APPENDIX I

WSA

SUD-B Northeast Quadrant Development Project

SB 610 Water Supply Assessment

SUD-B Northeast Quadrant
SB 610 Water Supply Assessment

Prepared for the
City of Lincoln

Draft

January 2017

Prepared by:

Tully & Young
Comprehensive Water Planning

Prepared for:
The City of Lincoln

Approved on

Contact:
Tully & Young, Inc.
Sacramento, Ca.
(916) 669-9357

Table of Contents

SECTION 1 – PROJECT INTRODUCTION

1.1 INTRODUCTION

As the lead agency under the California Environmental Quality Act (CEQA), the City of Lincoln (hereafter referred to as the "City") is assessing the potential environmental impacts associated with the proposed development under the Special Use District B Northeast Quadrant (Specific Plan) in the western portion of the City. To support the CEQA analysis, a Water Supply Assessment (WSA) for the Special Use District B Northeast Quadrant Specific Plan is necessary (hereafter referred to as the "Proposed Project").

Statutory Background

Enacted in 2001, Senate Bill 610 added section 21151.9 to the Public Resources Code requiring that any proposed "project" as defined in section 10912 of the Water Code comply with Water Code section 10910, et seq. Commonly referred to as a "SB 610 Water Supply Assessment," Water Code section 10910 outlines the necessary information and analysis that must be included in an environmental analysis of the project to ensure that proposed land developments have a sufficient water supply to meet existing and planned water demands over a 20-year projection.

Proposed "projects" requiring the preparation of a SB 610 water supply assessment include, among others, residential developments of more than 500 dwelling units, shopping centers or business establishments employing more than 1,000 persons or having more than 500,000 square feet of floor space, commercial office buildings employing more than 1,000 persons or having more than 250,000 square feet of floor space and projects that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project.[1] The Proposed Project requires a WSA because it will require an amount of water greater than the amount of water required by a 500 dwelling unit project and it is planned to have more than 500,000 square feet of floor space.

The WSA will be incorporated into the CEQA document — an Environmental Impact Report (EIR) — being prepared for the Proposed Project (the Project EIR).[2]

Document Preparation and Approval

The WSA law requires that the lead agency – in this case, the City of Lincoln – identify a "public water system"[3] and request that each identified public water system prepare a WSA for the project. If the lead agency is not able to identify a public water system that may supply water for

[1] Water Code § 10912, subdivision (a).
[2] Water Code § 10911(b).
[3] A "public water system" is a system that provides water for human consumption that has 3,000 service connections.

the project, the lead agency must prepare the WSA itself after consulting with "any entity serving domestic water supplies whose service area includes the project site, the local agency formation commission, and any public water system adjacent to the project site."[4]

In this case, the City of Lincoln has prepared the WSA because the City plans to serve water to the Proposed Project and the Proposed Project lies within the City's General Plan Area. This document provides the necessary information for the City to make its water supply determinations and to comply with the assessment of water supply sufficiency as required by applicable statutes.

Document Organization

This WSA supports the Proposed Project's environmental review process and analyzes the sufficiency of water supplies to meet projected water demands of the Proposed Project through the required planning horizon. The WSA is organized according to the following sections:

Section 1: Project Introduction. This section provides an overview of WSA requirements, and a detailed description of the Proposed Project, especially the land-use elements that will require water service.

Section 2: Proposed Project Estimated Water Demands. This section describes the methodology used to estimate water demands of the Proposed Project and details the estimated water demands at build-out of the Proposed Project.

Section 3: Other Estimated Water Demands. This section details the other water demands currently served by the City, anticipated to be served based on information in the City's General Plan, as well as known and planned modifications since the City's adoption of the General Plan.

Section 4: Water Supply Characterization. This section characterizes the City's water supply portfolio that will serve the Proposed Project along with other current and future water demands. City wells, along with water service contracts and agreements are characterized for normal, single dry, and multiple dry year conditions.

Section 5: Sufficiency Analysis. This section assesses whether sufficient water will be available to meet the Proposed Project water demands, while recognizing existing and other potential planned water demands within the City of Lincoln service area. To provide the necessary conclusions required by statute, the analysis integrates the demand detailed in Section 2 and Section 3 with the characterization of the City's water supply portfolio detailed in Section 4.

[4] Water Code § 10910(b).

1.2 PROPOSED PROJECT DESCRIPTION

The Proposed Project is a new residential, mixed use development on approximately 198 acres located in western Placer County adjacent to existing City of Lincoln developments. The Proposed Project is bounded by Nelson Lane on with West and sits between the new Highway 65 bypass on the South and Nicolaus Road on the North. The Eastern project boundary is defined by existing homes and the Independence Project.

Project Background

The Project Site is currently designated as Special Use District B by the City of Lincoln's 2050 General Plan. These designations were intended to direct City build-out in a logical and orderly manor based upon a projects geographic location. As such, these designations provide project proponents and the City with improvements and flexibility in how the lots are organized, situated, and constructed. For example, this designation allows the development to allocate less area to single residences and provide larger communal areas through redistribution of densities or to increase housing density to maintain environmentally sensitive areas as open space, while conforming with the General Practice Guidance Principles.

It should be noted that this Proposed Project is limited to the northeast quadrant of SUD-B following City Council Resolution 2002-97 which allowed for the portion of SUD-B cut off by the Highway 65 bypass to build independent of the remainder of SUD-B. **Figure 1-1** depicts the proposed project location and land uses.

Project Description

This WSA includes an evaluation of the Proposed Project, which consists of approximately 430 dwelling units and 971 thousand square-feet of commercial space on 198 acres. Residential uses are limited to 430 Low Density dwelling units on 84.8 acres. Commercial uses consist of 69.7 acres of mixed commercial sizes and uses. Parks make up 4 acres with the remaining 39.9 acres consisting of rights-of-way and Open Space. Layout of the Proposed Project uses the commercial areas as well as open space to buffer the residential lands from neighboring aircraft flight path.

Table 1-1 summarizes the Proposed Project's land use acreages and dwelling unit counts.

Figure 1-1 – Proposed Project Location and Land Uses

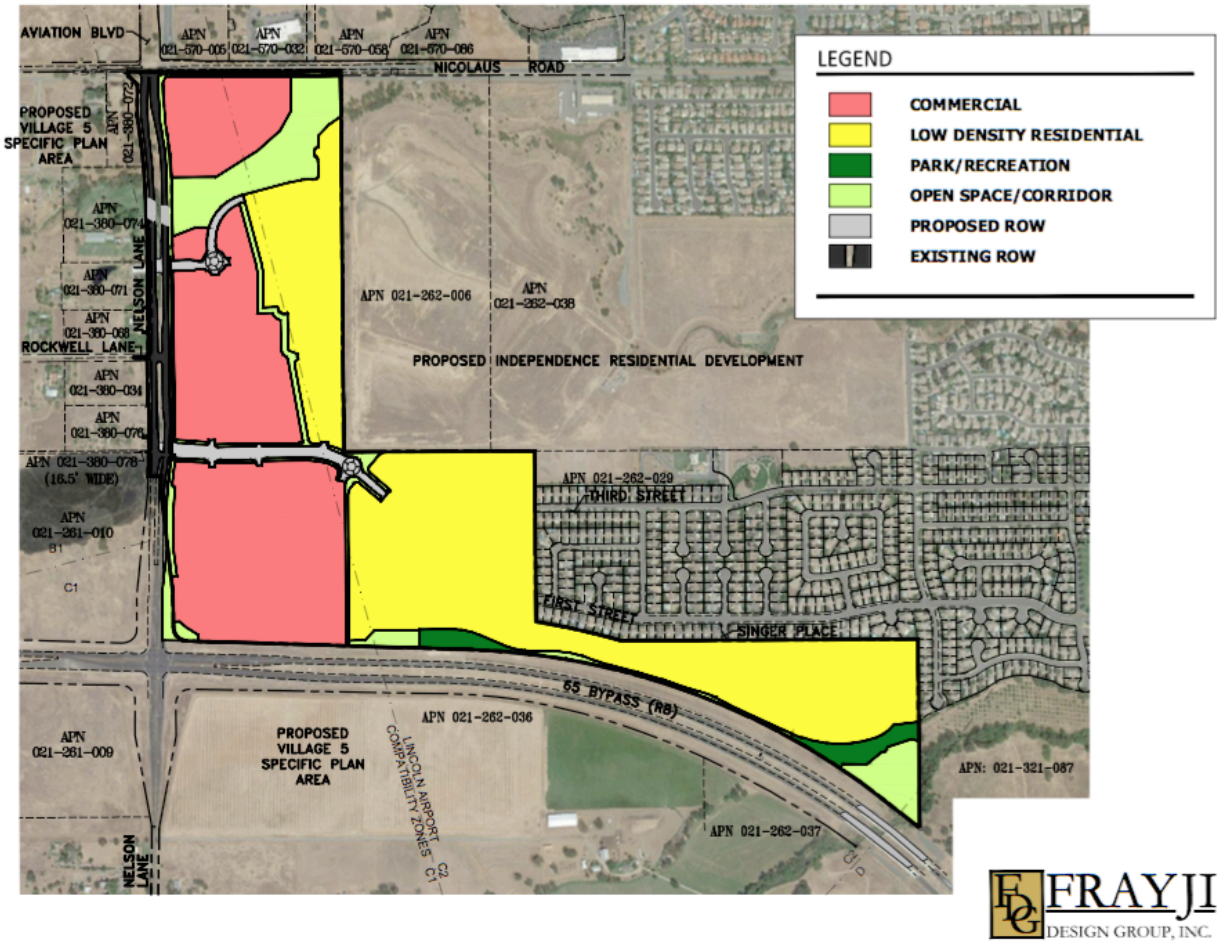


Table 1-1 – Summary of Project Land Uses and Acreages

Land Use	Gross Acreage	Details
Low Density	84.8	430 Dwelling Units
Mixed Commercial	69.7	971,000 SF
Parks	4.0	
Open Space	22.6	
Right of Ways	5.0	
Existing Right of Way	12.3	
Total	**198.4**	**430 Dwelling Units and 0.97 Mill SF**

Overall, the Proposed Project includes 430 dwelling units at average densities between 3 and 5.9 dwelling units per acre depending on unit type. The Proposed Project has a single occupancy rate per dwelling unit for a total projected resident population of approximately 1,548.

1.3 PROPOSED PROJECT PHASING

Table 1-2 describes the Proposed Project's anticipated construction phases for purposes of this WSA. Each phase represents a portion of the Proposed Project, focusing on particular land use classifications. Before constructing homes, commercial space, or other parts of the Proposed Project, the applicants will begin site grading and Project-wide infrastructure development. Some infrastructure and site grading will continue throughout all phases of the Proposed Project, as necessary. These activities include, among other things, installing facilities for potable water, recycled water (as appropriate for the Proposed Project), sewer, electric, telecommunications, gas, stormwater, and roads. During these activities, a small water demand will exist – referred to in this WSA as "construction water." This demand is included in the projected annual water demands presented in Section 2.

While the timing of the Proposed Project's ultimate build-out will be market driven, it is anticipated that all residential construction should be complete within about 10 years, well within the 20-year statutory planning horizon of this WSA. Given the differences between the commercial and residential housing markets, the commercial area is expected to reach build-out five years after the residential build-out is achieved.[5]

Table 1-2 – Proposed Number of Units and Project Phasing

Project Element	Unit Count					
	Current	2020	2025	2030	2035	2040
Low Density	0	215	430	430	430	430

[5] Specific Plan Exhibit 7.1 and Specific Plan Page 1-2. *"The SUD-B NEQ Specific Plan is designed to respond to the anticipated long-term demand for housing and services within the City of Lincoln's Sphere of Influence over the next 10-15 years."*

SECTION 2 – PROPOSED PROJECT ESTIMATED WATER DEMANDS

2.1 INTRODUCTION

This section describes the methodology, provides the supporting evidence, and presents the estimated annual water demands for the Proposed Project. For the purpose of estimating annual water demand, the Proposed Project is planned to develop according to the phasing in **Table 1-2**.

2.2 DETERMINING UNIT WATER DEMAND FACTORS

As detailed in Section 1, the Proposed Project has specific residential and non-residential land uses with defined residential lot-sizes, types of commercial and office uses, and other characteristics. As these attributes vary among the types of proposed land uses, so too will the water needs. To understand the water needs of the entire Proposed Project, unique demand factors that correspond with each unique land use are necessary. This subsection presents the methodology for determining the unit water use demand factors that become the basis of the Proposed Project water demand estimates. Two distinct groups of demand factors are presented: (1) residential, and (2) non-residential.

Values developed for each distinct group are based on several sources of information, details of which are provided below.

2.2.1 Current and Future Mandates

There are several factors that affect the development of unit water demand factors, ranging from state mandates to changes in the types of housing products being offered. These factors are incorporated into the determination of unit water demand factors, as discussed later in this section. Characteristics of the most important factors are described below.

2.2.1.1 Water Conservation Objectives

On November 10, 2009, Governor Arnold Schwarzenegger signed Senate Bill No. 7 (SBX7-7), which established a statewide goal of achieving a 20 percent reduction in urban per capita water use by 2020 for urban retail water suppliers.[6] Since the Proposed Project is yet to be built, this legislation has limited restrictive applicability.

The efforts undertaken by the City, and to a lesser extent Placer County, Placer County Water Agency, and Nevada Irrigation District to comply with this statute will affect the Proposed Project's use of appliances, fixtures, landscapes and other water using features, through changes or additions to City and County ordinances and/or through an emerging "conservation ethic" seen in the region as a result of drought conditions.

[6] California Water Code § 10608.20

2.2.1.2 Indoor Infrastructure Requirements

In January 2010, the California Building Standards Commission adopted the statewide mandatory Green Building Standards Code (hereafter the "CAL Green Code") that requires the installation of water-efficient indoor infrastructure for all new projects beginning after January 1, 2011. The CAL Green Code was incorporated as Part 11 into Title 24 of the California Code of Regulations.[7] The Cal Green Code was revised in 2013 with the revisions taking effect on January 1, 2014; however these revisions do not have substantial implications to the water use already contemplated by the 2010 Cal Green Code.[8] A similar revision occurred in 2016 with revisions taking effect on January 1, 2017 with no revisions directly impacting residential water use.[9] The CAL Green Code applies to the planning, design, operation, construction, use and occupancy of every newly constructed building or structure. All Proposed Project land uses must satisfy the indoor water use infrastructure standards necessary to meet the CAL Green Code.

The CAL Green Code requires residential and non-residential water efficiency and conservation measures for new buildings and structures that will reduce the overall potable water use inside each building and structure by 20 percent. The 20 percent water savings can be achieved in one of the following ways: (1) installation of plumbing fixtures and fittings that meet the 20 percent reduced flow rate specified in the CAL Green Code, or (2) by demonstrating a 20 percent reduction in water use from the building "water use baseline."[10] The Proposed Project will satisfy one of these two requirements through the use of appliances and fixtures such as high-efficiency toilets, faucet aerators, on-demand water heaters, or other fixtures as well as Energy Star and California Energy Commission-approved appliances.

2.2.1.3 California Model Water Efficient Landscape Ordinance and County Ordinance

The Water Conservation in Landscaping Act was enacted in 2006, requiring the Department of Water Resources ("DWR") to update the Model Water Efficient Landscape Ordinance

---

[7] The CAL Green Code is Part 11 in Title 24. All references in this WSA will be to the Chapter and Section numbers that appear in the adopted document which may be obtained by visiting the California Building Standards Commission web site at: http://www.documents.dgs.ca.gov/bsc/CALGreen/2010_CA_Green_Bldg.pdf

[8] "The 2010 CAL Green Code was evaluated for updates during the 2012 Triennial Code Adoption Cycle . HCD evaluated stakeholder input, changes in technology, implementation of sustainable building goals in California, and changes in statutory requirements. As such, the scope of the CAL Green Code was increased to include both low-rise and high-residential structures, additions and alterations." *Guide to the 2013 California Green Building Standards Code (Residential)*, California Department of Housing and Community Development, 2013.

[9] 2016 CAL Green Code changes were focused on energy savings and the only water related changes were related to residential hot water heater efficiencies. http://www.bsc.ca.gov/Home/CALGreen.aspx

[10] See CAL Green Code. For Residential construction, Section 4.303.1 provides the residential water conservation standard and Table 4.303.2 identifies the infrastructure requirements to meet this standard. Table 4.303.1 and Worksheets WS-1 and WS-2 are to be used in calculating the baseline and the reduced water use if Option 2 is selected. For non-residential construction, Section 5.303.2.3 provides the water conservation standard as well as the baseline and reduced flow rate infrastructure standards. Note that Worksheets WS-1 and WS-2 incorporate both residential and non-residential fixtures, yet the water use is still to be analyzed by "building or structure" as specified in Chapter 1, Section 101.3.

(MWELO).[11] In 2009, the Office of Administrative Law (OAL) approved the updated MWELO, which required a retail water supplier or a county to adopt the provisions of the MWELO by January 1, 2010, or enact its own provisions equal to or more restrictive than the MWELO provisions.[12] In 2015, MWELO regulations were again revised further impacting land use planning and water planning. Because the City of Lincoln is a "local agency" under the MWELO, it must require "project applicants" to prepare plans consistent with the requirements of MWELO for review and approval by the City of Lincoln. The City of Lincoln is in compliance with this state law and formally notified DWR of the City's adherence to the State's MWELO in a letter dated February 4, 2010. This WSA uses the conservative methods applicable to the MWELO in setting landscaping irrigation limits. For the purposes of this WSA, the MWELO limit is applied to all aspects of the Proposed Project.

The MWELO applies to new construction with a landscape area greater than 500 square feet.[13] The MWELO "highly recommends" use of a dedicated landscape meter on landscape areas smaller than 2,500 square feet, and requires weather-based irrigation controllers or soil-moisture based controllers or other self-adjusting irrigation controllers for irrigation scheduling in all irrigation systems.[14] The MWELO provides a methodology to calculate total water use based upon a given plant factor and irrigation efficiency.[15] Finally, the MWELO requires the landscape design plan to delineate hydrozones (based upon plant factors) and then to assign a unique valve for each hydrozone (low, medium, high water use).[16]

2.2.1.4 Metering, Volumetric Pricing, and Water Budgets

California Water Code §525 requires water purveyors to install meters on all new service connections after January 1, 1992. California Water Code §527 requires water purveyors to charge for water based upon the actual volume of water delivered if a meter has been installed. Consistent with current customer billing, the City will be billing the SUD-B Northeast Quad water users on a volumetric basis. This will have little impact on the City in terms of implementation as the majority of the City was built in the last two decades, after the

[11] Gov. Code §§ 65591-65599

[12] California Code of Regulations (CCR), Tit. 23, Div. 2, Ch. 27, Sec. 492.4. The MWELO provides the local agency discretion to calculate the landscape water budget assuming a portion of landscape demand is met by precipitation, which would further reduce the outdoor water budget. For purposes of this WSA, precipitation is not assumed to satisfy a portion of the outdoor landscape requirement because the determination of an appropriate effective precipitation factor is highly uncertain given the various landscape slopes, terrain composition, concurrent watering schedules, etc.

[13] CCR Tit. 23, Div. 2, Ch. 27, Sec. 490.1.

[14] CCR Tit. 23, Div. 2, Ch. 27, Sec. 492.7(a)(1)(A)-(B).

[15] In calculating Estimated Total Water Use, the MWELO requires use of at least a 71% irrigation efficiency factor. Assuming 71% irrigation efficiency, the average plant factor must be 0.50. It would be possible to stay within the water budget if the average plant factor were higher than 0.50 by designing a system with an irrigation efficiency higher than 71%. Again the relationship between a Plant Factor (PF) and Irrigation Efficiency (IE) in the Applied Water formula is: AW=(ETo*PF)/IE.

[16] CCR Tit. 23, Div. 2, Ch. 27, Secs. 492.3(a)(2)(A) and 492.7(a)(2).

introduction of plumbing restrictions in the 1990s, and all City customers are billed volumetrically.

Though the water retailer for the Proposed Project will be billing customers on a volumetric basis, this action alone is not expected to substantially reduce water use. However, it is anticipated that the retail billing system will encourage and help maintain reasonable use (e.g. through the tiered rate structure and/or water budgets with penalties), so that the Proposed Project's water demands at build-out are not expected to grow as the Proposed Project progresses.

2.3 RESIDENTIAL WATER USE DEMAND FACTORS

The Proposed Project anticipates one general lot-size designation within the Proposed Project. The size of the lot has the greatest impact on the annual per-lot demand for water as the irrigation needs for landscaping increase with larger landscaped areas. In contrast, indoor water demands remain relatively consistent regardless of lot size, but do vary slightly based on the number of people per dwelling unit. Distinct demand factors are provided for the following residential uses:

- Indoor Residential Use – this category differentiates the slight variance anticipated to occur between the conventional housing and higher density housing to reflect the difference in people per dwelling unit.
- Outdoor Residential Use – this category addresses the landscape water demands for varying lot sizes planned within the Proposed Project.

For purposes of this WSA, residential unit water demand factors are described as "the acre-feet of water use annually per dwelling unit" – or simply put, acre-feet/dwelling unit (af/du).

2.3.1 Indoor Residential Water Use Factors

The Proposed Project's residential elements will be built in accordance with all applicable, then-current building codes including the Cal Green Code discussed previously.

Based upon the meter study conducted for the 2015 UWMP, the historic combined unit demand factor in the City's existing service area for newer houses is approximately 0.46 af/du/yr. At 2.4 persons per household, the per capita demand is about 171 gallons per person per day (gpd).[17] Because a vast majority of the existing customers are in homes built within the last decade, the current and future indoor unit demand factor is assumed to be nearly equivalent, even with the additional drivers such as the Cal Green Code.

[17] See section 4.3.3 of the 2015 Lincoln UWMP

Additionally, the size of the house has little impact on indoor water demands. While a bigger house may have more space dedicated to living areas, water use is predicated on bathroom fixtures and appliances, which are limited by the previously mentioned CAL Green Code. For the purposes of this WSA, indoor demands are assumed to only vary slightly based on the number of people per unit. The Proposed Project's Specific Plan points to persons per household numbers that differ from previous City assumptions. For the Proposed Project the projected persons per household are 3.6 for the Low Density dwelling units.[18]

2.3.2 Outdoor Residential Water Use Factors

The primary factor driving outdoor water use on a per lot basis is the size of the lot and square footage of landscaping. The Proposed Project includes a single lot type. Thus, landscaped area depends upon the proposed housing layout and irrigated landscaped area. The plantings are intended to consist of low-water, drought-tolerant, and native plants. Backyards are not subject to limitations or standard developer installed landscaping; however homeowners will be strongly encouraged to follow the sustainability principles and recent drought actions may require stricter backyard landscaping plans.

To provide flexibility for the Proposed Project to landscape lots as needed and to provide a conservative assumption for this analysis, each lot is assumed to have a landscaped area equal to the lot square footage minus the house footprint and an amount of hardscaping in line with the Floor Plan Diagrams in the General Development Plan. The remaining area of each lot is conservatively assumed to demand the maximum amount of water allowed by the MWELO. However, this provides for a conservative analysis since the landscaping goals set forth in the Specific Plan will likely result in a lower outdoor residential water demand than is estimated by this WSA because of actions taken by developers and end users to be more water efficient.

Review of historic City data indicates a wide range of planning numbers for indoor and outdoor unit demand factors. The outdoor demand factor for the various land classifications in the City was calculated from the 2010 UWMP meter study results and revised with data from the 2015 water meter study. This was achieved by looking at meter volumes for outdoor uses such as parks, and then dividing by the total acreage giving a range of demand factors. More details of this analysis can be found in the Lincoln Draft Comprehensive Water Master Plan.[19]

Based on the analysis preformed in the meter study, there was a range of outdoor demands. These demands changed due to the type of use and the differences in climate year to year. The resulting average outdoor demand factors for 2010, a milder year, was 3.60 AF/Ac. This is

[18] Persons per household numbers are stated in the SUD-B Northeast Quad Specific Plan
[19] The final Comprehensive Water Master Plan is scheduled for adoption in January 2017.

consistent with previous assumptions for the area where the outdoor demand was estimated at 3.73 AF/Ac as 85% of ETo.[20]

The primary driver that could significantly change both existing residential and non-residential outdoor water demands is the MWELO, as discussed in **Section 2.2.1.3**. In following MWELO methodologies, landscaping demand can by calculated as an estimate of reference ETo as described in **Section 2.2.1.3**. Using demand values estimated for MWELO, a demand per acre or square foot is applied to the average lot size of each category to develop the outdoor demand for each residence type.

Using the outdoor unit demand factor of 3.73 af/ac/yr and associated landscape area for an average lot in the City, an estimate of current outdoor demands can be derived.[21] Using this same number and the average lot size from the SUD-B Northeast Quad land-use plan, which is a current example of future development in the City, an estimate of future outdoor demands is created. All lots are assumed to use this number.

The revised MWELO provides for determining the Maximum Applied Water Allowance ("MAWA"), where the maximum is determined as 55 percent of the reference evapotranspiration for the area for residential projects and 45 percent for non-residential, resulting in the following equation:

> *MAWA = (ETo) (0.62)(0.55 x LA), where ETo is the reference evapotranspiration in inches per year, LA is the landscape area, and 0.62 is a conversion factor. The resulting value is in "gallons per year"*

This number was derived for the 2015 UWMP and after conversion results in an irrigation limit of 3.73 af/ac/yr.[22] Based on a review of most recently studied meter data, there was no significant change in use to justify a revision of the 3.73 af/ac/yr.

[20] ETo is the Evapotranspiration or a standard measurement used to calculate plant water demands. For more information on ETo, refer to MWELO. This value is still accurate for parks under the revised MWELO where special landscaped areas are allowed.
[21] This value is conservative for residential use under the revised MWELO but meter results for newer homes still support this value. It is anticipated that a small reduction in this value will be seen in the next meter study performed by the City.
[22] 2015 City of Lincoln UWMP.

- **Low Density.** – The proposed 430 lots of this designation will include single family dwellings on lots with an average of 8,600 square-feet. As this lot designation is consistent with a designation analyzed as part of the UWMP meter study, the outdoor demand factor derived for the UWMP is used for the purposes of this WSA. It should be noted that while this lot type is most consistent with traditional detached single family dwellings, the developers would allow alternative lot configurations. For the purposes of this WSA, the Proposed Project will use the City's Low Density outdoor demand factor, derived from meter data, of 0.27 acre-feet per year.

2.3.3 Summary of Residential Water Use Demand Factors

Table 2-1 provides a summary of the baseline demand factor for each residential land use category and the resulting unit demand factor used to estimate the Proposed Project's water use.

Table 2-1 – Summary of Residential Baseline and Proposed Project Demand Factors

Water Demand Category by Dwelling Unit (du) Type	Average Density (du/ac)	Indoor Factor	Outdoor Factor	Total Demand Factor (af/du)
Low Density 8,600 SF	5.1	0.19	0.27	0.46

2.4 NON-RESIDENTIAL WATER USE DEMAND FACTORS

The non-residential factors are developed from existing research performed for the 2015 UWMP including an extensive meter study and a separate commercial meter analysis conducted in 2014 for the ongoing City planning efforts.

For purposes of this WSA, the per-lot demand for non-residential classifications is described as either "the acre-feet of water use annually per acre of land", acre-feet/acre (af/ac), or as a single demand projection for a demand category such as an amenity center (e.g. which has a unit of "1"), acre-feet/unit (af/unit). These values reflect indoor and outdoor water needs expected for typical non-residential use for each of the following classifications:

- Mixed Commercial
- Parks
- Other miscellaneous uses, including open spaces, right-of-ways, and construction water

The method and basis for determining the unit water demand factor for each of these classifications is detailed in the following subsections.

Mixed Commercial

The Proposed Project is anticipated to include 971,000 square feet (sf) of space located on approximately 69.7 acres. Water uses are anticipated to serve a range on commercial facilities ranging from small neighborhood commercial up to big box stores.

The commercial meters analyzed as part of the Water Master Planning effort meter study produced numbers lower than the General Plan Estimate. Commercial, Office, and Professional demands are estimated at 0.99 acre-feet/acre for the purposes of this WSA.

Parks

The Proposed Project includes two distinct parks with both being traditional parks. As described more fully in the Specific Plan, the parks (totaling approximately 4 acres) consist of two neighborhood parks on the southern portion of the project. The neighborhood parks are smaller and located to allow for pedestrian access from the surrounding homes. These parks will provide playgrounds, picnic areas, game courts, walking paths and shade structures. Both parks are located adjacent to open spaces to increase the effective feeling of size of the parks.

Park area demands were analyzed as part of the 2015 UWMP updated meter study and more recently verified to be correct as part of the Water Master Planning effort. For the Purposes of this WSA the City's demand factor of 3.55 acre-feet/acre is used.

Other Miscellaneous Uses

The Proposed Project has additional miscellaneous land uses including common area open space, an on-site agricultural preserve, and wildlife preserve areas. With the exception of the agricultural preserve, these uses have minimal impacts to the overall projected water use due to their limited size and water needs, or because they are temporary in nature.

Open Space

As of the preparation of this WSA, the Proposed Project includes about 22.6 acres of Open Space. While including informal trails and natural planted areas, a portion of the Open Space on riparian and wetlands environment may be fenced or buffered to provide boarders discouraging direct access to sensitive areas. The remainder of the area will be undisturbed and not be irrigated.

Given the form and function of the landscaping of this Project element, a water supply will only be needed to establish plantings for the first few years. After plant establishment, these landscape features will be served by annual precipitation. Establishment of water demand factors are conservatively based on the City's landscape demand of 3.73 acre-feet/acre. For purposes of the WSA, half of this area will be established prior to 2020, with the remaining half to be established prior to 2025.[23] Thus, the first half will no longer need to be irrigated as the remaining area is planted and established.

Right-of-Ways

The Proposed Project includes approximately 17.3 acres of right-of-way. As part of the 2015 UWMP updated meter study, the City analyzed the meter demands for median landscaping and

[23] Based on Phasing areas in Specific Plan Exhibit 7.1.

derived a demand factor that accounts for the majority of areas that is hardscape. For the purposes of this WSA a demand factor of 0.19 acre-feet/acre for right-of-ways is used.

Construction Water

As stated in Section 1, early phases of the Proposed Project will include site grading and infrastructure installation. These and other construction elements will require dust suppression and other incidental water uses. These are estimated to be nominal, and do not continue beyond the construction phases of the Proposed Project. For purposes of identifying incremental water demands, construction water is assumed for purposes of this WSA to be 2 acre-feet per year (this is about 640,000 gallons – or over 160 fill-ups of a 4,000 gallon water truck).

Summary of Non-Residential Demands

Table 2-2 provides a summary of the non-residential demand factors used to estimate the Proposed Project's future demands.

Table 2-2 – Summary of Non-Residential Demand Factors

Land Use	Demand Factor	Unit
Mixed Commercial	0.99	af/ac
Parks	3.55	af/ac
Open Space (establishment only)	3.73	af/ac
Right of Ways	0.19	af/ac
Construction Water	2.0	af/unit

2.5 PROPOSED PROJECT WATER DEMAND PROJECTION

Combining the Proposed Project's land use details and phasing as summarized in **Table 1-1** and **Table 1-2** with the demand factors presented in **Table 2-1** and **Table 2-2**, the water demands for the Proposed Project from initiation to build-out can be estimated. At completion, the Proposed Project is estimated to need approximately 284 acre-feet of water annually (prior to considerations of non-revenue water, described in the next subsection) and approximately 316 acre-feet when considering non-revenue water, as shown in **Table 2-3**. This value represents a nearly even split between indoor potable demands and outdoor non-potable demands.

2.5.1 Non-Revenue Water Demands

The demand factors presented earlier in this section represent the demand for water at the residential or non-residential customer meter for each category. To fully represent the demand on water resources, non-revenue water also needs to be included. Non-revenue water represents all of the water necessary to deliver to the customer accounts and reflects distribution system leaks, water demands from potentially un-metered uses such as fire protection, hydrant flushing,

and unauthorized connections, and inescapable inaccuracies in meter readings.[24] In most instances, the predominant source of non-revenue water is from system leaks – the loss from fittings and connections from water sources through treatment plants, tanks, pumping plants, major delivery system back-bone pipelines, and community distribution systems. Because a significant portion of the delivery system used to bring water to the Proposed Project will be new, the percentage of non-revenue water is estimated to meet the 10 percent goal set forth by the American Water Works Association. Therefore, the Proposed Project's water delivery system is expected to require an additional 32 acre-feet at build-out with 15 acre-feet of that required for outdoor demands that could be mostly met with water from non-potable sources.[25]

2.5.2 Potential Recycled Water Demand

A portion of the Proposed Project's demands may be met with recycled water (see **Section 4** for further discussion of water supply sources). Through the use of a recycled water or "purple pipe" system, a separate water line will be run to serve recycled water for non-potable use only – essentially to serve common areas and right-of-way landscaping throughout the Proposed Project.

As detailed in **Table 2-3**, park demands are only represented as outdoor demands. This means that the total recycled water demands are slightly lower than what is presented due to a small water demand meant to serve the potable requirements of the park facilities such as bathrooms and drinking fountains. It should be noted that these indoor demands are insignificant in comparison to the outdoor landscape demands. The most recent meter study puts the indoor demands at a conservative 2% of the total demands. With standard losses around 10%, the indoor park demands are considered insignificant and thus not subtracted for the purposes of this WSA.

Total demands for the Project elements which could be receiving recycled water total approximately 17 acre-feet prior to the inclusion of system losses.

[24] The American Water Works Association and the California Urban Water Conservation Council recognize the inherent non-revenue water that is either lost or not accounted for in urban treated water distribution systems and suggest purveyors strive for a value of 10% of all delivered water. Obtaining this value is dependent on numerous factors including the age and extent of distribution system infrastructure, meter rehabilitation programs, and how a purveyor accounts for actions such as fire flows and hydrant flushing.

[25] This WSA assumes all water will be met with potable sources but provides an estimate of the total amount of water which could be met with other non-potable sources such as raw water from upstream purveyors, recycled water, or untreated wells.

Table 2-3 – Estimated Proposed Project Water Demands

	Unit Count or Acreage						Demand Factor	Demand (af/yr)					
Category	Current	2020	2025	2030	2035	2040	(af/du or af/ac)	Current	2020	2025	2030	2035	2040
Residential													
Low Density	0	215	430	430	430	430	0.19 (indoor)	0	41	82	82	82	82
							0.27 (outdoor)	0	58	116	116	116	116
DU Total	**0**	**215**	**430**	**430**	**430**	**430**							
							Indoor Subtotal	0	40.9	82	82	82	82
							Outdoor Subtotal	0	58.1	116	116	116	116
Commercial													
Mixed Commercial	0	10	40	70	70	70	0.99	0	10	40	69	69	69
							Indoor Subtotal	0	9.9	39.6	69	69	69
Park	0	4	4	4	4	4	3.55	0	14	14	14	14	14
Right of Way Landscaping	0	5	17	17	17	17	0.19	0	1	3	3	3	3
Open Space	0	23	23	23	23	23	0.00	0	0	0	0	0	0
							Outdoor Subtotal	0	15.2	17.5	17	17	17
Other Miscellaneous Uses													
Construction Water	0	2	2	0	0	0	1	0	2	2	0	0	0
							Outdoor Subtotal	0	2	2	0	0	0
							Indoor Total	0	51	121	151	151	151
							Outdoor Total	0	75	136	134	134	134
							Total	0	126	257	284	284	284
							Outdoor Non-revenue water 11%	0	8	15	15	15	15
							Indoor Non-revenue water 11%	0	6	13	17	17	17
							Total Indoor	0	56	135	167	167	167
							Total Outdoor	0	84	151	148	148	148
							Total Proposed Project Demand	**0**	**140**	**285**	**316**	**316**	**316**

SECTION 3 – OTHER ESTIMATED WATER DEMANDS

3.1 INTRODUCTION

As stated in this excerpt from Water Code Section 10910(b)(3): *"[T]he water supply assessment for the project shall include a discussion with regard to whether the public water system's total projected water supplies available…will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses…"* This section details the City's other "existing and planned future uses." For purposes of this WSA, existing and planned future uses are subdivided into the following:

- **Other Currently Proposed Projects** – in addition to the Proposed Project, the City of Lincoln (City) is the Lead Agency (pursuant to CEQA) for three additional proposed large development projects and one smaller project that have already completed WSAs but have yet to start construction. As Lead Agency, the City requested separate WSAs for each of these other projects though they were prepared prior to new land use information, revised demand estimates are now available. Because general plan land-use information is available for other planned developments, each of these projects have unique water demand estimates that are included in this WSA.

- **All Other Existing and Planned Future Uses –** in addition to the Proposed Project and the Other Currently Proposed Projects, existing customers and anticipated growth in the County must be quantified. The subdivisions of this category are:

    - **Current Customers and Uses** – using the 2015 UWMP as a baseline condition, this category reflects the current range of the City's potable and recycled water customers. Because these customers and uses already exist, keeping them separate from planned future uses allows an analysis to reflect anticipated reductions in use over time as Lincoln continues to implement its urban water conservation programs targeted at many of the existing customers.[26] As the majority of existing demand is from after the implementation of early water efficient plumbing codes, achievable conservation is minimal.

    - **Current Projects Underway** – within the City limits there are nearly 20 developments that are approved and ready to start or currently underway. This category includes nearly more than a dozen smaller development projects with as little as 10 units and projects underway with only half a dozen units to be

[26] New customers added to Lincoln's system will have lower demand factors, as discussed in Section 2, and will be less likely to implement additional conservation or see much reduction when changes are made. For instance, some existing customers may still have 3 gallon per flush toilets and many have 1.6 gallon per flush toilets, which when replaced, will likely only use 1.28 gallons. New houses will be constructed, per the CAL Green Code, with 1.28 gallon per flush toilets.

completed. This category also includes some parts of larger developments that are yet to be completed such as the southern portion of Twelve Bridges with more than 1,000 single family units remaining to be built.

- **Adjusted General Plan Land Use Growth** – in addition to the identified development projects currently undergoing CEQA review, the City's 2008 General Plan Update (GPU) anticipates continued urban growth throughout the City's sphere of influence. Adjustments to anticipated GPU growth to reflect the revised projections for proposed land-uses have been made. The adjustments discussed under this category include potential changes in the 2008 General Plan land use designations as identified in early project developments; specifically a revised water demand factor that accounts for the new efficient water use fixtures and building practices.[27]

- **Non-Revenue Water** – As discussed in Section 2.7.1, an additional demand is seen by the City to treat and deliver water to all customers. Referred to as non-revenue water, this water demand represents a 10 percent increase added to estimated customer demands. This value represents a long-term average experienced by the City of Lincoln.

3.2 OTHER CURRENTLY PROPOSED PROJECTS

As mentioned in the previous section, there are a number of projects either in the early proposal stage or with completed WSA's but yet to have started construction. The estimate of water demand for each project typically follows the same methods used in Section 2 of this WSA, with specific unit demand factors applied to each unique land use element or was developed in a manor appropriate for the specific project. The other projects are:

- Village 1 – located on the western edge of the existing City and straddling highway 193, the Village 1 project has a completed WSA but has yet to start construction.
- Village 7 – located south of the Proposed Project west of highway 65, Village 7 has a completed WSA but has yet to begin construction.
- Village 5/SUD B – located adjacent to the proposed project, Village 5/SUD-B has a completed WSA but has yet to begin construction
- Independence – located adjacent to the proposed project to the east

Based on the detailed analysis completed in the recent Urban Water Management Plan effort, these "Other Currently Proposed Projects" represent approximately 10,224 acre-feet per year of new demand by 2040 when accounting for losses. **Table 3-1**, presented later in this section, summarizes the estimated water demands as determined and detailed in the other WSAs for each

[27] The City understands that projects not yet having a complete specific plan may change, however calling the demands out separately than other general plan growth will better allow the City to address water supply requirements as the relate to each project.

unique project with modifications from the UWMP effort.[28] The values shown are the estimated customer and use demands and include the additional water associated with non-revenue percentages attributable to the treatment and distribution for each project (see **Section 3.5**).

3.3 ALL OTHER EXISTING AND PLANNED FUTURE USES

In simple terms, this category of use would typically reflect all the other water demands anticipated by the City that are in addition to the Proposed Project or other projects with a WSA including: other minor developments, developments currently underway, and future developments outside the City's current city limits without a specific plan. Because other potential changes to the 2008 General Plan Update have been brought to the City's attention, and the City anticipates changes to current customer uses, a more detailed assessment of future demands is warranted. This subsection describes:

- Current Customers and Uses
- Current Projects Underway
- Adjusted GPU Land Use Growth

3.3.1 Current Customers and Uses

Current customers and uses in the contiguous Lincoln service area provide a baseline from which to assess additional demand from the Proposed Project and other potential planned uses. For purposes of the WSA, the deliveries to current customers in over the last few years were used to define this baseline. Based on the past few years of non-drought impacted water use, the City delivers approximately 10,000 acre-feet into its potable water system to meet current demands. This value includes the non-revenue water (see Section 2.7.1), including system losses, necessary to deliver these supplies from their respective treatment plants to the customer meter.

Given on-going conservation efforts, adoption of new rate structures, and other drivers, the City has seen an overall decrease in the annual customer use since the 2010 UWMP. Combined with this reduction in demand, the growth rate of new units coming online has left the system balanced. Therefore, the 10,174 acre-feet baseline used for the 2015 UWMP and this WSA is more representative of what would be seen from existing customers and uses if drought measures were not in effect.

An adjustment to this baseline is necessary, however, to project it into the future. A decrease is assumed that reflects on-going implementation of conservation and installation of new water-

[28] It should be noted that the 2015 UWMP effort reevaluated growth rates and presented different growth rate results than the previous water planning documents. Specifically, the City's growth rates presented in the 2015 UWMP follow a long-term average growth rate (3%) rather than the specific growth rates presented in each previous WSA. The 2015 UWMP growth adequately accounts for the proposed growth rate or other large projects as described by the project proponents but differs from previous WSAs which anticipated significant development would have proceeded before the 2015 UWMP was completed.

using fixtures by existing customers. The City's continued leadership in conservation will enable existing customers to retrofit toilets, receive appliance rebates for new household items such as dishwashers, water heaters and clothes washers, and implement irrigation efficiency improvements through various incentives. Additional reductions in existing customer demands will also occur simply as a result of the natural replacement of old fixtures and appliances with lower water-use devices. The demand reductions described in this WSA follows the trend documented in the 2015 UWMP. However, his demand reduction trend is less than the conservation the City achieved in the 2015 drought.

3.3.2 Current Projects Underway

The City of Lincoln currently has approximately 20 projects underway within the existing City limits. This category of demand does not include planned villages that would require annexation. Six of these projects represent minor subdivisions with fewer than 30 units or developments with fewer than 30 units remaining to be built. A few of these developments are portions of much larger developments that have yet to be completed such as the remaining Twelve Bridges units which are to be built on the ungraded areas. Others include the mid-size developments generally with a few hundred units. In some instances, approved projects have been underway for more than a decade.

This class of development represents a significant challenge for the City as the number of developers involved makes tracking each development's progress and anticipated build-out difficult. Staff projections are the best available source of project timing but yearly estimates are uncertain. Given the location of these developments within the current City limits, it is anticipated that some of these developments will be completed within the 20 year time frame of this WSA and others may not be completed for a longer horizon into the future.

3.3.3 Adjusted GPU Land Use Growth

In addition to the planned developments, being the developments outside the City limits that will require annexation and have a WSA, the City has a number of other developments that are further out in the planning process. These other villages and SUDs are part of the general plan but have no specific plans as of yet. Land use projections are based off of housing density plans for vast areas and typical demand factors. These demands are expected to be re-evaluated as specific plans are developed. Since the General Plan, demand factors measured in the City have changed enough to necessitate re-evaluation of the projected demand impacts on the City. Though these projects will not likely be completed within the 20 year planning horizon of this WSA, some may start construction.

3.4 NON-REVENUE WATER DEMANDS

The subtotal values in **Table 3-1** represent the demand for water at the customer's meter for each category. To fully represent the demand placed on the City's water resources, non-revenue water

also needs to be included. Non-revenue water represents all of the water necessary to deliver to the meter and reflects distribution system leaks, water demands from potentially un-metered uses of fire protection, fire hydrant flushing, and unauthorized connections, and inescapable inaccuracies in meter readings. In most instances, the predominant source of non-revenue water is from system losses – the loss from fittings and connections from the City's water sources through tanks, major delivery system back-bone pipelines, smaller water mains, and single connection lines for individual customers.

Although the District has an established program for identifying and accounting for most unbilled and other system losses, there are still pipeline leaks, unmetered uses, unauthorized connections, meter inaccuracies, and other losses that are difficult to specifically quantify. Consistent with the District's methodology for calculating future water meter availability, non-revenue water is projected at a fixed rate of 10 percent.

As shown in **Table 3-1**, non-revenue demand for Existing and Planned Future Uses, not including the proposed project is estimated to be about 2,021 acre-feet per year by 2040.

3.5 Estimated Existing and Planned Future Uses

Combining the estimated water demand for Other Currently Planned Projects (see **Section 3.2** with the All Other Existing and Planned Future Uses demand (Current Customers, Projects Underway, etc.), the total estimated demand during each 5-year increment to 2040 is derived (see subtotal water demand in **Table 3-1)**.

Table 3-1 – All Other Existing and Planned Future Uses

Development	Estimated Demand (af/yr)					
	Current	2020	2025	2030	2035	2040
Other Proposed Projects	0	1,855	3,193	5,216	7,298	9,419
Current Demands	9,158	9,158	8,681	8,204	7,727	7,250
Projects Underway	0	50	225	293	301	433
GPU Land Use Growth	0	0	0	0	0	1,102
Total Water Demand	**9,158**	**11,063**	**12,099**	**13,713**	**15,326**	**18,204**
Loss (10%)	1,016	1,228	1,343	1,522	1,701	2,021
Total with Loss	**10,174**	**12,291**	**13,442**	**15,236**	**17,027**	**20,224**

3.6 Total Estimated Demand

The other existing and planned future water demands described in this section represent the total demands anticipated *in addition to* the water demands of the Proposed Project. Combining the estimated Proposed Project water demands of 316 acre-feet annually (see **Table 2-3**) with the estimated Existing and Planned Future water demands of approximately 20,225 acre-feet annually (see **Table 3-1**), a total estimated demand for City water supplies by 2040 is

determined. Estimated existing and planned future water demands, inclusive of non-revenue water needs, for each 5-year increment to 2040 are presented in **Table 3-2**. The estimated demand for City Water supplies in 2040 is approximately 20,542 acre-feet.

Table 3-2 – Total Estimated Water Demands

Category	Estimated Demand (af/yr)					
	Current	2020	2025	2030	2035	2040
Current Customer Use	10,174	10,174	9,645	9,115	8,585	8,055
Projects Underway	0	56	250	326	334	481
Other Proposed Projects	0	2,061	3,548	5,795	8,108	10,465
GPU Land Use Growth	0	0	0	0	0	1,224
Proposed Project	0	140	285	316	316	316
Total Water Demand	**10,174**	**12,431**	**13,728**	**15,553**	**17,344**	**20,542**

Of note is that the estimated water demand for 2040 presented in **Table 3-2** is only slightly different than the 2015 UWMP demands. Differences are due primarily to the difference in the projected demands of the Proposed Project in the UWMP versus the land use classifications and accompanying demand numbers derived from the SUD-B Northeast Quadrant Specific Plan. Differences may also be due to the delay caused by slower than expected growth and due to efficiency increases realized or mandated since the 2015 UWMP update.

SECTION 4 – WATER SUPPLY CHARACTERIZATION

4.1 INTRODUCTION

This chapter describes the City of Lincoln's existing and planned supplies for the 20 year period covered in this Water Supply Assessment (WSA). The water supplies that are used within the City and its Sphere of Influence (SOI) are derived from Placer County Water Agency (PCWA), Nevada Irrigation District (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. Nevertheless, the City will provide retail water to meet the Proposed Project's needs.

4.2 HISTORICAL POTABLE WATER SUPPLIES

The City's water supplies have historically included water supplies that are treated and delivered through PCWA's treatment and conveyance system. The water that is treated and delivered to the City consists of PCWA surface water rights and entitlements as well as 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 summer maximum day and peak hour water demands. **Table 4-1** shows the City's annual surface water and groundwater potable water supply volumes that have been used to meet the City's treated water demands.

Table 4-1 – City of Lincoln Historic Water Supplies[29]

	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

[29] 2016 Water Supply Numbers were not available at the drafting of this WSA.

The City generally only purchases and delivers water that is necessary to meet the City's customers' demands. Historically, the City relied upon significant quantities of groundwater to meet demands but has since transitioned to acquiring surface water assets from PCWA and NID. 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.

4.3 EXISTING WATER SUPPLIES AND ENTITLEMENTS

There are six primary water contracts and entitlements (collectively, "water supplies") that are used within the City's existing service area and SOI. All six 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
- Groundwater rights
- Recycled water rights
- PCWA raw water entitlements
- NID raw water entitlements

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 customers' demands. Importantly, the structural framework morphs and changes requiring the City's water managers to adjust water asset management and system operations.[30]

4.3.1 PCWA Treated Water Supply Contract

In 2012, the City entered into an updated water supply contract with PCWA for delivery of treated surface water.[31] 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.[32] The contract distinguishes between regulated and unregulated deliveries as follows:

[30] The City is investigating additional water assets that may be included in its water supply portfolio.
[31] 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"). This contract is attached to this WSA as **Appendix A**.
[32] Article 5(b) PCWA Contract.

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

Regulated water deliveries are those deliveries where the City uses its system operations to deliver water on a demand pattern for certain uses within the City. Specifically, the City uses its facilities to regulate pressure and accommodate peak demands. Unregulated water deliveries are those water deliveries that are made to the City where PCWA uses its system operations to manage the water deliveries. PCWA's unregulated deliveries currently serve the City's "high elevation lots" generally in the Catta Verdera area.[33] The contract also contains opportunities for the City to purchase additional supplies beyond the Maximum Delivery Entitlement identified in the PCWA contract.

The City's PCWA contract provisions require PCWA to deliver water up to the maximum 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 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 drought reductions, the City's maximum day (max day) regulated use under the contract was 13,944,160 gallons and the max day unregulated water use was 605,716 gallons.[34] This delivery included water derived from NID's water assets – which is described in more detail below.[35] 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 121,000 million gallons on the unregulated side.[36] 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

[33] Article 5(c) PCWA Contract.
[34] Letter to Matthew Brower from Brent Smith dated March 1, 2016 at page 2. (Hereafter, "PCWA Letter").
[35] PCWA Letter at page 1.
[36] PCWA Letter at page 2.

Plant.[37] The recent treated water supply quantities delivered by PCWA to the City are shown in **Table 4-2**.

Table 4-2 – Historic PCWA Water Supplies Delivered to the City of Lincoln[38]

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

4.3.2 PCWA Water Rights

Importantly, the City's water supplies contemplated in the PCWA Contract for delivery to the City are grounded in PCWA's water rights and contracts. In other words, 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. Collectively, all of these water rights are the source waters constituting the supplies available under the PCWA Contract.[39] **Table 4-3** below depicts PCWA's available supplies for the City of Lincoln under PCWA's various water rights.

[37] PCWA Letter at page 2.
[38] 2016 Water Supply Numbers were not available at the drafting of this WSA.
[39] The City of Lincoln's 2015 UWMP provides more detail on the underlying water reliability issues associated with PCWA's water rights and contracts.

Table 4-3 – PCWA Available Surface Supplies[40]

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.[41]

4.3.3 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.[42] 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 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.

[40] Availability of CVP supply requires necessary diversion and conveyance infrastructure to be built. Full diversion of the MFP requires additional conveyance capacity at the American River Pump Station as well as construction of Ophir Water Treatment Plant.
[41] This total supply may be used in all areas within the City based upon the City's, NID's, and PCWA's mutual understandings and water rights determinations.
[42] This document is attached as **Appendix B**.

Nevertheless, NID's 2015 Draft 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.

In September 2004, the City, PCWA and the Nevada Irrigation District (NID) entered into a 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 4-4** below summarizes NID water deliveries into the City's service area from 2008 through 2015. The delivery mechanism for these supplies has been PCWA's treatment and delivery systems.

Table 4-4 – Historic NID Water Supplies Delivered to the City of Lincoln[43][44]

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 separate water treatment plant that would serve NID water and potentially PCWA water to various areas in Lincoln and Lincoln's SOI.[45] This proposed facility could deliver as much as 17,500 acre-feet of water per year.

4.3.4 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

[43] 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.
[44] 2016 Water Supply Numbers were not available at the drafting of this WSA.
[45] The Water Facilities/Planning Phase Agreement is included in **Appendix C**.

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.

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 4-5** shows the reservoirs and their storage capacity.

Table 4-5 – 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

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.

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 4-6** below shows NID's normal year, single dry year, and multiple dry year supply reliability forecast.

Table 4-6 – 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

On February 4, 2004, the City and NID entered into a Memorandum of Understanding (MOU) to assess the feasibility of providing the City with a treated water supply. Among the numerous efforts undertaken pursuant to the MOU was completion of the *Lincoln Area Water Treatment Plant Planning and Site Study* (WTP Study) in August 2005. As described in the WTP Study, the treatment plant would be capable of meeting projected annual water demand of 17,500 acre-feet per year. Of this amount, approximately 70 percent would be allocated to the City, which is estimated to be approximately 12,000 acre-feet per year.

On July 4, 2007, the City and NID established a conceptual framework for the development of a treated water facility including a Framework for Collaboration. The City and NID contemplate moving forward under the following four definitive agreements:

1. Agreement on the respective service areas of NID and Lincoln;
2. Agreement regarding the planning required to install the water treatment plant and associated facilities, including environmental evaluation (adopted by NID Board and Lincoln City Council in 2007);
3. Agreement on terms and conditions of treated water service to be provided, at wholesale, by NID to Lincoln; and
4. Agreement on the financing and construction of the identified Project.

NID is currently working on completing the planning, design studies, and engineering details necessary to better define the project and its alternatives. Once this step is complete, NID plans to move forward with the environmental review process. NID had planned to start operating the plant by 2015 based upon previous land use growth projections. 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 the City.[46]

4.3.5 Groundwater Supplies and Management

The North American Groundwater Subbasin (Subbasin), the aquifer system underlying the City of Lincoln, 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

[46] NID's 2015 UWMP incorporates a value of approximately 12,000 acre-feet per year of water that the City of Lincoln will use to meet its demands within NID's service area in the City of Lincoln. The 2008 NID Regional Water Supply Project, Land Use and Water Demands Memorandum confirms this number and is attached as **Appendix E**.

(DWR) in Bulletin 118-2003 as Basin No. 5-21.64. 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 source for the City.

The City maintains 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. 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 are shown in **Table 4-7** below.

Table 4-7 – Active Wells

Well Name	Design Capacity, gpm	Year Built/ Upgraded	Status
Well No. 2-Nicolaus Rd.	900	1984/1990/2015	Operational
Well No. 6-Westwood	800	2000	Operational
Well No. 7-Moore Rd.	1,100	2002	Operational
Well No. 8-Fiddyment	1,400	2004	Operational
Well No. 9-Nelson	2,300	2005	Operational

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

The City's wells are used to supplement supply and manage operational pressures in the lower pressure zones. Availability of surface water supplies from PCWA and NID will continue to reduce the City's reliance on its groundwater assets. As urbanization occurs, groundwater pumping for municipal and industrial demands will increase but will likely be more than offset by the reduction in groundwater pumping by private agricultural users. **Tables 4-8 and 4-9** below show the City's historic groundwater pumping as well as its projected groundwater pumping into the future.

Table 4-8 - Historic Groundwater Pumping[47]

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

Table 4-9 - Projected Groundwater Pumping

Acre-feet				
2020	2025	2030	2035	2040
1,243	1,373	1,555	1,734	2,054

[47] 2016 Water Supply Numbers were not available at the drafting of this WSA.

The City currently limits groundwater use during normal years to 10 percent of its build-out demand – which is anticipated to be approximately 3,600 acre-feet. To maximize the benefits of this groundwater supply it is critical that the wells are used as a peaking source only in the summer months with daily production increasing with the daily demands. This type of operation can help offset the peak day demands on the surface water supply and help manage pipe velocities in peak hour scenarios.

The current groundwater pumping system has a combined capacity of 8.5 mgd or about 75 percent of the current maximum day demand which is sufficient as an emergency supply for all but the hottest summer irrigation days. The total capacity of the system on any given day will vary depending on the number of wells in operational condition.

4.3.6 Western Placer County Groundwater Management Plan[48]

In 2006, a Memorandum of Understanding was signed by Lincoln, PCWA and the City of Roseville to proceed with the West Placer County Groundwater Management Plan (WPCGMP) effort. The Basin Management Objectives are listed below:

- Management of the groundwater basin shall not have a significant adverse effect on groundwater quality;
- Manage groundwater elevations to ensure an adequate groundwater supply for backup, emergency, and peak demands without adversely impacting adjacent areas;
- Participate in State and Federal land surface subsidence monitoring programs;
- Protect against adverse impacts to surface water flows in creeks and rivers due to groundwater pumping; and
- Ensure groundwater recharge projects comply with State and federal regulations and protect beneficial uses of groundwater.

The City, working with PCWA and others, developed the WPCGMP.[49] This effort builds upon and expands the geographic coverage of the City's own GMP.[50] As documented in both the City's GMP and the WPCGMP, the groundwater conditions underlying the City and the SOI indicate currently and historically stable groundwater elevations and reliable water quality.

[48] A summary of the groundwater basin is included as **Appendix F** and the WPCGMP **is provided as Appendix G** to this document

[49] Adoption by the City of Lincoln of the WPCGMP occurred in December 2007. The WPCGMP can be viewed at the City of Lincoln Public Works Department.

[50] The City of Lincoln November 2003 Groundwater Management Plan can be viewed at the City of Lincoln Public Works Department.

The City is planning to install additional wells within the Lincoln Sphere of Influence to be able to, when necessary in back-up and emergency situations, meet 75% of the average day demand at build-out (approximately 34 mgd) with groundwater. The City is conducting ongoing groundwater investigations to help determine optimal well spacing and pumping schedules.

The City will continue its field and theoretical analyses over the next few years, developing a Lincoln area groundwater model and quantifying recharge and recoverable groundwater volumes. The City is currently in discussions with the Regional Water Authority, PCWA, the County of Placer and the City of Roseville regarding the sharing of groundwater data in the Western Placer County area, and developing a mutually beneficial Integrated Water Resources Management Plan. The Integrated Water Resources Management Plan will address anticipated water use policies and goals regarding surface water, groundwater and reclaimed water in western Placer County. All parties signed a Memorandum of Agreement in the fall of 2007 allowing implementation of the actions in the WPCGMP.

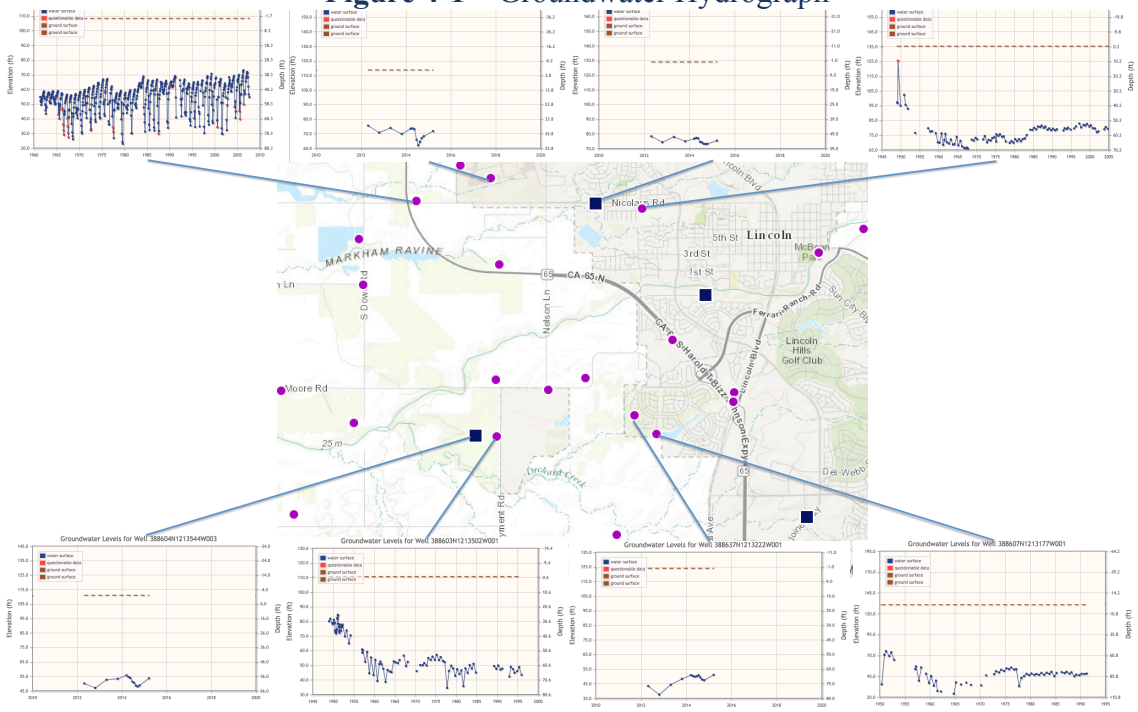
The WPCGMP will likely be the basis technical document for groundwater supply in the City of Lincoln related to the 2014 Groundwater Sustainability legislation. At this time, the City and its regional partners are determining the nature and jurisdictional reach of the groundwater sustainability actions but there is no reason to conclude that the sustainability plan will differ from the WPCGMP currently in use.

In 2015, a review of the groundwater conditions in the area of the City was drafted to support the Water Supply Master Plan and 2015 UWMP update. The following information was taken from an internal memo about groundwater conditions:

> *Groundwater conditions in and around the City appear, in spite of the sever drought, relatively stable. The basin elevations have not seen significant long-term decline and in some cases have shown some recovery. Groundwater elevations have seen increased seasonal variability in some wells and decreased in others but the natural recharge has been sufficient to refill the basin in and around the City. This indicates that the basin in and around the City is operating within it's safe yield. Although basin decline was caused by the 2011 canal failure and resulting emergency pumping, the basin was able to completely refill with no apparent long-term effects in the City area. This indicates that the 2011 pumping may have been above the area's safe yield, but did not cause a permanent decline in groundwater capacity. Unbroken periods of well records are difficult to locate in the area of this review but neighboring wells with new and old data show consistent elevations.*

A hydrograph from the groundwater memo is shown below in **Figure 4-1**. For the purposes of this WSA, groundwater is considered a reliable supply usable for both potable and non-potable purposes.[51]

Figure 4-1 – Groundwater Hydrograph



4.3.7 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.

4.3.8 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 water deliveries and payment obligations are not controlled by the City. The raw water offsets potential potable water use within the City of Lincoln.

4.4 Recycled Water

Lincoln's Wastewater Treatment and Reclamation Facility (WWTRF) became operational in 2004 for the purpose of treating wastewater generated within the City. The

[51] Draft 2015 Groundwater Conditions and Long Term Planning WSMP Support Memo, Tully & Young, Inc.

WWTRF is capable of producing tertiary treated recycled water that meets DHS requirements in Title 22 for unrestricted reuse. The 2008 WWTRF Expansion Plan contemplates the expansion of the capacity of the WWTRF to accommodate an increase in flow as the City of Lincoln's treated water demand increases in the coming years.

While plant capacity will dictate the potential recycled water supply from the WWTRF, treated water demand and the wastewater generated from such demand will drive the quantity of water available for reuse after treatment. Because it is not certain at this time whether the City of Lincoln will partner with Placer County and/or the City of Auburn, for use of Recycled Water, the recycled water availability analysis that follows assumes only the WWTRF is only treating wastewater generated by the City of Lincoln's treated water service customers is the available reclaimed supply for Lincoln.

The City of Lincoln has identified existing and potential recycled water users.[52] The City of Lincoln identifies three recycled water use categories, including Agricultural Irrigation (i.e., crops), Landscape Irrigation (i.e., parks, golf courses, road medians, highway landscaping), and Industrial/Commercial (i.e., cooling, washing, and other process uses) uses. The City's Recycled Water Master Plan indicates that significant infrastructure will be constructed throughout the City in order to deliver treated wastewater to end-users. Since 2000, the City has been installing "purple pipe" within the new developments that will use the recycled water produced by the City. Uses for recycled water include irrigation of parks, school grounds, and median landscapes (including along the Highway 65 Bypass right of way) as well as industrial cooling and process water for a few of the City's primary industries. Recycled water may be available to meet uses in various new developments.

The current design daily average dry weather flow capacity of the WWTRF is 5.9 MGD. The City recently completed a WWTRF expansion and upgrade to increase the design average dry weather flow 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 allows for an increase in the permitted average dry weather flow up to 8.4 MGD to accommodate growth within the City's service area and additional regionalization projects.

Recycled water from the WWTRF is currently utilized for agricultural purposes or is discharged into Auburn Ravine. 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. Nevertheless, out of an abundance of caution for purposes of this

[52] City of Lincoln, Technical Memorandum 1, Recycled Water Users Description and Phasing, April 16, 2007 (Lincoln Recycled Water Tech. Memo 1).

WSA, the City has assumed that all potential non-potable water demands will be met with potable supplies.

4.5 SUD-B Northeast Quadrant Water Supplies

SUD-B Northeast Quadrant water demands will be met with a combination of surface water and groundwater as shown in **Table 4-10**. Treated surface water from PCWA will be the primary source of water for the Proposed Project. Consistent with the City's goal, groundwater will be used to meet no more than 10 percent of Proposed Project's annual water demands during normal years – an average value when considering the need to provide backup, emergency and peak day water supplies to appropriately manage surface water deliveries. This usage is consistent with the WPCGMP described in section 4.3.6.

Table 4-10 – SUD-B Northeast Quadrant Water Supplies

Supply (AF)	2015	2020	2025	2030	2035	2040
Groundwater	0	14	29	32	32	32
Surface Water	0	126	257	284	284	284
Total Supply	0	140	285	316	316	316

4.6 City of Lincoln's Projected Water Supply Reliability

The City of Lincoln has reliable and redundant water supplies. Specifically, the City has surface water supplies under its contractual relationships with PCWA and NID that are derived from two vast and wet watersheds – the American River system and the Yuba-Bear system. Both PCWA and NID have planned to serve their respective service areas within the City's existing boundary and Sphere of Influence – calculating the City's future demands into their planning documents, including each agencies 2015 UWMPs.

In addition, the City has access to groundwater throughout its service area as well as recycled and raw water to meet non-potable demands. Together this portfolio of water supplies is robust and provides ample security for the City's long term water planning. Importantly, as noted above, the City will only access and use water supplies that it needs in any given year. For example, even though PCWA has allocated approximately 37,000 acre-feet of water to meet the City of Lincoln's needs, the City, in any given year, will only access and pay for the volume of water it needs to meet its existing demands. As such, the City will not be taking excessive water assets through its system even though it may have the ability to call on those assets as needed.

SECTION 5 – SUFFICIENCY ANALYSIS

5.1 INTRODUCTION

The analysis detailed in this section provides a basis for determining whether sufficient water supplies exist to meet the estimated water demand of the Proposed Project.[53] The WSA must provide a reasoned analysis of the likely availability of the identified supplies to serve the Proposed Project, while considering the demands of existing and other future planned-for demands on those supplies. [54]

This section includes:

- Analysis of sufficiency of groundwater to serve the Proposed Project, considering variations in supply and demand characteristics under normal, single-dry and multi-dry hydrologic conditions.
- Analysis of sufficiency of PCWA and NID treated water to serve the Proposed Project, considering variations in supply and demand characteristics under normal, single-dry and multi-dry hydrologic conditions.
- Analysis of conclusions for purposes of determining water supply sufficiency.
- Alternatives analysis of sufficiency when considering recycled water supply sources that will be used to meet a portion of the demands of the Proposed Project.

5.2 GROUNDWATER SUPPLY SUFFICIENCY ANALYSIS

The sufficiency analysis integrates the water demands detailed in **Section 2** with the water supplies characterized in **Section 4** in light of existing and planned future water uses. The results are presented in **Table 5-1** beginning with "current" conditions

[53] CWC § 10910 (c)(4) provides that "If the city or county is required to comply with this part pursuant to subdivision (b), the water supply assessment for the project shall include a discussion with regard to whether the total projected water supplies, determined to be available by the city or county for the project during normal, single dry, and multiple dry water years during a 20-year projection, will meet the projected water demand associated with the proposed project, in addition to existing and planned future uses, including agricultural and manufacturing uses."

[54] *Vineyard Area Citizens for Responsible Growth, Inc*. v. *City of Rancho Cordova* (2007) 40 Cal.4th 412, 430-32.

(recognized as 2008 to 2015 period)[55] and continuing with 5-year increments from 2020 through 2040. While the analysis at various intervals before build-out is important, the most critical projection for the sufficiency analysis occurs in 2040. This analysis assumes that the Proposed Project is fully constructed in line with the Specific Plan, well before 2040.

Table 5-1 incorporates the Proposed Project's water demand projection in **Table 2-3**, assuming the Proposed Project develops as detailed in **Section 1**, and presents "existing and planned future uses" on the North American Subbasin expected during normal years, years with emergency supply issues, and long-term average.[56] The emergency usage represents years like 2011 when PCWA's Bear River Canal failed and surface water supplies were limited. This City was able to pump the groundwater basin at nearly triple the extraction volume of 2010 enabling it to maintain service to customers. Lower pumping in the following years has resulted in a recovery of levels in the groundwater basin and trending of long term average use back down to the 10% target. The normal year and emergency usage values are effectively pumping targets to maintain the long-term average.

Table 5-1 – 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.[57] 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.

5.2.1 Existing and Planned Future Uses

As required by statute, the analysis of sufficiency needs to consider existing and planned future uses that would be served in addition to the Proposed Project. Since there are other users of the same groundwater basin, the identification of existing and planned future uses expands beyond the boundaries of the City.

5.2.1.1 Western Placer County

In Western Placer County, the cities of Lincoln and Roseville, PCWA, and California American Water Company will rely upon some groundwater to meet municipal and

[55] This period was chosen to represent the "current" condition because of the minor increase in housing over that period. To account for drought impacts to supply and demand as well as extra pumping to address a PCWA canal outage 2011, 2012, 2014, and 2015 are removed from the average calculation. Using a period of normal use is more accurate for long term planning. 2016 Data was not yet available at the time of this drafting but would also have required normalization due to drought conditions.
[56] See California Water Code Section 10910(c)(3)
[57] 2016 Data was not yet available at the time of this drafting.

industrial demands. Because of the large amounts of surface water provided by PCWA, neither the City of Roseville, California Water Service Company (West Placer Service Area), nor PCWA currently pump groundwater. As a result of the surface water supplies from PCWA and NID, the City of Lincoln will continue to limit groundwater to 10% of its overall supplies to meet emergency and peak demands during normal years. Service areas of the Cities of Lincoln and Roseville, PCWA, and California American Water Company comprise a majority of the western portion of the North American Groundwater Subbasin. As described in Subsection 4.6.5, the implementation of the Western Placer Groundwater Management Plan (WPCGMP) will help ensure that groundwater levels remain stable as urban areas expand. It is likely that additional groundwater is available as high agricultural use is converted to low urban use.

Private agricultural users in western Placer County also pump some groundwater to supplement surface water deliveries. This use is limited and, as described below, accounts for less than 5 percent of total agricultural water supplies. This is largely due to the availability of surface water supplies from PCWA. Groundwater pumping by private agricultural users is not anticipated to increase from existing uses as crop types are not likely to change substantially. Further, agricultural groundwater use will likely decrease as urbanization occurs throughout the area.

No significant changes are expected in groundwater pumping in dry years in the Western Placer County portion of the North American Subbasin.

5.2.1.2 Eastern Sutter County

The portion of eastern Sutter County that overlies the North American Subbasin includes the Natomas Central Mutual Water Company (NCMWC) and the South Sutter Water District (SSWD). NCMWC's service area includes over 33,000 acres, a portion of which lies within Sutter County. NCMWC has rights and entitlements to over 120,000 acre-feet per year of surface water from the Sacramento River. Groundwater within NCMWC is pumped by privately owned wells to supplement surface water supplies. It is estimated that rice accounts for over 80% of crops grown within NCMWC. Despite the predominance of this high water-using crop, groundwater levels within NCMWC's service area have remained relatively stable as per the NCMWC Groundwater Management Plan. Any shift toward different crop types or urbanization of these lands would likely reduce reliance on groundwater in the future.

SSWD covers approximately 57,000 acres and supplies surface water to supplement groundwater as needed. SSWD is considered a "supplemental" water district because it does not provide full service to landowners. Instead, SSWD allocates supplemental surface water supplies according to acreage of land owned. Similar to NCMWC, rice accounts for a majority of agricultural land use within SSWD's service area. Most of

SSWD's customers are agricultural-based and use private wells to obtain the majority of their water supplies.

5.2.1.3 Future Groundwater Demand Growth Outside the City

The City of Lincoln does not expect any significant growth in groundwater use in the North American Subbasin. This is due to the prevalence of delivered surface water use in the area and the lack of undeveloped farmland in the area. Further urban growth will displace agricultural activities, and like existing farming and residential uses, continue to more heavily rely on surface water supplies.

In addition, the 2014 Sustainable Groundwater Management Act (SGMA) will likely limit future development of groundwater. Under the SGMA, water users overlying the North American Subbasin will need to form a Groundwater Sustainability Agency (GSA) as well as a Groundwater Sustainability Plan (GSP). The purposes of these legislative requirements are to (1) create a management structure capable of protecting groundwater resources; and (2) develop a plan that will allow for the continued protection of groundwater in defined groundwater basins. Management of the North American Subbasin will require cooperation among various public and private entities in Sacramento County, Placer County and Sutter County. Although the specific details of how this cooperation will manifest have not yet been identified, the overarching principle to maintain a sustainable groundwater basin – in accordance with recognized Groundwater Management Plans – likely safeguards basin-wide groundwater pumping.

5.2.1.4 Future Groundwater Demand Growth by the City

To understand whether future groundwater uses within the areas of the SOI are similar to historic and existing uses of groundwater for irrigated agricultural, and therefore reasonably certain to exist, an analysis was completed for the 2008 General Plan Update EIR. Primary data sources and assumptions used in the analysis include:

1. Data:
    a. Existing and anticipated future crop acreage data for the lands within the Adopted 2008 General Plan Update area but outside the previous City boundaries - ECORP Consulting as used in the Adopted 2008 General Plan Update
    b. Evapotranspiration rates, crop coefficient values and precipitation – California Irrigation Management Information System (CIMIS) for Station #131 (Fair Oaks)
    c. Irrigation methods and associated irrigation efficiencies – Technical Memo: On-Farm Irrigation Systems Management (June 1994) prepared in support of the Bureau of Reclamation, Mid-Pacific Region's Central Valley Project Improvement Act Programmatic EIS

2. Assumptions:
    a. Groundwater is used to regionally supplement PCWA raw water supplies:
        i. Early in the growing season for some PCWA contractors
        ii. Directly to irrigate crops with no surface water supplies
        iii. To supplement shortages in PCWA raw water based on a frequency of shortfalls once every 6 to 10 years (equivalent to a 10 to 15 percent occurrence of shortfalls in surface water supplies over multiple years).
    b. Groundwater use for early irrigations and for lands with no surface water is assumed to represent 10 percent of the total estimate of applied water
    c. Based on PCWA's Integrated Water Resources Plan, shortages to users in Zone 5 are estimated to be 15 percent. Notations in the document, however, indicate raw water customers are cutback prior to wholesale treated water customers, which could lead to a conclusion that this assumption is too low of a reduction (i.e. shortages would be greater than 15 percent for irrigated agricultural customers).
    d. The long-term annual average of this shortage condition is represented by assuming an additional two percent of the applied water is met with groundwater every year (e.g. Nine of ten years has 100 percent surface supply and one year has only 85 percent).
    e. Combined, groundwater is assumed to meet 12 percent of the annual applied water demand for the crops within the SOI under both existing and future conditions.

In order to understand the relationship between existing and future groundwater use within the Adopted 2008 General Plan Update area and estimates of annual applied water demands for agriculture needed to be calculated. **Table 5-2** indicates the estimated applied water use under the existing crop acreage and crop mix, as well as that expected after build-out according to the Adopted 2008 General Plan Update. Estimates of annual applied water for irrigation uses were derived by multiplying existing and projected acreages for various crop types by applied water demand factors.

Table 5-2 – Estimated Current and Future Groundwater Pumping by Agricultural Users in the City's SOI

Irrigated Acres in SOI			Applied Water per Acer (feet)	Total Applied Water (AF/yr)	
Crop	Existing	Future		Existing	Future
Alfalfa	220	129	4.7	1,034	605
Orchards	100	95	4.4	441	418
Pasture	901	193	4.8	4,325	927
Rice	3,168	515	5.7	18,060	2,933
Row Crops	2,116	689	4.6	9,735	3,169
Totals	6,506	1,620	-	33,595	8,052

Using the conservative assumption that only 12 percent of the total applied water needs are met with groundwater, it is estimated that current use of groundwater within the SOI represents approximately 4,000 acre-feet annually. Under future conditions, groundwater use for irrigated crops is estimated to be about 1,000 acre-feet per year. This represents a reduction of about 3,000 acre-feet per year from current conditions as a result of irrigated lands taken out of production for new land uses proposed in the Adopted 2008 General Plan Update.

However, although not serving agricultural needs, these lands will have urban uses that will be served groundwater on an average of 10 percent of the demand. Thus, a comparison of the existing, sustained groundwater use to that anticipated upon conversion will help assess whether the urban uses increase, decrease or match the historic groundwater use on the same lands. In order to perform this comparison, only the portion of demand anticipated from the additional lands of the SOI should be compared.

As previously stated, the City's goal for groundwater use in normal years is 10 percent of the anticipated demand at build-out. In the Adopted 2008 General Plan Update general plan that number was approximately 5,300 acre-feet per year. Given that the City already uses groundwater and has anticipated using groundwater to meet emergency, dry, and back-up water demand within the existing City, a portion of the anticipated future demand for groundwater is already represented in planning documents or reflected in the current and historic stable groundwater conditions underlying the City. Using the same 10 percent goal and the revised build-out demand of 35,986 developed from ongoing Water Master Planning efforts, approximately 3,600 acre-feet of groundwater had been anticipated to meet previously planned build-out demands. Therefore, the SOI acreage in the 2008 General Plan Update results in an incremental increase in the anticipated use of groundwater, while still remaining at a goal of 10 percent.

The increment of groundwater demand necessary to meet the expanded built-out water demand under the Water Master Planning efforts is therefore only about 1,600 acre-feet[58]. Comparing this to the estimated decrease in use of groundwater for irrigated agriculture indicates an offset of approximately 2,400 acre-feet . Thus, the incremental increase in use of groundwater as part of the City's water supply portfolio represents a 2,400 acre-feet net reduction in groundwater pumping within the SOI. As documented in the WPCGMP and the City's GMP, the groundwater elevations underlying the City and the SOI have remained stable at current conditions.

Therefore, it is safe to conclude that the increment of additional groundwater use for the City's planned growth would be fully offset with reduced pumping and still maintain

[58] 3,600 acre-feet less the current ~1,000 acre-feet average use.

current stable groundwater conditions. Continued monitoring and management of the groundwater as indicated in both the WPCGMP and the City's GMP will help maintain this condition over time while still providing a reliable increment of groundwater for the City's emergency, dry and peak water demand needs.

5.3 PCWA AND NID SUPPLY SUFFICIENCY ANALYSIS

The following section details the sufficiencies of PCWA and NID supplies for both normal, single-dry, and multi-dry year periods.

5.3.1 Normal Year Supply

During normal years, the City of Lincoln will rely upon a portfolio of water supplies consisting of treated surface water from PCWA and NID, groundwater and recycled water. Water supplies that are projected to be available to meet water demands projected as described in Section 2.5 are shown in **Table 5-3**.

Table 5-3 – Projected Water Supplies Needed for Demands

Source (AF)	2020	2025	2030	2035	2040
PCWA	9,065	9,991	11,632	12,699	13,220
NID	2,123	2,364	2,366	2,911	5,267
Groundwater	1,243	1,373	1,555	1,734	2,054
Total	12,431	13,728	15,553	17,344	20,542

According to PCWA's 2015 UWMP and the City's 2015 UWMP, up to 37,000 acre-feet will be available to the City of Lincoln for use to meet municipal and industrial demands by build-out. However, with the recent slowdown in the economy and subsequent slow down in new construction, the City does not anticipate a need for more than about 18,000 acre-feet per year of treated surface water delivered by PCWA to meet demands through 2040.

As discussed in Section 4, the City is currently working with NID to ultimately receive approximately 12,000 acre-feet per year of treated water from NID facilities. No more than 5,300 acre-feet per year of water should be needed from NID through 2040.

As previously described, the City's goal is to use groundwater pumping for approximately 10 percent of demands during normal years. The amount of groundwater represented in **Table 5-3** is consistent with this goal.

5.3.2 Single-Dry and Multiple-Dry Year Sufficiency Analysis

During single-dry and multiple-dry water years, the City's surface water supplies may be subject to reductions due to characteristics of PCWA's and NID's sources of supply. As discussed in **Section 4**, the City could be subject to a reduction in PCWA supplies during a single-dry year and likely no reduction during multiple-dry years. These reductions are

based on a full normal year delivery of 37,000 acre-feet at build-out conditions as allocated to the City by PCWA.[59] This document, as shown in **Table 5-3**, does not anticipate a need for PCWA supplies to surpass 15,000 acre-feet by 2040. Therefore, for this assessment projected single-dry year reductions are based on the PCWA maximum reduction of 25% in dry years.[60] PCWA's various supplies all have different dry year reduction values but the PCWA contract does not specify which water supply the City is to be served by. PCWA has indicated that supplies could be reduced by only 5 percent in multiple dry years.[61]

Based on analyses in NID's 2015 UWMP, it is anticipated that the City's supply from NID would be subject to reductions during dry periods at the same level as other NID customers. NID, as demonstrated in 2015, may not reduce supplies at all during dry years.[62] Accordingly, the City is not anticipating any supply reduction from NID in dry or multi-dry years. To manage water supplies, the City will increase groundwater pumping to supplement any shortages resulting from curtailments to its PCWA and NID supplies, that allow it to stay within its long-term annual average pumping of 10%. Management of the City's water supplies during dry periods is shown in **Table 5-4**.

Conservative modifications to the estimated demands of the Proposed Project are made to reflect conditions expected during single-dry and multiple dry year events as follows:

Single dry year: Landscape irrigation demands will increase to reflect the generalized earlier start of the landscape irrigation season due to limited rainfall in the single driest year. Since this increase only applies to the outdoor portion of a customer's demand, an adjustment factor of 5 percent is applied to the total normal-year water demand values to conservatively reflect the expected increase in demand for water.

Multiple dry years: During multiple dry years, demands are also expected to increase during the first in a series of dry years – as discussed above for the single dry year condition. However, during the second and third consecutive dry years, demands also are expected to reflect water shortage contingency plans implemented by the municipal water purveyor.[63] During the second year, the water purveyor is assumed to request a reduction target of 10 percent. The resulting demand, however, only reflects a 5 percent reduction to accommodate conservatively low participation by customers. During the third year, the purveyor is expected to set a conservation target of 20

[59] Assuming the NID treatment plant is not online to supply NID water.
[60] Placer County Water Agency 2015 Urban Water Management Plan at 7-2.
[61] Placer County Water Agency 2015 Urban Water Management Plan at 7-3.
[62] All reduced water deliveries in NID's service area resulted from SWRCB's mandated water conservation requirements rather than a lack of supply in NID's system.
[63] Though the municipal water purveyor does not exist yet for the Proposed Project, this WSA assumes that whatever purveyor is established will develop a water shortage contingency plan to address drought conditions. This would be consistent with the County's ordinance regarding water conservation.

percent. For this analysis, the demands in the third year are only reduced by 10 percent to again reflect a conservatively low participation rate by the customers. Thus, during multiple dry conditions, demands both increase due to reduced effective precipitation, but also decrease (from the increased demand) to reflect implementation of short-term conservation measures.

Table 5-4 – Water Demand and Supply Comparisons during Normal, Single-Dry, and Multiple-Dry Years

Year	Projected Baseline Water Demand (AF)			Hydrologic Year Type	Water Supplies (Acre-feet)					
	City of Lincoln	SUD-B NE Quad	Total		PCWA Supply	NID Supply	Groundwater Supply*	Recycled Water	Total Supply	Surplus
2020	12,291	140	12,431	Normal	13,239	12,000	2,854	3,300	31,393	18,962
				Single Dry	9,929	12,000	2,523		24,452	12,021
				Multiple Dry	12,577	12,000	2,788		27,365	14,934
2025	13,443	285	13,728	Normal	15,421	12,000	3,117	3,748	34,286	20,558
				Single Dry	11,566	12,000	2,731		30,045	16,317
				Multiple Dry	14,650	12,000	3,040		33,438	19,710
2030	15,237	316	15,553	Normal	18,335	12,000	3,472	4,381	38,188	22,635
				Single Dry	13,751	12,000	3,013		33,145	17,593
				Multiple Dry	17,418	12,000	3,380		37,179	21,627
2035	17,028	316	17,344	Normal	21,187	12,000	3,820	5,015	42,022	24,678
				Single Dry	15,890	12,000	3,290		36,195	18,851
				Multiple Dry	20,128	12,000	3,714		40,857	23,513
2040	20,226	316	20,542	Normal	25,533	12,000	4,360	6,063	47,956	27,414
				Single Dry	19,150	12,000	3,721		40,934	20,392
				Multiple Dry	24,256	12,000	4,232		46,551	26,010

*GW pumping as listed in this table reflects the long term average projections from the 2015 UWMP. Actual pumping in a given year will be more inline with the discussion in **Section 5.2**.

As illustrated in the table above, the City's planned water supplies will be able to meet all current and future water demands in the depicted normal, single-dry, and multiple-dry water years without the need to implement demand reduction measures. Nevertheless, in the event that demand reduction is needed, in 2015, the City demonstrated its ability to reduce demands by over 25%.

Furthermore, as discussed in Chapter 4, the City is also developing non-potable water supplies that could be used to meet water supply needs when they are fully developed. This WSA assumes that there non-potable supplies are not used to meet existing demands within the City's service area or the Proposed Project.

5.4 Sufficiency Analysis Conclusions

As detailed in **Section 2**, this WSA estimates water demands for the Proposed Project to be 316 acre-feet per year at build-out during normal conditions (including non-revenue water demands).

Table 5-4 provides a detailed comparison of projected water demands and available water supplies. As shown in the table, surface water supplies are readily available and groundwater supplies are expected to be pumped as needed, with no identified "shortfall"

between available supplies and projected demands.[64] Based on this representation, sufficient water will be available under all hydrologic conditions in each of the 5-year increments through 2040.

The addition of the Proposed Project combined with planned growth in the City is expected to increase pumping during normal conditions from approximately 1,000 acre-feet (see **Table 5-3**) to approximately 2,100 by 2040 – essentially doubling the volume pumped by the City when compared to the normal historic pumping conditions. Redevelopment of irrigated crop lands to urban use coupled with the City's conjunctive management efforts in partnership with PCWA and the WPCGMP will continue to stabilize groundwater elevations in the North American Subbasin. The Subbasin is expected to continue to sustainably provide for the supplemental and emergency groundwater needs of the City.

Groundwater elevations throughout western Placer County have remained relatively stable for the past 25 years. As documented in the WPCGMP, groundwater elevations in many locations have actually risen during that time. As urbanization occurs in and around western Placer County and the City of Lincoln, annual groundwater pumping from the North American Subbasin is not anticipated to change significantly from existing quantities for the following reasons:

- Availability of surface water supplies from PCWA and NID will continue to limit reliance on groundwater to meet municipal and industrial as well as agricultural water demands.
- As urbanization occurs, groundwater pumping for municipal and industrial demands will increase but will likely be more than offset by the reduction in groundwater pumping by private agricultural users. This is demonstrated by the analysis shown in **Table 5-2**.
- Efforts by partners of the Western Placer County Groundwater Management Plan will help maintain sustainable groundwater resources in western Placer County.

Through 2040, the City will rely upon treated surface water from PCWA and NID, groundwater, non-potable water, and recycled water to meet water demands within its service area. During single-dry and multiple-dry years, the City may experience curtailments of its treated surface water supplies from the PCWA WTP. Under extreme

[64] The City of Lincoln utilizes its water assets on an as needed basis. As described in Section 4, the City does not acquire additional supply beyond its demand even though the surplus supplies are available from PCWA and NID. Groundwater is used as a backup supply and to manage system peaking.

conditions, the City will manage its water assets to meet its demands as demonstrated in the 2011 Bear River Canal failure and 2014-16 drought.[65]

Water demand projections were developed for the growth described in **Section 2.5**. Sufficient water will exist to meet all current and projected water demands through 2040 during normal, single-dry and multiple-dry years. PCWA's and NID's planned infrastructure development parallel the City's acquisition of water assets. If currently planned PCWA infrastructure improvements described below are completed, then the supply issues for the City are limited to the completion of the Phase 3 pipeline (currently in development). This increase in planned capacity would allow for additional deliveries sufficient to supply the City through the build-out of the Proposed Project without having to rely more heavily than necessary on groundwater.

With the combination of existing surface and potential groundwater supplies both the City and the SUD-B Northeast Quad development have adequate supplies in all water year types from current conditions to the build-out of the Proposed Project.

5.5 WATER SYSTEM CAPACITY

The City of Lincoln has ample water supplies available from PCWA and NID to meet its long-term water demands while maintaining its 10% groundwater production goal. The City's system is designed to deliver peak flows under normal conditions coupled with fire suppression requirements. Thus, although sufficient supplies are available, the critical component is the ability of the infrastructure to deliver those supplies while still meeting fire safety needs. The sections below described the infrastructure development necessary to deliver the water supplies to meet the City's long-term needs.

5.5.1 Existing PCWA Treatment Plant Capacity

As discussed in the March 2, 2016 letter from PCWA described in **Section 4**, there is unused capacity in PCWA's existing treatment plants that could be used by the City to meet future growth needs. This is estimated to be about 4.5 mgd that Lincoln already has rights to but is not currently using. There is another 3.86 mgd available on a first come first serve basis in PCWA's existing facilities in 2016. Using 1150 gpd/EDU there was enough capacity in PCWA's treatment plant along with the City's existing un-used rights to for over 6,800 additional EDUs.[66] The City's usage relative to these EDU's is

[65] As shown in the 2011 catastrophic canal failure, the City did augment water supplies with increased groundwater pumping. Moreover, the SWRCB's 2015 and 2016 mandated water conservation measures demonstrated the City's ability to conserve additional water even when PCWA and NID have adequate surface supplies to deliver.

[66] This number represents an availability at PCWA's treatments plants and a contractual availability to the City. This does not take into account current restrictions with the City's existing PCWA connection being rectified by the Phase III Project.

dependent upon the lot size and development potential. Nevertheless, one EDU has historically served approximately two houses in a medium density development.[67]

PCWA must deliver raw water to its treatment plants prior to treating and delivering the water to the City. PCWA's Ophir Pipeline Project will enable PCWA to deliver an additional 22,000 AF form the American River to its treatment facilities.

The connection from the treatment plant to the City's system results in a third limitation on system capacity. PCWA can deliver only 17.7 mgd through the existing connect with the City. An additional 5 mgd can be provided through the future Phase 3 pipeline and metering station. This Phase 3 pipeline is currently in the final planning stages and is scheduled for development.[68] The City's old 14" service pipeline was turned off in 2003 but remains connected for supply reliability and system redundancy. This pipeline remains in case of service interruption with the new pipeline but it is not intended to be utilized to serve additional demands.

5.5.2 Groundwater System Capacity

As discussed in the groundwater section, the City has an ample supply of water to accommodate future development. The City policy to use groundwater for approximately 10 percent annual average of normal demands to meet peaking and backup water needs. Separate from the 10% average use, the groundwater system itself is sized by City policy to be able to serve up to 75% of average day demands.[69] This system can provide more water for use in curtailment periods is necessary to be able to supply backup water in emergency situations. Two wells were retrofitted and brought online with one coming on in the fall of 2014 and the other in late 2015. This type of expansion of pumping capability will ensure groundwater system capacity to serve the City as it grows.

[67] An EDU is a measured volume of water that PCWA calculates to effectively deliver water supplies to the City of Lincoln and other retail providers. The EDU is a planning number that provides guidance in water supply availability – especially when paired with management efforts like utilizing groundwater to manage system peaking events.
[68] The latest Phase III project status can be obtained from the City Engineer.
[69] It should be noted that the number of wells and pumping capacity of the wells is separate from the annual pumping target volume. Many wells are only operated a minimum amount to maintain them as a ready backup supply or for summer peaking and oftentimes operations are source-shifted among available wells. As such, annual groundwater use will only be 10% of annual demand but will be made up of variable well operations.