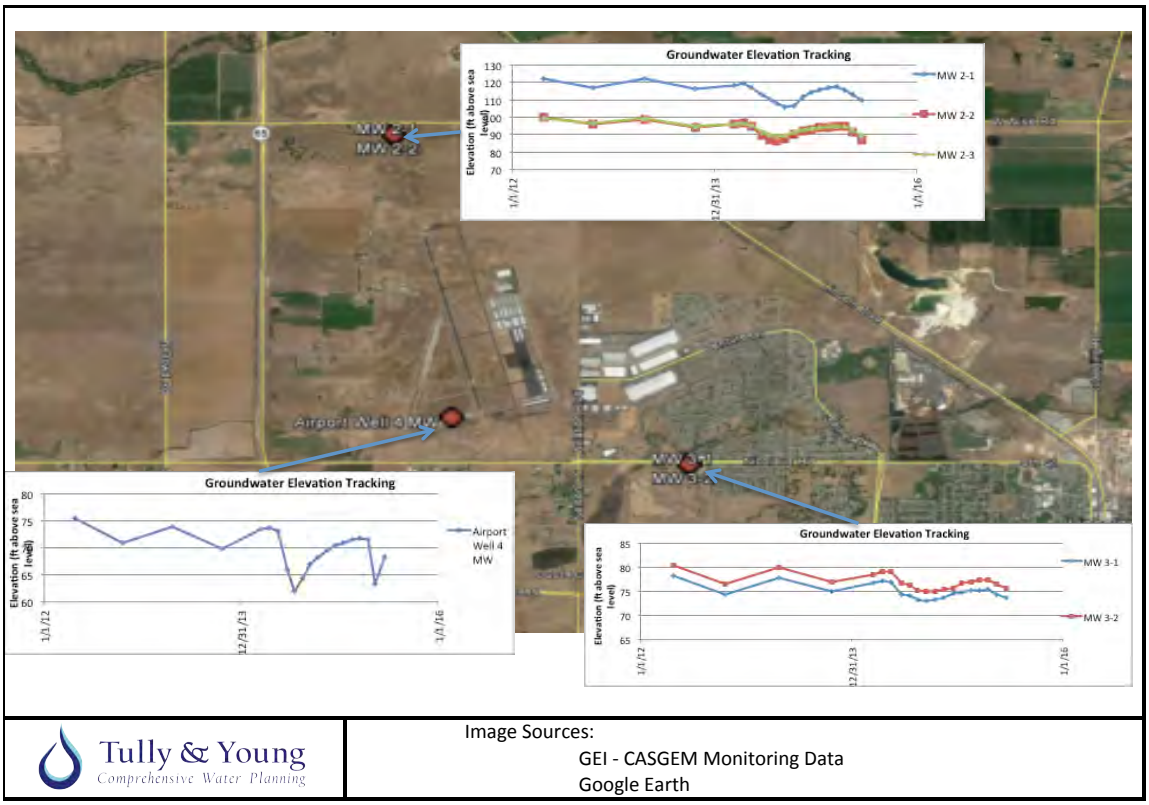

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Image Sources:
GEI - CASGEM Monitoring Data
Google Earth

Figure 6-8 above shows the aerial location of three of the City's monitoring wells in the Lincoln Airport area east of the Highway 65. Each of the three locations have 3-year hydrographs that show the annual trend of recovery for the water table. Considering the drought impacts elsewhere in the state, the downward drift in depth to water of 3 to 8 feet in the annual spring peak of recovery, between 2012-2015, is minimal. Note that the lower monitored zones for two of the wells mirror the water table values in the wells.

Figure 6-9 shows the aerial location of four of the City's monitoring wells in the southwestern area of the City, south of the Highway 65. The two hydrographs included show the annual trend of recovery for the water table. The upward drift in depth to water of 0 to 5 feet in the annual spring peak of recovery, between 2012-2015, is small but significant relative to stable groundwater levels in the area. Note that the lower monitored zones for well MW-1 mirror the upper water table values in the well. Also note that Well SLC-3 recovers adequately but has lower minimum levels than the other 2 wells in the area. These

lower values for SLC-3 are due the close proximity, about 500 feet, to a City production well and is influenced by its use.

Figure 6-9 – Groundwater Elevation Tracking (Southwest)

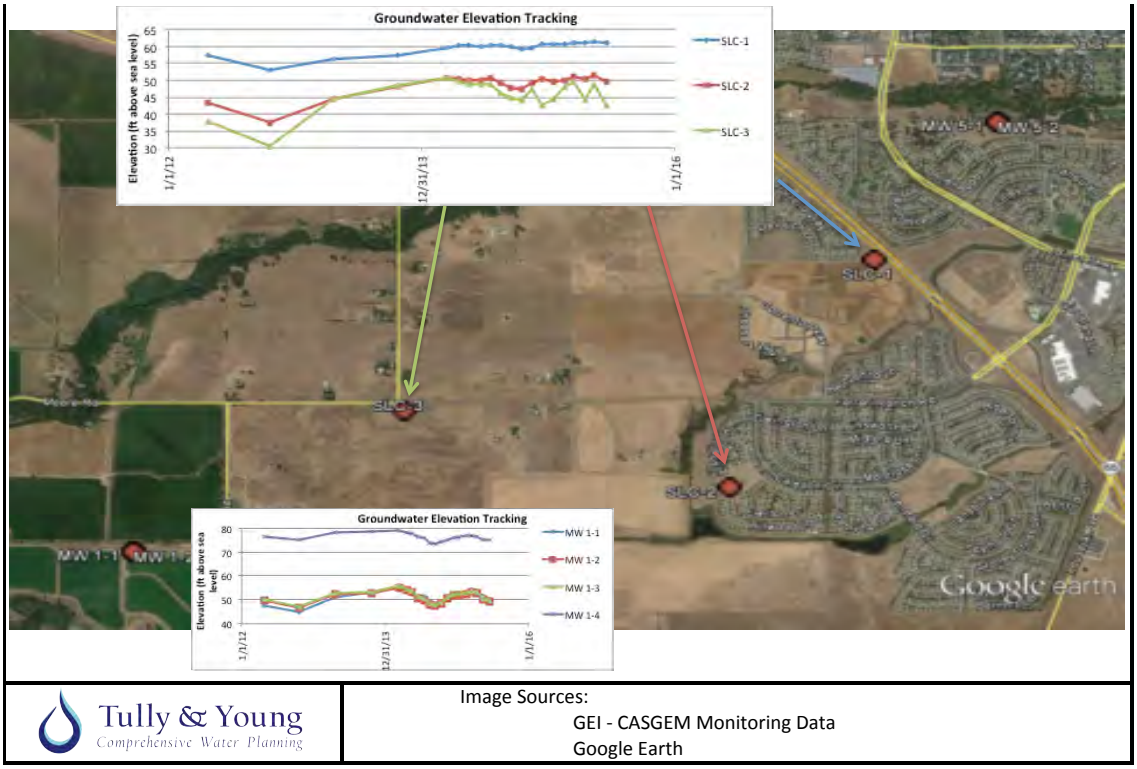

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Image Sources:
GEI - CASGEM Monitoring Data
Google Earth

Figure 6-10 shows the aerial location of two of the City's monitoring wells in the center area of the City, along the Auburn Ravine. The two hydrographs included show the annual trend of recovery for the water table. The stable drift in depth to water of 0 to 3 feet annually can be attributed to the minimum flows maintained in the Auburn Ravine. The blip in December 2014 could be attributed to a storms passing through the watershed that resulted in high flows in the Auburn Ravine floodplain and the corresponding scour of the ravine of accumulated silts and clays to allow more efficient groundwater recharge in the proximity of the two monitoring wells.

Figure 6-10 – Groundwater Elevation Tracking (Center)

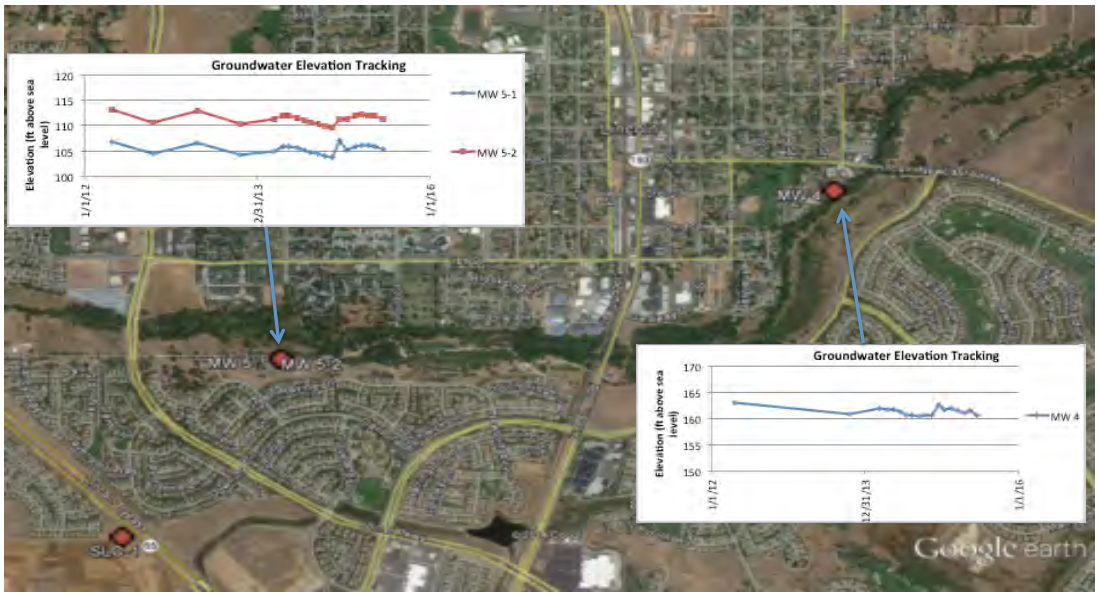

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Image Sources:
GEI - CASGEM Monitoring Data
Google Earth

Figure 6-11 – Groundwater Elevation Tracking (Southeast)

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Image Sources:
GEI - CASGEM Monitoring Data
Google Earth

Figure 6-11 shows similar results to **Figure 6-10**. The aerial location of the City's monitoring well lies in the southeastern area of the City, east of the Highway 65. The well is at the westerly edge of the Sierra Nevada foothills with a depth to water of less than 10 feet. The two hydrographs show the annual stability of the water table, in a range of less than 3 feet. Note that the lower monitored zone for the well mirrors the upper water table values in the well.

6.3.2 Recharge

The West Placer Groundwater Management Plan (WPCGMP) has addressed recharge in the Lincoln Area. The technical definition of a recharge area is where water enters the saturated zone and has a net downward flow direction. Thus, to precisely define recharge areas it is necessary to measure the shallow groundwater head gradient in three dimensions across the groundwater basin – in essence requiring groundwater level measurements in a densely spaced monitoring network of wells, each containing piezometers in each aquifer unit. In practice, the direct measurement of a groundwater basin's recharge area is impractical and instead a combination of monitoring well data and indirect methods of inference are employed to delineate probable recharge areas. Currently, there are several indirect indicators of the potential recharge areas within the Lincoln SOI, which are discussed below.

The runoff characteristics and recharge potential of the soil throughout the Lincoln area have been investigated and mapped – providing a qualitative indication of the areal potential for deep percolation of surface water into the aquifer systems. Most of the soil cover across the North American Subbasin has been classified as having high runoff (low infiltration) potential, except in the vicinity of river and stream drainages. Large areas surrounding Auburn Ravine, as well as Coon Creek, were thought to have moderate to high runoff potential (low to moderate infiltration potential). Subsequent analyses indicate that although Coon Creek has a high recharge potential, areas around Auburn Ravine are more limited. Markham Ravine drainage and Orchard Creek drainage are also potential areas of groundwater recharge based on the inferred shallow depth to the upper aquifer zone in these areas.

6.3.3 Estimated Groundwater Quantity

A recent investigation of groundwater resources in the Lincoln area mapped the top and base of the upper aquifer sequence across much of the area, using fairly widespread geophysical surveys and drill hole data to give a more accurate picture of the sub-surface lithology. The results of this investigation indicated that the productive zone of the North American Subbasin pinches out to the east, along a north-south line close to old Highway 65. East of this line, the likely potential water bearing formations are the Ione Formation and fractured granitic bedrock. West of this line, the productive aquifer zone thickens westward, although

there are localized variations in thickness. There are also known variations in the presence and number of clay interbeds and in the hydrologic properties of the aquifer zone, but these properties cannot be determined from the data. The thickness of the upper aquifer system exceeds 300 feet near the western boundary of the Lincoln Sphere of Influence, south of Lincoln Airport. Recent studies indicate that there are significant volumes of recoverable water in and around the City of Lincoln.

6.4 City Wells

The City has a network of wells that are used to augment water supplies to manage peak flows, provide emergency back up, and address drought conditions. The wells are interspersed throughout the City's water infrastructure system. Below in **Figure 6-12** is a map depicting the locations of these wells.

The City currently has five (5) active production wells on-line and available for automatic operation through a SCADA system dedicated to the City water system. Selected characteristics of the 5 active wells is shown in **Table 6-1** below.

Table 6-1 – City of Lincoln Well Production[7]

Well Name	Max. Production (gpm)	Year Built	Status
Nicolaus (Well #2)	900	1984	Active
Westwood (Well #6)	1,000	2000	Active
Moore (Well #7)	1,000	2002	Active
Fiddyment (Well #8)	1,400	2004	Active
Nelson (Well #9)	1,500	2005	Active
Subtotal	**5,800**		
Well #4	n/a	1999	Inactive
Well #5	n/a	1999	Inactive

[7] Groundwater quality from the City wells meets primary and secondary State standards and requires only on-site disinfection.

Figure 6-12 – Production Wells Map

Tully & Young
Comprehensive Water Planning

Image Sources:
Google Earth Pro

Well No. 2 – Nicolaus Road

Well No.2 received a significant upgrade in 2015. Upgrading was required due hydraulic changes in the City distribution system that required increasing the total dynamic head available from the well pump to match the increased system pressures in the area of the well.

The well was originally completed as a City well in 1984. Drilled by cable-tool methodology, a blank 14-inch casing was anchored at about 117 feet-below ground surface (bgs) and an open hole below to -285 bgs. When a severe sanding issue arose in 1990, a well screen was installed below the blank casing, and the well equipped to pump about 650 gpm with an on-site back-up generator for emergency well operations. Until 2003, Well Nos. 2 & 4 exclusively served a portion of the City through a 10,000 gallon hydro-pneumatic tank at each well site, with treated surface water available as an emergency backup supply. In 2003, the hydraulic grade at Well No. 2 was increased as valves were opened in the system to eliminate the separate well zone and allow the treated surface water supply form the City's gravity storage tank to serve the former well zone with Well Nos. 2 & 4 taken offline as inactive until upgraded.

In 2015, Well No. 2 was upgraded with new equipment for automatic, online operation as a backup and peak management source of potable water in the City's distribution system. Significant upgrades included well casing improvements, pumping plant replacement (100HP pump), and pump-to–waste facilities per State requirements.

Well No. 6 – Westwood Well

Well No. 6, or commonly referred to as the Westwood Well, was completed in 2000 and the first of three wells constructed by a developer on behalf of the City. Drilled by the reverse-rotary method, the 16-inch well casing extends to 235 feet-bgs. The Westwood Well was the first of the City's last 4 wells to fully incorporate a standardized approach to production facility design and operation. Housed in a concrete block building and discharging into a 10,000 hydro-pneumatic tank before entering the City distribution system, the 125 HP submersible pump was installed to minimize noise into the nearby residential housing. The Westwood Well is fully automatic for on-line operation from the City SCADA system, and can accommodate temporary stand-by power in case of emergency.

Well No. 7 – Moore Road Well

Well No. 7, or commonly referred to as the Moore Road Well, was completed in 2002 and the second of three wells constructed by a developer on behalf of the City. Drilled by the reverse-rotary method, the 16-inch well casing extends to 300 feet-bgs. The Moore Road Well was the second of the City's last 4 wells to fully incorporate a standardized approach to production facility design and operation. Housed in a concrete block building and discharging into a 10,000 hydro-pneumatic tank before entering the City distribution system, the 150 HP vertical turbine pump was installed. The Moore Road Well is fully automatic for

on-line operation from the City SCADA system, and can accommodate temporary stand-by power in case of emergency. The 150 HP motor has been repaired once since its initial installation.

Well No. 8 – Fiddyment Road Well "A"

Well No. 8, or commonly referred to as the Fiddyment Well, was completed in 2005 and the last of three wells constructed by a developer on behalf of the City. Located on City property near the Regional Wastewater Treatment Facility there was considerable caution taken by the State in approving the well for potable water production due to potential leakage and associated biological contamination from the City's nearby waste treatment and storm water retention ponds. Drilled by the reverse-rotary method, the 16-inch well casing extends to 330 feet-bgs. The Fiddyment Well was the third of the City's last 4 wells to fully incorporate a standardized approach to production facility design and operation. Due to the location, the 200 HP vertical turbine pump was installed outside of the concrete block building, discharging in to a 10,000 hydro-pneumatic tank before entering the City distribution system. The Fiddyment Well is fully automatic for on-line operation from the City SCADA system, and can accommodate temporary stand-by power in case of emergency. Since commencement of operation, there have been no problems with any biological testing of the groundwater pumped from the Fiddyment Well.

Well No. 9 – Moore-Nelson Well

Well No. 9, or commonly referred to as the Nelson Well, was completed in 2005 and the first well constructed by the City since 1990. Located just east of the Fiddyment Well, on City property near the Regional Wastewater Treatment Facility, there was considerable caution taken by the State in approving the well for potable water production due to potential leakage and associated biological contamination from the City's nearby waste treatment and storm water retention ponds. Drilled by the reverse-rotary method, the 16-inch well casing extends to 340 feet-bgs. The Nelson Well was the final of the City's last 4 wells to fully incorporate a standardized approach to production facility design and operation. Due to the location, the 300 HP vertical turbine pump was installed outside of the concrete block building. The Nelson Well is fully automatic for on-line operation from the City SCADA system, and can accommodate temporary stand-by power in case of emergency. Since commencement of operation, there have been no problems with any biological testing of the groundwater pumped from the Nelson Well. The 300-HP vertical turbine motor and pump assembly was replaced with a submersible assembly in 2014.

Table 6-2 – Historic Groundwater Pumping

Acre Feet							
2008	2009	2010	2011	2012	2013	2014	2015
1,085	836	962	2,686	2,620	1,113	691	707

Table 6-3 – Future Groundwater Pumping

Acre-feet					
2020	2025	2030	2035	2040	BO
1,230	1,348	1,530	1,711	2,034	3,568

6.4.1 Groundwater Quality

Groundwater delivered by the City of Lincoln is regularly tested and meets all primary drinking water and secondary standards. Groundwater quality data, summarized from the City's annual Consumer Confidence Report is provided below in **Figure 6-13**.

6.4.1.1 Total Dissolved Solids

TDS concentrations in City of Lincoln wells in production are between 230 and 330 mg/L. The Secondary Maximum Contaminant Level (MCL) concentration of TDS in public drinking water supplies is 500 milligrams per liter (mg/L). Secondary MCLs are set for contaminants in drinking water that primarily affect the aesthetic qualities relating to public acceptance of drinking water.

6.4.1.2 Iron and Manganese

When iron and manganese are present in high concentrations they contribute to plumbing incrustation deposits and surface staining on fixtures. Iron concentrations in the existing City of Lincoln wells range from non-detect (ND) to 1.8 mg/L. Manganese concentrations in the existing water supply wells range from non-detect to 0.07 mg/L. The Secondary MCLs of these constituents in public drinking water supplies are 0.3 mg/L for iron and 0.05 mg/L for manganese. The sources of iron and manganese are naturally occurring.

6.4.1.3 Arsenic

Arsenic concentrations in the City of Lincoln wells range from ND to 4.8 ug/L. The U.S. Environmental Protection Agency is implementing a 10 ug/L standard for arsenic. The source of naturally occurring arsenic in Lincoln groundwater is typically from volcanic deposits.

Figure 6-13 – Groundwater Quality

2015 City of Lincoln Groundwater Quality

Regulated Contaminants

Contaminant (units)	MCL/AL	PHG (MCLG) [MRDLG]	Major Source in Drinking Water (as provided by the State Department of Health Services)	Groundwater (Wells) Range	Average	MCL Violation?
Primary Drinking Water Standards						
Arsenic (ppb)	10	0.004	Erosion of natural deposits	2.2-2.9	2.6	No
Barium (ppm)	1	2	Erosion of natural deposits	ND - 0.1	0.048	No
Chromium (ppb)	50	100	Erosion of natural deposits	ND – 5.0	2.8	No
Fluoride (ppm)	2	1	Erosion of natural deposits; Water additive which promotes strong teeth	0.24 - .0.27	0.25	No
Hexavalent Chromium (ppb)	10	None	Discharge from certain industrial facilities; erosion of natural deposits	1.5 - 4.5	3.6	No
Nitrate (ppm)	10 as N	10 as N	Runoff from fertilizer use; Leaching from septic tanks	1.5 – 3.6	2.2	No
Perchlorate (ppb)	6	6	Environmental contamination from historic industrial operations	ND	ND	No
Regulated Contaminants with Secondary MCLs (California Code of Regulations)						
Odor --- Threshold (units)	3	None	Naturally-occurring organic materials	0 – 2	1.3	No
Turbidity (NTU)	5	None	Soil runoff	0.025 - 0.057	0.15	No
Total dissolved solids (ppm)	1,000	None	Runoff/leaching from natural deposits	210 - 310	240	No
Specific conductance (us/cm)	1,600	None	Substances that form ions when in water; seawater influence	290 - 480	355	No
Chloride (ppm)	500	None	Runoff/leaching from natural deposits; seawater influence	20 - 57	29.8	No
Sulfate (ppm)	500	None	Runoff/leaching from natural deposits; industrial wastes	7.5 - 18	11	No
Manganese	50	None	Leaching from natural deposits	0 - 3	0.75	No
Monitoring of Unregulated Substances						
Sodium (ppm)	No Standard	No Standard	Generally found in ground and surface water	28 - 50	37	No
Hardness (as CaCO3) ppm	No Standard	No Standard	Generally found in ground and surface water	82 - 140	99	No
Alkalinity (as CaCO3) ppm	No Standard	No Standard	Generally found in ground and surface water	91 - 120	103	No
Calcium (ppm)	No Standard	No Standard	Generally found in ground and surface water	15 - 25	18	No
Magnesium (ppm)	No Standard	No Standard	Generally found in ground and surface water	11 - 18	13	No

2015 Surface Water (Placer County Water Agency Purchased Water*)

Regulated Contaminants

Contaminant (units)	MCL/ AL	PHG (MCLG) [MRDLG]	Major Source in Drinking Water (as provided by the State Dept. of Health Services)	Range and Avg. or (HRAA)	MCL Violation?
TTHMs[Total trihalomethanes](ppb)	80	None	By-product of drinking water disinfection	36 – 83 (62.25)	No
Haloacetic Acids (HAA) (ppb)	60	None	By-product of drinking water disinfection	22 - 52 (39.75)	No
Chlorine (ppm)	4	[4]	Drinking water disinfectant added for treatment	0 – 1.22 (0.6)	No
Total Organic Carbon (ppm)	TT=RAA<2	None	N/A	0.9 – 1.4 (1.1)	No
Fluroide	2	1	Water additive that promotes strong teeth	ND	No
Secondary Drinking Water Standards					
Odor --- Threshold (units)	3	None	Naturally-occurring organic materials	ND	No
Total dissolved solids (ppm)	1000	None	Runoff/leaching from natural deposits	50 – 53 51.5	No
Specific conductance (µS/cm)	1,600	None	Substances that form ions when in water; seawater influence	68 – 72 70	No
Chloride (ppm)	500	None	Runoff/leaching from natural deposits; seawater influence	4.9 – 5 4.95	No
Sulfate (ppm)	500	None	Runoff/leaching from natural deposits; industrial wastes	6.7 - 8.1 7.4	No
Monitoring of Unregulated Substances					
Sodium (ppm)	None	None	Generally found in ground and surface water.	5.1– 5.2 5.15	No
Hardness (as CaCO3) ppm	None	None	Generally found in ground and surface water.	17- 18 17.5	No

* Results based on 2015 PCWA water quality report supplied by PCWA to the City of Lincoln.

Turbidity Performance Standards (that must be met through the water treatment process). *Turbidity is a measurement of clarity or the level of suspended matter in the water. In reporting turbidity, the highest single measurement and the lowest monthly percentage of samples meeting the turbidity limits are specified.* Turbidity of the filtered water must 1) be less than or equal to 0.3 NTU in 95% of measurements in a month and 2) not exceed 1 NTU at any time.

Lowest monthly percentage of samples that met Turbidity Performance Standard No. 1	**100% (PCWA)**
Highest single turbidity measurement during the year	**0.21 (PCWA)**
Number of violations of any surface water treatment requirements	**0 (PCWA)**

2015 City of Lincoln Distribution System Water Quality

	MCL (MRDL/ MRDLG)	Running Annual Average	Range of Detections	Typical Source of Contaminant	MCL Violation
TTHMs[Total trihalomethanes](ppb)*	80	34	0 - 55	By-product of drinking water chlorination	No
Haloacetic Acids (HAA) (ppb) *	60	22	0 - 35	By-product of drinking water chlorination	No
Chlorine (ppm)	(4 / 4)	0.59	0.28 – 1.7	Disinfectant added for treatment	No
Total Coliform Bacteria	5%	1.6% ◊	ND	Naturally present in environment; an indicator that potentially harmful bacteria may be present	No
Vanadium	50*	2.5	0 - 21	* = Notification level	No
Chromium	50	0.27	0 - 3	Erosion of natural deposits	No
Hexavalent Chromium	10	0.09	0.035 - 0.18	Discharge from certain industrial facilities; erosion of natural deposits	No

MCL = Systems that collect more than 40 samples per month: More than 5% positive samples in any one month

◊ = Highest number of positive samples in any one month

* = No samples were collected during the third quarter in 2015

Monitoring of Unregulated Substances

Chlorate	n/a	181	88 - 280		No
Strontium	n/a	43	0 - 210	Decay of natural and man-made deposits	No

Lead and Copper Action Levels at Residential Taps

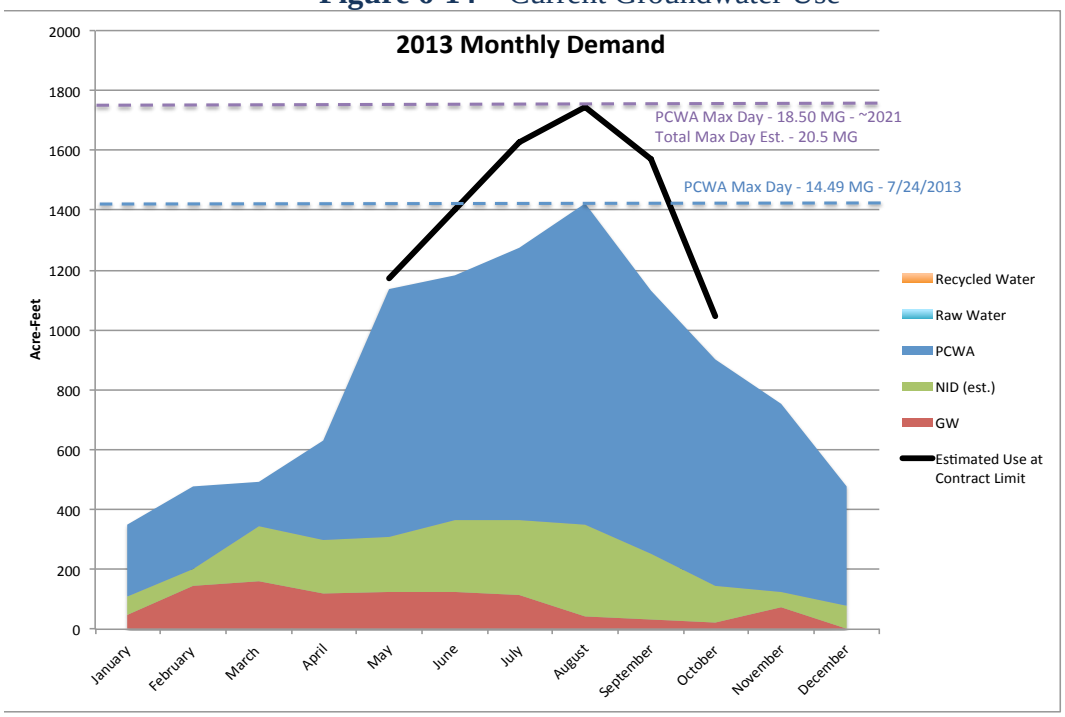
	Action Level (AL)	PHG (MCLG)	90th Percentile Value	Sites Exceeding AL	Number of Sites Tested	Typical Source of Contaminant	AL Violation?	MCL Violation?
Lead (ppb)	15	0.2	1.6	0	30	Corrosion of household plumbing	No	No
Copper (ppb)	1,300	300	6.3	0	30	Corrosion of household plumbing	No	No

6.5 City's Groundwater Usage

The City's current groundwater usage is tiered from policies established through the City's General Plan, WPCGMP partnership, and recent workshops conducted in the development of this Water Master Plan. Specifically, the City has set a policy to meet 10 percent of its average annual demand with groundwater.[8] The City has been successful in meeting this demand over the course of the last five years. Operationally, the City utilizes groundwater in all months of the year – managing its system to meet 10 percent usage per month. This management effort meets the overall intent of the policy but could be modified to better meet other congruent City policies for long-term groundwater management. **Figure 6-14** below shows the overall water use, and the groundwater use highlighted in red, for 2013 – the last "normal" water use year.

Future groundwater management could be altered to utilize the City's groundwater in only the summer months. In this way, the City could best manage its surface and groundwater assets to meet its long-term needs, reduce costs, and reserve groundwater to meet emergency and back-up needs. This type of groundwater management change may require adjustments to current policy implementation.

Figure 6-14 – Current Groundwater Use



[8] This policy is derived from the City of Lincoln's 2008 General Plan.

In 2011, PCWA's Bear River Canal failed due to a landslide and Lincoln aggressively used its groundwater assets to offset the reduced PCWA deliveries. This intensive pumping resulted in localized declines in the groundwater table. However, upon repair of the canal and resumption of surface water deliveries, the groundwater basin recovered because of the active recharge provided by the snowmelt and aquifer systems. Utilizing the groundwater basin to address these sorts of management issues is critical for long-term planning. The City's groundwater usage since 2008 is previously depicted in **Table 6-2** and below, **Table 6-4** provides projections of future groundwater use, including emergency usage.

Table 6-4 – Projected Use of Groundwater Supplies

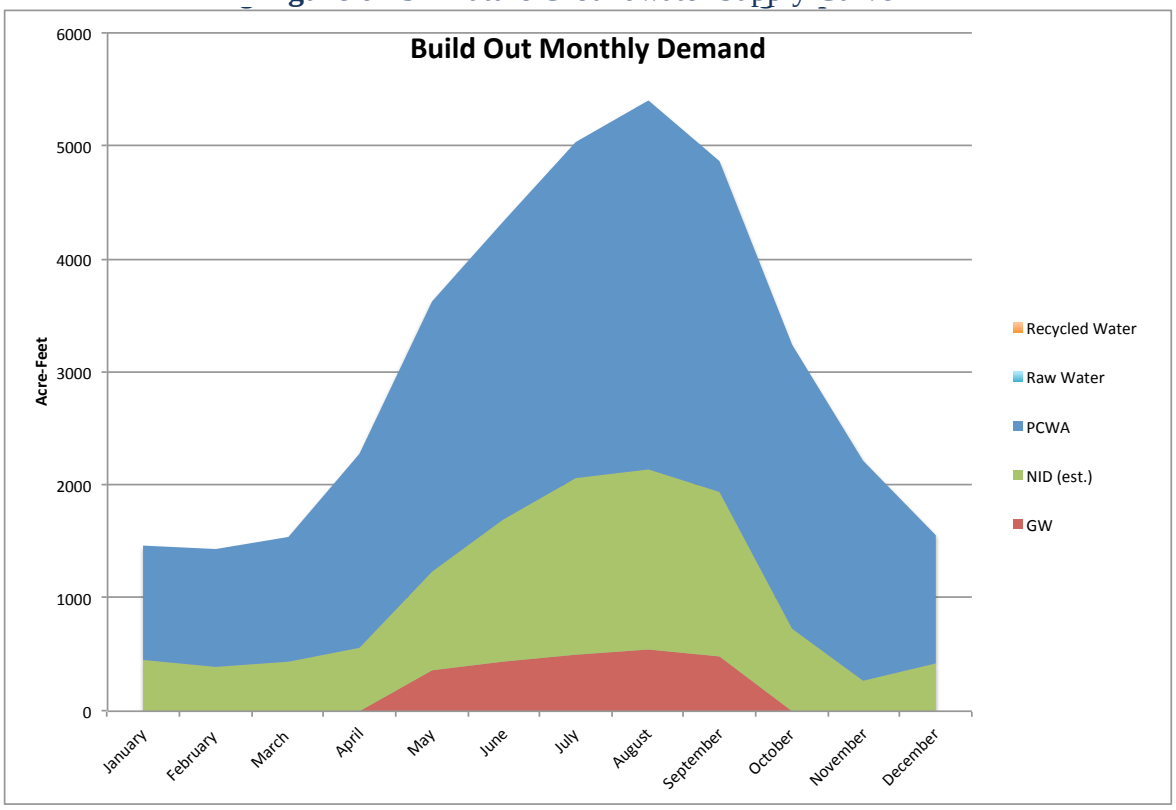
Groundwater	Estimated Supply (af/yr)					
	Current	2020	2025	2030	2035	2040
Normal Year	--	1,106	1,213	1,377	1,540	1,830
Emergency Usage	--	3,687	4,043	4,588	5,134	6,100
Long-Term Average	999	1,229	1,348	1,529	1,711	2,033

Note: The current long-term average, being from 2008 to 2015 requires the removal of drought years with low use and years with high use from canal outages. If viewed as a running average, the City's use is still high from impacts of the canal outage but the trend is dropping closer to the 10% target each year.

The City, through its 2015-16 workshops, resolves to utilize the groundwater basin to manage peaking in the summer months. Under this new management effort, groundwater would be used mostly in the summer months to offset system peaking and, subsequently, extend the duration and usability of PCWA supplies. In this scenario, more surface water could potentially be delivered by PCWA to the City than the current operations allow. But, in the same instance, the maximum day water use for the PCWA surface supply could be reduced. In addition, groundwater would be used to manage the summer months peaking and the basin would experience a shorter period of withdrawal and longer annual recharge period. The revised pumping regime would result in a supply curve depicted in **Figure 6-15** that uses groundwater in the most efficient manor and requires the most on-site technical management.

The key constraints to implementing this alternative operation are: the lack of a comprehensive and modern SCADA system; the limiting capacity of the 30-inch pipe from the City's 5MG tank at Catta Verdera the completion of the PCWA Phase III Project; the lack of adequate above ground water storage; and the need to manage the existing grouped City well locations to manage significant pressure spikes when wells are individually activated. All of these issues are currently being addressed.

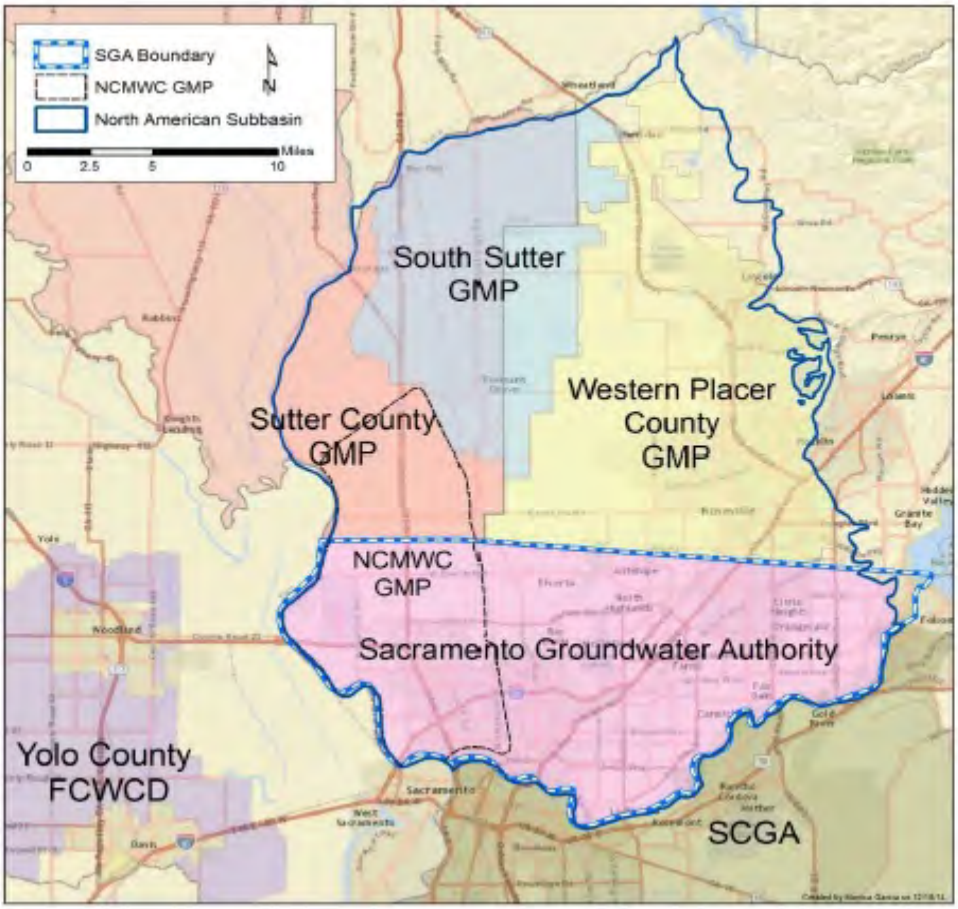
Figure 6-15 – Future Groundwater Supply Curve



6.6 North American Subbasin Governance

The governance of the North America Subbasin has numerous components – many of which will evolve over the course of the next five years. The existing governance structure congeals around the development of groundwater management plans under the Groundwater Management Act (Water Code §§ 10750 *et seq.*). Numerous plans have been developed to cover the North American Subbasin, including: Sacramento Groundwater Authority's Groundwater Management Plan, Western Placer County Groundwater Management Plan, Natomas Area Groundwater Management Plan, South Sutter Water District Groundwater Management Plan, and Sutter County Groundwater Management Plan. There is some land area that overlies the North American Subbasin in Placer County that is not incorporated into a groundwater management plan. These areas are subject to the judicial rules associated with groundwater rights and priorities. Below in **Figure 6-16** is a map depicting the various groundwater management plans affecting the North American Subbasin.

Figure 6-16 – Map Depicting North American Subbasin GMPs[9]



The Groundwater Management Plans within the North American Subbasin reflect the original groundwater management strategies of the forming entities over the course of the last decade. Under the new Sustainable Groundwater Management Act (SGMA), discussed later in **Section 6.6.3**, new groundwater sustainability plans and groundwater sustainability agencies will be developed to meet the updated legislative requirements.

6.6.1 Water Forum Agreement

In 1993, the City of Sacramento and Sacramento County created the Water Forum to address concerns over both water supply reliability and environmental degradation in the Sacramento Region and the Lower American River (LAR). Specifically, the region was experiencing a prolonged drought and surface and groundwater conditions were becoming critical. Moreover, there was an increasing awareness of the environmental conditions along the LAR and that further dilapidation of the LAR might lead to

[9] Sacramento Groundwater Authority Groundwater Management Plan, 2014 at p. 8.

permanent problems. The LAR supports 43 species of fish, including federally protected species – fall run Chinook salmon and Central Valley steelhead.

The Water Forum Agreement is a signed document that seeks to meet specific objectives in the American River watershed. The Agreement is a package of linked elements with two, co-equal objectives: to provide a reliable and safe water supply for the region's economic health and planned development to the year 2030; and preserve the fishery, wildlife, recreational, and aesthetic values of the Lower American River. In order to meet these co-equal objectives, the Water Forum Agreement incorporates seven key elements: increased surface water diversions; actions to meet customer needs while reducing diversion impacts in drier years; support for improved pattern of fishery flow releases from Folsom Reservoir; Lower American River habitat management; water conservation; groundwater management; and Water Forum Successor Effort.

The City of Lincoln is not a signatory to the Water Forum Agreement or a member of the Water Forum (although it participates in the Regional Water Authority – (described below)), so the Agreement is only applicable through its impact on surrounding entities – in particular, Placer County Water Agency. PCWA has specific obligations under the Agreement and its subsequent Purveyor Specific Agreement that may impact PCWA's ability to build surface water diversion facilities and deliver surface water to the City of Lincoln. Accordingly, the actions and efforts within the Water Forum Agreement have direct bearing on the City's use of surface water from the American River as well as the longevity of its groundwater assets.

6.6.2 Groundwater Governance

There are numerous governing bodies that assert jurisdiction over groundwater supplies in the North American Subbasin. At the fundamental basin-wide level, however, groundwater rights underpin each water user's ability to capture and use groundwater supplies. Specifically, overlying groundwater rights are available to water users that extract groundwater and use it on overlying property that the water user owns. For instance, a City that owns a park may extract groundwater through a well and use that water for irrigation on the park. This manifestation of an overlying groundwater right on the users property is generally a secure water right.

In contrast, appropriative groundwater rights are available to water users that extract groundwater that is *surplus* to the needs of the overlying users. The groundwater appropriators use the water on property that either (a) does not overly the groundwater basin; or (b) does not belong to the overlying water user. For example, a City that extracts groundwater and delivers the groundwater to its customers utilizes an

appropriative groundwater right because it delivers water to property that the City does not own (its customer). Under California case law, overlying users may impede groundwater appropriators pumping when there is no surplus water in a groundwater basin. However, groundwater appropriators that pump groundwater even when aquifer conditions are not in surplus may "prescribe" against an overlying water right and obtain water rights to the detriment of the overlying water right user. The judicial action sorting out the various groundwater rights in an overdrafted basin with numerous users is tedious and uncertain. Moreover, groundwater banking activities may further cloud the ownership and usability of underground water resources.

Additional water supplies and efforts may be developed through contracts. For instance, a groundwater user may retain the right to pump groundwater under an overlying water right but may restrict his actual pumping and use by entering a contract with a neighbor declaring his intent to reduce use. These voluntary agreements may supersede the underlying water rights that make up the basis of a water use. Many of the groundwater management plans described above have elements of contractual agreements that may bind water users to capture less water then their rights might otherwise allow.

There are numerous federal, state, regional, and local agencies that have an interest in governing groundwater extraction and use in the North American Subbasin. The federal agencies include, but are not limited to: U.S. Bureau of Reclamation, US Army Corps of Engineers, US Fish and Wildlife Service, US Environmental Protection Agency, and National Marine Fisheries Service. At the State level there are several agencies that impact groundwater: California Department of Water Resources, State Water Resources Control Board, and California Department of Fish and Wildlife. The regional agencies that impact the North American Groundwater Subbasin include: Regional Water Authority (RWA), Sacramento Groundwater Authority (SGA), and the Western Placer County Groundwater Management Partnership (WPGMP). Last, there are approximately 20 local agencies that impact groundwater issues in the North American Groundwater Basin near the City of Lincoln – including the City of Roseville, South Sutter Water District, Sutter County and Placer County. The City of Lincoln is also a local governing body that asserts independent governance authority over the North American Subbasin.

6.6.2.1 RWA, SGA, WPCGMP Partnership

This section provides a brief synopsis of the regional entities that have jurisdiction over groundwater in the North American Subbasin. The City participates in two of these entities – RWA and WPCGMP Partnership. The third entity, SGA, shares an Executive Director with RWA and, thus, coordinates SGA activities with RWA activities – like legislative interactions.

Regional Water Authority

The Regional Water Authority (RWA) is a joint powers authority formed in 2001 to promote collaboration on water management and water supply reliability programs in the greater Sacramento, Placer, and El Dorado County region. RWA is an outgrowth of the Water Forum, whose original intent was to allow regional agencies to collectively implement the provisions of the Water Forum Agreement. RWA currently represents 24 water suppliers and associated agencies in the greater Sacramento Area – including suppliers that have no connection to the North American Subbasin. The mission of RWA is to serve and represent the regional water supply interest and to assist Members in protecting and enhancing the reliability, availability, affordability, and quality of water resources. A nine-member Executive Committee is elected annually to guide RWA.

Sacramento Groundwater Authority

The Sacramento Groundwater Authority (SGA), formerly the Sacramento North Area Groundwater Management Authority, was formed as a joint powers authority and charged with the management of Sacramento County's Region of the North Area Groundwater Basin. The SGA's formation in 1998 resulted from a coordinated effort by the Sacramento Metropolitan Water Authority and the Water Forum to establish an appropriate management entity for the basin. SGA draws its authority from a joint powers agreement signed by the cities of Citrus Heights, Folsom and Sacramento as well as the County of Sacramento to exercise their common police powers to manage the underlying groundwater basin. In turn, these agencies chose to manage the basin in a cooperative fashion by allowing representatives of the 14 local water purveyors and representatives from the agricultural and self-supplied pumper interests to serve as the Board of Directors of the SGA. SGA has recently sought authorization to be a Sustainability Agency under the Sustainable Groundwater Management Act (SGMA) discussed below.

Western Placer County Groundwater Management Partnership

The WPCGMP is designed to assist the City of Lincoln, City of Roseville, Placer County Water Agency (PCWA), and the California American Water Company (CAL-AM) in an effort to maintain a safe, sustainable and high-quality groundwater resource within a zone of the North American River Groundwater Subbasin. The WPCGMP has as its objective the maintenance of groundwater resources to meet backup, emergency, and peak demands without adversely affecting other groundwater uses within the WPCGMP area. Moreover, the WPCGMP provides a framework to coordinate groundwater management activities through a set of basin management objectives and specific implementation actions that were agreed to by all of the participants. The policies and actions that were agreed to by the City of Lincoln are further described in later in this section.

6.6.2.2 City of Lincoln Groundwater Management

The City of Lincoln has been very active in managing and governing groundwater within the current City boundary as well as within the City's Sphere of Influence. Before the turn of the Century, the City of Lincoln relied heavily on groundwater to meet its needs. As a deeper understanding of the value of robust aquifers was understood, the City transitioned to surface water sources delivered from neighboring wholesale agencies – Placer County Water Agency and Nevada Irrigation District. Moreover, the City took additional significant steps to address its long-term groundwater management by (a) developing policies in its General Plan and other planning documents that address groundwater usage; and (b) agreeing to groundwater management parameters in concert with the WPCGMP partnership – PCWA, City of Roseville, and Cal American Water Company (note that Placer County is not a partner in the WPCGMP). In developing groundwater management objectives, the City has developed numerous policies in a number of planning forums – the key ones are described in the sections below.

6.2.2.3 City General Plan Policies

The City has adopted the following policies applicable to groundwater as part of its General Planning process. Additional policies may be incorporated in other documents, like Development Agreements, that have the force and effect of a City Ordinance.

Policy PFS 2.7 Groundwater Supplies: The City shall consider development of groundwater supplies in the western portions of the City's sphere of influence to provide emergency back up and to supplement the domestic supply provided by the PCWA and NID.

Policy PFS 2.11 Groundwater Recharge: The City shall evaluate groundwater recharge capabilities as necessary, but at lest every five years and ensure adequate long-term protection of groundwater resources.

Policy PFS 2.19 Regional Sustainability of Groundwater Supplies: The City shall work in concert with the County of Placer, other cities and local water purveyors to share groundwater data, develop a mutually beneficial Integrated Regional Water Resources Management Program, define the long-term sustainability of the groundwater basin, and work to manage groundwater uses in ways that facilitate the basin's sustainability.

Policy OSC-1.5 Protection of Minerals: The City will protect mineral resources such as groundwater, clay deposits, as well as groundwater recharge areas from urban development.

Policy OSC-4.2 Develop Groundwater Management Plan: The City shall develop and periodically update a groundwater management plan to protect local aquifers.

Policy OSC-4.3 Protect Surface Water and Groundwater: The City shall ensure that new development projects do not degrade surface water and groundwater.

Policy OSC-4.4 Protection and Management of Flood Plains: The City shall encourage the protection of 100 year floodplains and where appropriate, obtain public easements for purposes of flood protection, public safety, wildlife preservation, groundwater recharge, access and recreation.

Policy OSC-4.6 Best Management Practices: The City shall continue to require the use of feasible and practical best management practices (BMPs) to protect surface water and groundwater from the adverse effects of construction activities and urban runoff. Additionally, the City shall require, as part of its Storm Water NPDES Permit and ordinances, to implement the Storm Water Pollution Prevention Plan (SWPPP) during construction activities for any improvement projects, new development and redevelopment projects for reducing pollutants to the maximum extent possible.

6.2.2.4 WPCGMP Policies

In addition to its General Plan policies, the City has consented to additional management objectives as described in the Western Placer County Groundwater Management Plan to which it was a participating agency. The Basin Management Objectives identified in the WPCGMP are listed below:

1. Management of the groundwater basin shall not have a significant adverse effect on groundwater quality;

2. Manage groundwater elevations to ensure an adequate groundwater supply for backup, emergency, and peak demands without adversely impacting adjacent areas;

3. Participate in State and Federal land surface subsidence monitoring programs;

4. Protect against adverse impacts to surface water flows in creeks and rivers due to groundwater pumping; and

5. Ensure groundwater recharge projects comply with State and federal regulations and protect beneficial uses of groundwater.

6.6.3 Sustainable Groundwater Management Act

In 2014, Assemblyman Roger Dickinson and Senator Fran Pavley developed legislation – the Sustainable Groundwater Management Act (SGMA) – that addresses the State's ongoing groundwater overdraft and groundwater contamination issues. The legislation

requires two things that affect the City of Lincoln's groundwater assets: (1) the development of groundwater sustainability agencies (GSA) by 2017 in medium and high-priority groundwater basins; and (2) the development of groundwater sustainability plans (GSP) by the GSA's in all medium and high-priority basins by 2022. The North American Subbasin is a medium priority basin. Thus, failure to develop a groundwater sustainability agency and groundwater sustainability plan in the prescribed time period will invite DWR to determine the regional GSA that will develop the GSP – likely the local counties overlying the affected groundwater basins.

The implementation of SGMA and the ultimate impacts it will have on the North American Subbasin is a complex issue due to the diversity of the impacted purveyors. As seen in **Figure 6-17**, over ten different purveyors overlay the subbasin. The resulting GSA and GSP for the area, will involve a complex mix of priorities and goals between all the purveyors political viewpoints and approaches towards water management.

6.6.3.1 SGMA Overview

The SGMA was codified in Water Code sections 10720 et seq. and the implementing guidelines are found in Title 23 of the California Code of Regulations. The Act, and implementing regulations, generally favor local control of groundwater resources as well as upholding of existing groundwater rights law. However, the SGMA is based in the reasonable use doctrine of Article X, Section 2 of the California Constitution, notes the potential for "state intervention", and creates an expedited groundwater adjudication process. All of these concepts indicate that the status quo will not be maintained for California's groundwater management.

The first step in SGMA compliance is creating a groundwater sustainability agency to govern the defined groundwater basin. Water Code Section 10721(j) defines a groundwater sustainability agency as follows:

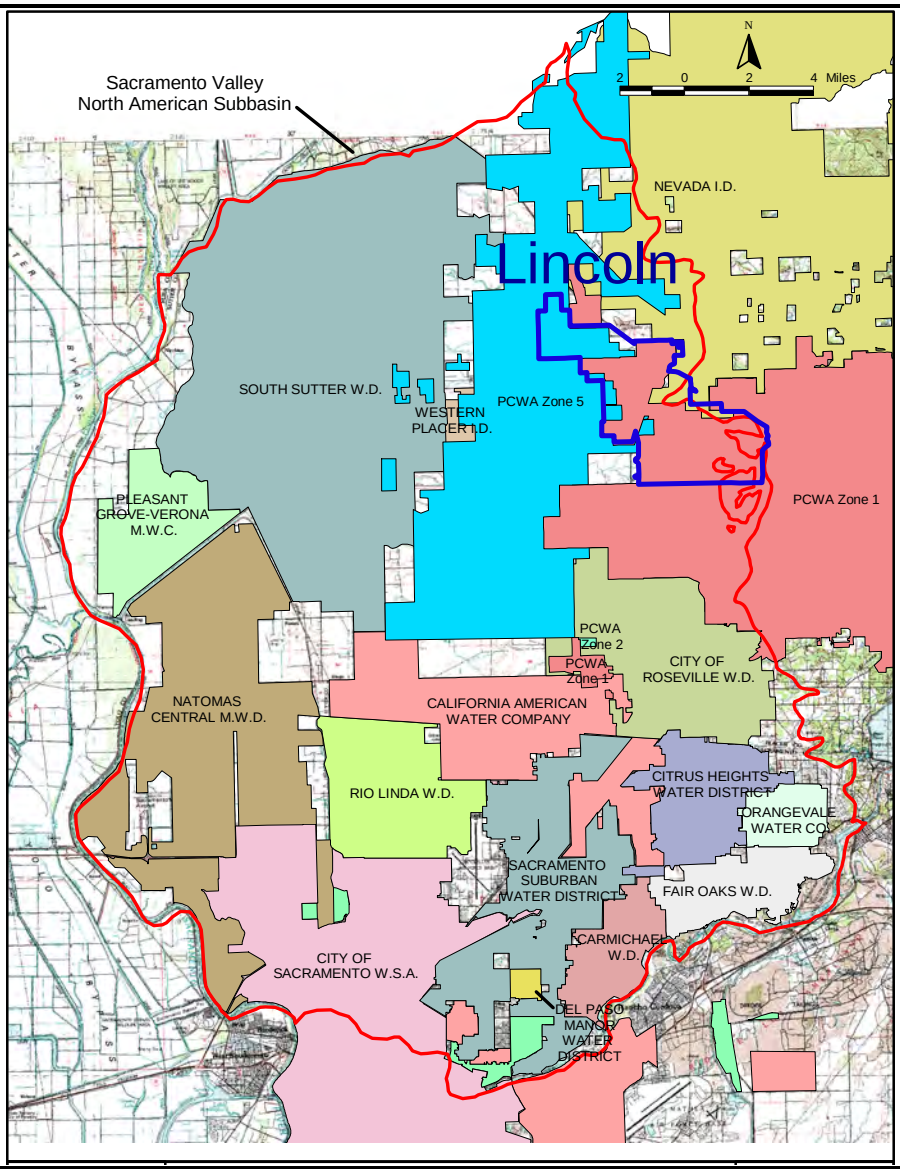
> *"Groundwater sustainability agency" means one or more local agencies that implement the provisions of this part [Part 2.74]. For purposes of imposing fees pursuant to Chapter 8 (commencing with [Water Code] Section 10730) or taking action to enforce a groundwater sustainability plan, "groundwater sustainability agency" also means each local agency comprising the groundwater sustainability agency if the plan authorizes separate agency action.*

A GSA may be comprised of numerous local agencies. The local agencies may be derived from numerous existing public agencies.

"Local agency" means a local public agency that has water supply, water management, or land use responsibilities within a groundwater basin.

These definitions inform the formation of the new GSA's. The GSA's require development of joint powers authority's (JPA) or other legal or contractual relationships between agencies and individuals. The key aspect for SGMA compliance is that the newly formed GSA must have responsibility for managing and regulating groundwater use in the identified groundwater basin.

Figure 6-17 – Overlying Water Suppliers within the North American Subbasin



Tully & Young
Comprehensive Water Planning

Image Sources:
City of Lincoln
Groundwater Management Plan 2003, page 16.

In order to become a GSA, a local agency must provide public notice of its intent to form a GSA by itself, or in conjunction with other local agencies. Following a notification period, Water Code 10723(b) requires that the agencies hold a public hearing in all the counties overlying the groundwater basin. The code also identifies 15 specific entities deemed GSAs but none of the agencies listed are located near the City of Lincoln.

Water Code Section 10723.8(a) provides the specific requirements of what must be filed with DWR to successfully form a GSA. These requirements include:

- Proof that notice of GSA formation was submitted to DWR within 30 days of the decision.
- The definition of the proposed GSA's service area including a map depicting the proposed area and narrative describing the service area boundaries.
- A descriptions of the basin, or portion of the basin, that the GSA intends to manage as well as any other agencies managing groundwater within the basin.
- A copy of the resolution or contract forming the new GSA
- Any bylaws, ordinances, or new authorities adopted by the GSA
- A list of interested parties developed under Water Code Section 10723.2 and discussion of how their interests will be considered in the development and operation of the GSA and GMP.

If multiple local agencies form separate GSAs in a basin within a 90-day period, and if any of those GSA formations result in a service area overlap in the areas proposed to be managed, then none of the local agencies will become the exclusive GSA unless the overlap is resolved. This means that the defined boundaries of a proposed GSA's jurisdiction is a critically important element of the GSA formation for interested parties, in case multiple GSA's have overlapping definitions, invalidating their eligibility to oversee that area until it is resolved.

Identifying the groundwater basin boundaries is a major consideration in forming the GSA. Specifically, the groundwater basin may follow political jurisdictions (like county lines), groundwater basin boundaries (that often cross county lines), or potentially smaller-subsets of the groundwater basin already subject to some regulatory jurisdiction (e.g. SGA's jurisdiction over the north area groundwater basin). The definition of the political boundary that will be the basis of the GSA is an important facet of GSA formation that will affect the City's groundwater assets and long-term groundwater management efforts.

In the North American Subbasin, only the Sacramento Groundwater Authority (SGA) has formed a GSA. On October 8, 2015, SGA resolved to form a GSA over its portion of the North American Subbasin and on October 20, 2015 it provided notice to the California Department of Water Resources (DWR) of SGA's intent to be a GSA. SGA noted its GSA formation boundary in the notice as only a portion of the North American Subbasin.

In addition to establishing guidelines for establishing GSAs and GMPs, SGMA also defines the types of groundwater use allowed under Water Code Section 10721(v) as follows:

> *"Sustainable groundwater management" means the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results.*

Undesirable results under 10721(x)[10] include:

> (1) chronic lowering of groundwater levels (not including overdraft during a drought, if a basin is otherwise managed);
>
> (2) significant and unreasonable reductions in groundwater storage;
>
> (3) significant and unreasonable seawater intrusion;
>
> (4) significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies;
>
> (5) significant and unreasonable land subsidence; and
>
> (6) depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

Although the GSP is directed to avoid undesirable results by practicing sustainable groundwater management, actions taken by the GSA can still have an adverse impact on Lincoln's water rights and control over its current groundwater supply. These potential impacts require Lincoln's participation in the formation of the new GSA in order for the City to preserve its groundwater rights as well as the governance authority over regional groundwater assets.

[10] This list includes the most relevant information provided from the statutory section for purposes of informing the reader. For a full quotation, see Water Code section 10721(x)(1)-(6).

The development of the groundwater sustainability plan (GSP) is the second step in the two-step SGMA compliance process. Water Code Section 10723.2 requires GSAs to consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing GSPs. An explanation of how those interests will be considered by a GSA when developing and implementing a GSP is required as part of the GSA formation notification requirements. The interests of water rights holders to be considered in the formation of a GSP include:

(a) Holders of overlying groundwater rights, including (1) Agricultural Users and (2) Domestic well owners.

(b) Municipal well operators.

(c) Public water systems.

(d) Local land use planning agencies.

(e) Environmental users of groundwater.

(f) Surface water users, if there is a hydrologic connection between surface and groundwater bodies.

(g) The federal government, including, but not limited to, the military and managers of federal lands.

(h) California Native American Tribes.

(i) Disadvantaged communities, including, but not limited to, those served by private domestic wells or small community water systems.

(j) Entities listed in Section 10927 that are monitoring and reporting groundwater elevations in all or a part of a groundwater basin managed by the groundwater sustainability agency.

The GSP will require the participating agencies to establish groundwater pumping criteria that meet the long-term sustainable yield needs of the identified groundwater basin. Such a formulation may impact the existing management planning efforts that were put in place to do the same thing. For instance, WPCGMP has a groundwater management plan that identifies basin safe yield, develops pumping criteria, and assess groundwater pumping for participating agencies. It is unclear whether these existing items will be contained in a new GSP that will be developed by a new GSA. Or whether multiple GSA's and multiple GSP's will be in place requiring multi-agency coordination. The new

GSA may determine that existing planning activities related to a groundwater basin must be reconsidered and reinvented. As such, the City should actively participate in the formation of the region's GSA(s) and GSP(s) since groundwater is one of the City's most important water assets.

6.6.3.2 AB 1390 and SB 226 Intersection with SGMA

In 2015, AB 1390 and SB 226 were signed into law and became effective January 1, 2016. These two bills conjunctively reformed the judicial procedures for groundwater adjudication without impacting existing groundwater rights. These new procedures focus on incorporating recognition of SGMA and the new GSA's into the adjudication process and ensuring that decisions encompass all water rights holders in the basin, whether or not they are currently pumping groundwater. The court can now determine the groundwater rights of all parties overlying the basin and whether others may export water from the basin. Through basin adjudications, courts can require the cooperation of users who otherwise might resist limits the on pumping of groundwater. Under these new laws, the courts are now authorized to issue a preliminary injunction (limiting or restricting certain appropriations, extractions, allocations and transfers) upon a finding that the basin is in a condition of "long-term overdraft." Long-term overdraft is defined as a "condition of a groundwater basin where the average annual amount of water extracted for a long-term period, generally 10 years or more, exceeds the long-term average annual supply of water to the basin, plus any temporary surplus." The court is required to issue a preliminary injunction if (1) the basin is in a condition of long-term overdraft; (2) the basin has been designated as a probationary basin or if the Sustainable Groundwater Management Act (SGMA) planning deadlines for implementing a groundwater sustainability plan have not been met; and (3) there is no interim plan in effect under Section 10735.8 of the Water Code. Additionally the court may now adopt a proposed stipulated judgment as to the stipulating parties, if it is supported by more than 50 percent of all parties and is supported by groundwater extractors responsible for at least 75 percent of the groundwater extractions.

6.6.3.3 Potential Impacts of SGMA

The SGMA provides a legislative solution to groundwater overdraft that permeates many groundwater basins throughout California. The SGMA will alter the current governing landscape for groundwater management and likely produce a new groundwater management structure that affects the City of Lincoln's groundwater assets.

The City must engage in GSA formation and retain jurisdiction over groundwater assets that underlie the City and its Sphere of Influence. The GSA formation in the WPCGMP region may be problematic for a number of reasons: (1) the original WPCGMP group will need to be augmented to include all relevant entities interested in groundwater in the

WPCGMP area (including Nevada Irrigation District and Placer County); (2) the SGA has formed a GSA over a portion of the North American Subbasin that will required negotiation for congruent regional management; (3) Sutter County and South Sutter Water District will likely seek groundwater management authority in the North American Subbasin; (4) agricultural interests with the senior overlying groundwater rights will require representation in the North American Subbasin governance structure; and (5) the diversity of interests and GSA formations will require formulating agreements for governance among interacting GSA's.

In the event that some or all participants in the newly formed governance structure for the North American Subbasin are dissatisfied with the proposed governance structure, a groundwater adjudication may ensue. Such an adjudication would be extremely time consuming and complicated in order to address the various rights and obligations of each user in the basin. Working through formal agreements to find solutions may be prudent to avoid long-term contested adjudication procedures.

6.6.4 Groundwater Banking

The Sacramento Groundwater Authority has developed a Water Accounting Framework, which is a tool to encourage policies and procedures to promote and support conjunctive use operations within the SGA area. The Framework recognizes investments by the SGA member agencies in the development of conjunctive use programs and supports groundwater banking programs that enhance the long-term sustainability of the groundwater basin. The WPCGMP partnership does not yet have a water accounting framework.

The City of Lincoln has expended significant funds to develop surface water resources in order to relieve pressure on the groundwater basin. Moreover, the City has implemented a thoughtful conjunctive use program where groundwater management and asset protection is the central core for long-term sustainability. Accordingly, a primary component of the City's long-term groundwater management strategy should be to promote development of a groundwater banking criteria for the Western Placer zone of the North American Subbasin.

6.7 Groundwater Strategy

The purposes of this section are to outline a long-term groundwater strategy that the City can utilize to meet its long-term land and water planning objectives. The strategy outline is organized into three sections: current and future system operations; long-term policy objectives; and regional groundwater management and governance.

1. Current and Future System Operations

    a. The City currently utilizes groundwater to meet 10% of its customers' demands annually. The City should alter its water management system in order to meet 10 percent of its demands in the summer months under peaking conditions. This would require revising or drafting new policies governing the quantity of groundwater available at different times throughout the year, and reviewing demand management measures.

    b. The City should identify exact volumes of groundwater needed to meet short-term and long-term water needs, including needs in emergency conditions. The City is moving from a long-term projected groundwater demand of approximately 11,800 acre-feet per year to closer to 3,400 acre-feet per year. Peaking management will require evaluation of the utility of this number over regular increments.

    c. The City should quantify its backup groundwater demand need. The City has historically considered emergency backup groundwater supply to be 75 percent of average day demand. With multiple sources planned in the future, assessing total groundwater needs for emergencies, including durations, should be a priority.

    d. Lincoln needs to develop emergency water management protocols and backup electrical and treatment systems to handle water supplies in case of a large-scale outage. Emergency protocols should include identification and installation of backup generators, automated water quality testing, and redundant system management.

    e. The City should begin to identify the best locations for peak management and emergency back up wells in the western part of the City and SOI. This assessment should coincide with the development potential of various areas, especially those associated with active specific plan areas such as Village 5. The groundwater well identification should consider both potable and non-potable water sources.

    f. Lincoln should preserve the agricultural wells that may be available for non-potable uses as development progresses. Numerous agricultural wells cover a broad area where General Plan development is planned. Normally, residential developments destroy agricultural wells. The City

should work with the landowners where development is set to occur as well as the development community to identify and map the agricultural wells for potential future use.

g. The City should conduct regular well system testing to ensure basin hydrology is sustained. The City should further its existing policies to monitor groundwater basin health and evaluate groundwater recharge. In conjunction with the WPCGMP and the emerging GSA, the City should affirmatively manage the groundwater basin by conducting independent and regular testing.

h. Lincoln should continue monitoring and reporting groundwater quality issues. The contamination sites already in and around the City need continued attention to ensure that any contamination area is wholly contained and meeting clean-up objectives. The City should also be diligent in monitoring it groundwater network to identify any further contamination potential.

i. Lincoln should assess threat to resources from industrial development as well as existing groundwater plumes. Inappropriately located industrial facilities – like mining operations – have the potential to disrupt groundwater migration and natural basin recharge. Accordingly, managing locations and operations of industrial facilities will help sustain the long-term health of the Subbasin.

2. Long-term policy objectives

a. The City should maintain 10 percent average annual use for its operations on a 10 year running average. The City's current policy is ambiguous to the measurement of the usage of groundwater. The running average over the course of a 10 year period would allow for fluctuations in groundwater usage based upon hydrological and climatological conditions that may impact how surface water deliveries are made.

b. Lincoln should preserve and store groundwater as a contingency source during drought conditions. The preservation and storage of groundwater requires developing a mechanism to account for groundwater offsets attributable to investments in surface water projects. The City should develop initial protocols to address opportunities to preserve groundwater for additional uses.

c. The City should utilize naturally percolating groundwater to manage peaking and emergency issues. Peaking issues are associated with short-term high demand on a water system that are generally made during the high-water using months in the summer. Peaking is most acute on the hottest days of the year. The City should also preserve the percolating groundwater to handle unforeseeable emergency conditions.

d. The City must work with regional partners throughout the North American Subbasin to protect groundwater assets from any form of contamination. Such work may include not only assessing and controlling potential contamination issues within the City boundary and SOI, but also efforts to manage potential contamination from areas outside the City's influence – including areas that are far removed from the City that may pass through the railway and highway transportation corridors.

e. The City should develop groundwater recharge projects and policies beyond simply in-lieu recharge efforts. The City should assess the opportunities to recharge groundwater systems with systematic application of raw surface water, recycled water and potable water to spreading basin or ASR projects within and around the City. The City of Roseville was successful in developing an ASR project that may be worth considering in the City.

f. Lincoln needs to account for the regional benefits to the groundwater basin through its acquisition of surface water resources. The accounting could include an assessment of total water usage over the course of the last 10 years coupled with a reasonable calculation of loss factor. The improvement to the groundwater levels in and around the City of Lincoln should be evidence of the benefits that the City's modified water use ethic is having on regional systems.

g. The City should assess the issues associated with increased groundwater pumping on the west side of the North American Subbasin. Long-term continued drawdown not only impacts the City's conjunctive use efforts and groundwater banking, but also changes the overall dynamics of the groundwater basin – potentially permanently. The City should actively engage the additional groundwater pumping and basin drawdown to assess potential opportunities to improve basin conditions.

h. The City should continue to protect local and regional flood plains in local drainage systems in order to improve opportunities for groundwater recharge.

3. Regional Groundwater Management and Governance

    a. The City should engage federal and state agencies on their governing interests in the North American Subbasin. The federal and state agencies have diverse interests in the management of these basins and engaging these entities before problems develop should be a priority. Pursuing and engaging Federal and State Executive Staff and Management will assist the City in moving projects forward when acute needs arise.

    b. Lincoln should assess regional and local governing agency involvement in creating sustainability agencies. SGA has already submitted to create its own GSA under the SGMA and since the new GSA will impact groundwater planning, it is critical for the City to continue to be involved with the GSA formation process. As such, the City should actively participate in the formation of SGA's GSA, while the City also takes time to fully digest the pros and cons of this action since groundwater is one of the City's most important water assets. This will help ensure that Lincoln's water rights are preserved and the City's interests are considered as the new GSA plans its GSP. The GSA and eventual GSP efforts will require close coordination with SGA and other regional agencies. Coordinating efforts, aligning interests, and assessing opportunities should be of paramount importance over the course of the next 12 months.

    c. The City and its WPCGMP partners should incorporate stakeholder participation in creating sustainability agencies. The stakeholder groups may have unique perspectives on managing regional water assets and early engagement may stave off unnecessary political opposition. Existing trepidation between private rural citizens and urban areas should be curtailed at the earliest possible time.

    d. The City of Lincoln needs to hold decision-making authority on any governing body formed out of SGMA. The City's groundwater rights cannot be left to the whims of others in an alternative governing body. The City should act as the lead agency in any GSA formation and provide staff support to execute tasks and achieve governance outcomes.

Development of a political plan to work with regional entities to ensure local control of groundwater resources is paramount.

e. The governance group for the GSA must formulate groundwater banking protocols for the North American Subbasin in order to allow the City to preserve and protect its existing groundwater assets. The City's financial and institutional investments to secure and deliver surface water resources has been a significant policy effort over the course of the last decade. The City must assume the benefits of its investments with the support of a robust groundwater accounting effort in the western Placer area of the Subbasin.

f. The City and its regional partners need to develop a sustainability plan (GSP) under the SGMA that outlines key criteria for basin management. Such criteria should be derived from the 5 existing Groundwater Management Plans in the North American Subbasin. These GMP's provide insight on the key substantive issues relevant to neighboring agencies. The GSP must incorporate the key policy criteria from the City and follow governance objective set by the City.

g. The City should seek to maintain local control of groundwater resources as much as possible. Ceding groundwater assets to a regional authority may jeopardize the long-term viability of the asset to the City. Quantification of assets may be a preferred alternative to ceding reasonableness of use of assets – where the City maintains control over its quantified allocation. Particular attention should be put on SGA's bid to become the new GMP for the area.

h. The City and the GSA group should seek federal and state regulatory approval of management plans for groundwater basin. Achieving some form of integration with federal and state agencies may further long-term sustainability objectives by addressing long-term certainty concerns associated with endangered or threatened species and other federal issues. Moreover, establishing basin accounting protocols that meet federal and state standards may help facilitate other forms of conjunctive management in the North American Subbasin.

i. The City should work with its regional partners to create planning opportunities that avoid basin adjudication. These opportunities will require integrating local agencies, regional agencies and individual well

owners into a sustainability plan. A long-term adjudication process will drain resources from all entities involved and likely result in a negotiated basin settlement. Accordingly, identifying key parameters of interested groups and stakeholders may help avoid basin adjudication.