Appendix H

Water Supply Assessment

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Water Supply Assessment for

CAL POLY

SAN LUIS OBISPO

California Polytechnic State University, San Luis Obispo

Master Plan 2035

Watearth Project No. 2018-314.1-CA

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Prepared for:

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California Polytechnic State University, San Luis Obispo

Water Supply Assessment for Master Plan 2035

Watearth No. 2018-314.1-CA

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Acronyms

ADD	Average Daily Demands
AFY	Acre-feet per year
Cal Poly	California Polytechnic State University, San Luis Obispo
CEQA	California Environmental Quality Act
CFC	California Fire Code
CIP	Capital Improvement Project
City	City of San Luis Obispo, California
CMC	California Men's Colony
EPA	U.S. Environmental Protection Agency
FDC	Fire Department Connection
GPCD	Gallons per capita per day
GPD	Gallons per day
GSF	Gross square feet
MDD	Maximum Daily Demand
MGD	Million gallons per day
PDD	Peak Daily Demand
PDH	Peak Hourly Flow
PHD	Peak Hourly Demands
PHF	Peak Hourly Flow
PPD	Peak Daily Demands
PPP	Public Private Partnership
SAY	Safe Annual Yield
SB 221	Senate Bill 221
SB 610	Senate Bill 610
Whale Rock	Whale Rock Reservoir
WRF	Wastewater reclamation facility

WRRF (City)	Water resources reclamation facility
WSA	Water Supply Assessment

1 EXECUTIVE SUMMARY

1.1 Purpose of the Water Supply Analysis

The purpose of this water supply analysis technical memorandum is to assess adequacy of the water supply to meet the needs of the proposed *2035 Master Plan* elements described below for the California Environmental Quality Act (CEQA), under the Utilities and Service Systems review.

Senate Bill 610 (SB 610) requires cities and counties to assess water supply demands of new developments and is to be written by the public water agency. California Polytechnic State University at San Luis Obispo (Cal Poly) is a state agency which is responsible for their own water supply via water rights to the Whale Rock Reservoir (Whale Rock). Therefore, SB610 is not applicable to this project because Cal Poly is a state agency. To facilitate review, this technical memorandum generally follows the format for SB610 Water Supply Assessments.

1.2 Project Summary

The Cal Poly campus is undergoing a 20-year master planning effort that will guide the development and use of campus lands through the year 2035. In order to accommodate planned growth in enrollment, Cal Poly has undertaken development of a *2035 Master Plan* to provide for needed academic facilities, additional student and non-student housing on campus, recreation and athletics facilities, and other support facilities on the Cal Poly campus to increase the student population from 20,944 in 2015 to 25,000 in 2035. Key project components include the following:

Total building development for academic facilities, new housing, and other support services is 1,290,000 gross square feet (GSF). Near-term projects include:

- Academic Center Library Addition
- Student Housing (multiple buildings)
- Classroom and Offices Building
- Beef Cattle Evaluation Center
- Engineering Project Building
- Davidson Music Center Renovation and Addition
- Facilities Operations Complex
- Health Center
- Technology Park Facility
- Building 19 Dining Commons
- Operations and Farm Shop Relocation
- Slack and Grand Residential Neighborhood for Faculty and Staff
- IT Services Consolidation
- University-based Retirement Community
- Wastewater Reclamation Facility (WRF)

1.3 Summary of Analysis

The water supply analysis evaluates the proposed changed conditions over the life of the project based on the project start year of 2015 (base year and existing conditions start point). As development is phased over 20 years, interim years of 2020, 2025, and 2030 are also evaluated. Near-term projects have established construction completion dates but the construction completion year of projects later in the *2035 Master Plan* are not as well established. This method captures changes in water supply demands over the life of the project with the available development plan.

1.3.1 Summary of Methodology

The methodology for analysis was intended to identify increases of water demand through existing and proposed water sources, which is established via the existing water rights, capacity agreements for potable water treatment and potable and non-potable water conveyance, and groundwater. Several standard factors were calculated to identify any impacts based on the proposed project elements compared to existing water supply demands. These include Annual Average Water Demand, Average Day Demand (ADD), Peak Daily Demand (PDD), and Peak Hourly Demand (PHD). Key factors included proposed buildings by type of use and size, water conservation efforts by land use type, and the on-campus Water Reclamation Facility (WRF). The *Master Plan 2035* proposed project elements are intended to be phased during the planning period so the reporting is during five-year increments including 2015 (base year), 2020, 2025, 2030, and 2035 (final year).

The City's existing water supply conveyance system was evaluated using the City-supplied WaterCAD model to conduct node-specific checks on capacity needs based on the proposed phases of development and changes in demands from the City's WRRF, to the campus, and downstream of campus. The node-specific checks analyzed 24 different scenarios. Cal Poly's total projected potable water demand was used in the WaterCAD modeling as discussed in Section 1.3.2.

1.3.2 Summary of Projected Potable Water and Recycled Water Demands

Cal Poly proposes to expand the campus to accommodate a total headcount for student population of 25,000, which is a net increase of 4,056 students by 2035. The expansion includes not only academic buildings for classrooms but also residential halls for students and residential communities for faculty and staff plus support services buildings such as administration offices and recreational facilities. During this same time period, Cal Poly continues implementing water conservation policies to meet or exceed goals set by the University System and the Governor's Office. Water conservation projects include a variety of efforts including turf removal, replacing landscaping with low to no water irrigation needs, replacing fixtures such as faucets and toilets in existing buildings, and implementing advanced landscape controls. This will result in 20 AFY of water savings 2015 through 2020 and an annual water savings of 40 AFY 2020 through 2035.

Cal Poly proposes to develop 1,290,000 gross square feet (GSF) of new residential, academic, and support services buildings to support growth as shown in Table 1. As described more fully in the analysis, Cal Poly has identified specific building needs for residential, expansion of the Campus Core, and support of the agriculture program. Each of these building types will have varying water use needs and construction will be phased over time.

Table 1 Total Residential, Academic, Administrative, and Support Space Growth Projections

Enrollment Year	Total GSF	Total Cumulative GSF
MP EIR Base Year 2015–2020	*0*	*0*
2020-2022	*0*	*0*
2022–2023	*184,000*	*184,000*
2024–2026	*276,000*	*460,000*
2027–2029	*276,000*	*736,000*
2030–2032	*276,000*	*1,012,000*
2033 – 2035	*278,000*	***1,290,000***

Based on *2035 Master Plan Draft Environmental Impact Report (EIR)* Project Description.

Cal Poly has water rights to 959 AFY based on the most recent Safe Annual Yield calculation for Whale Rock Reservoir. In addition, Cal Poly has agreements in place with the City to provide water treatment and conveyance of potable and non-potable water from the City's water treatment plant to the campus. No changes to these agreements are proposed with this project.

In order to meet potable water needs, Cal Poly will redirect Whale Rock water entirely through the City's potable water instead of the approximately 320 AFY current directed through the non-potable water system for agricultural irrigation water. The WRF project element will produce approximately 280 AFY of recycled water with tertiary treatment and UV disinfection to make it suitable for irrigation water on food products. The WRF development includes expansion of existing reservoirs to 100 AF, or if that is not possible, development of new reservoir areas as required to hold processed water for reuse.

Table 2 summarizes the total demand, which is the 2015 baseline water demand (813,288 GPD) plus proposed developed projects including residential and non-residential buildings and landscape, then reductions for water conservation and the on-campus WRF as the projects are phased over the life of the planning period. The likely case scenario assumes the WRF is online in 2022 and prior to bringing most major development projects online. The potable water demands used in the WaterCAD modeling of the City's distribution system are discussed in Section 4.11.

Table 2: Summary of Total Demand and Difference from Baseline Year in GPD

	2015	**2020**	**2025**	**2030**	**2035**
Total Cal Poly Demand	813,288	767,188	621,137	947,323	1,058,902
Change in Cal Poly Demand from Baseline (Likely Case)	0	-23,050	-109,436	-205,207	-93,628

1.3.3 Fire Flows

While the City is contractually obligated to deliver potable water to Cal Poly, this agreement does not extend to providing potable water for firefighting purposes. As such, water supply for firefighting purposes within the Cal Poly campus is stored within the 1,000,000-gallon ground storage tank, 30,000-gallon elevated storage tank, and 500,000-gallon elevated storage tank on the campus for a total of 1.5 million gallons (MG) of storage. The purpose of the analysis in the *2035 Master Plan* is to assess capacity through spot checks as the *Cal Poly Utility Master Plan*, currently underway, will conduct a full analysis. The purpose of the spot checks is to assess if additional infrastructure is required as part of the *2035 Master Plan* beyond what is already included in construction of new buildings.

The County of San Luis Obispo fire code is based on the 2015 International Fire Code and require specific volumes of water over time as well as pressures in fire flow lines to ensure sufficient water will be available to fight fires. While volume requirements depend on the building type, in general 1,500 gpm for four hours is a minimum requirement for residential structures. Requirements for non-residential structures vary on the campus from 375 gpm to 1,250 gpm for two to four hours. For single structure fires, partially full (as low as 25 percent for the three fire flow tanks) storage tanks are able to meet or exceed 1,500 gpm for four hours.

Pressure checks were conducted at four locations at nodes in close proximity to existing buildings that are also the greatest distance from the storage tanks. The fire code requires at least 20 pounds per square inch (psi) and pressures ranged from 27 psi to 140 psi. The existing system meets the requirements for fire flows and pressures to existing structures and the system indicates capacity to handle new structures as these will have similar profiles.

1.3.4 Water Demand Capacity Analysis at City Connections

The City conveyance capacity analysis is a high level, spot check of connections to the Cal Poly distribution system. The purpose is to ascertain if there is adequate capacity in the City potable water conveyance system for the proposed change in the routing of additional Cal Poly water right water through the potable water system instead of the non-potable water system. Based on the results of the WaterCAD modeling, there is adequate City potable water conveyance capacity under ADD, PDD, PHD, and PDD + City FF for all Cal Poly flow conditions modeled. While there are slight decreases in pressures at the five key locations, all pressures remain adequate and well above minimum required pressures for all modeled demand conditions. The low pressures at Key Location 1 (high elevation) appear to be within current City tolerances and the change from baseline conditions is minimal. WaterCAD modeling results indicate that no additional upgrades will be required to account for increased Cal Poly demands served by the City's potable water distribution system during the buildout of the *2035 Master Plan*.

Acronyms
ADD – Average Day Demand
PDD – Peak Daily Demand
PDH – Peak Hourly Flow (Reported results)
FF – Fire Flow
+ Future – 2035 Master Plan Conditions

Increased pumping to Reservoir #3 is expected to be required to both supply additional Cal Poly potable water demands served by the City's conveyance system, as well as additional City demands through 2035. This may require slight changes in operational practices, although settings in the City-provided WaterCAD model were adequate to turn on pumps as needed to maintain system flows and pressures. Increased flow rates to Cal Poly and to serve overall City demands will have minor to no effect on system aging as maximum velocities remain under 4.39 fps for all demand conditions modeled.

1.4 Determination

The determination of this Water Supply Assessment is that there is adequate water supply to develop the proposed *2035 Master Plan* project elements with the proposed phasing. The following key phasing elements are required for this determination to be valid.

1. The on-campus WRF provides adequate reclaimed water supply to serve the proposed additional water demands for Cal Poly while maintaining potable water demands served by Cal Poly's share in the Whale Rock Reservoir at or below 2015 baseline conditions for analysis years 2020, 2025, 2030, and 2035. While the WRF has no effect on Cal Poly's projected 2020 water demand of 790,238 GPD since it will not be operational until 2022, which is less than the 2015 baseline year due to indoor and outdoor water conservation yielding a reduction in average daily demand of 23,050 GPD. While not specifically analyzed, water conservation and the WRF are also adequate to limit potable water demands at or below Cal Poly's 2015 baseline conditions demands for the years between 2019 and 2025 assuming Phase 1 of the WRF is online in 2022.

   With the first phase of the 190 AFY (169,621 GPD) WRF online in 2022, Cal Poly has an excess reclaimed water supply 109,436 GPD, 205,207 GPD, and 93,628 GPD for analysis years 2025, 2030, and 2035, respectively. This excess supply in interim analysis years provides greater flexibility if funding is made available to bring proposed residential and non-residential buildings online sooner than anticipated in the phasing used for this analysis.

2. Seasonal water demands for future years are calculated based on projected annual average water demands and academic year and summer demand factors of 89.7% and 115.5%, respectively as discussed in Section 4.12. As described, academic year demand refers to the months of September through June during the main academic year and summer demand refers to the demands in July and August when irrigation demand is highest and enrollment and on-campus occupancy is lowest. In 2035, the average annual demand is projected at 0.718 MGD, the academic year demand is projected at 0.609 MGD, and the summer demand projected at 0.882 MGD under both the likely and worst-case scenario of the WRF.

3. There is adequate City potable water conveyance capacity under ADD, PDD, PHD, and PDD + City FF for all Cal Poly flow conditions modeled. While there are slight decreases in pressures at the five key locations, all pressures remain adequate and well above minimum required pressures for all modeled demand conditions.

   Increased pumping to Reservoir #3 is expected to be required to both supply additional Cal Poly potable water demands served by the City's conveyance system, as well as additional

City demands through 2035. This may require slight changes in operational practices but will have minor to no effect on system aging.

4. Cal Poly is responsible for their on-campus fire flow system. The existing system meets the requirements for fire flows and pressures to existing structures and the system indicates capacity to handle new structures as these will have similar profiles.

2 Introduction

As more fully discussed in the *2035 Master Plan EIR* Project Description, California Polytechnic State University, San Luis Obispo (Cal Poly or University) campus is undergoing a master planning effort that will guide the development and use of campus lands through the year 2035. In order to accommodate planned growth in enrollment, Cal Poly has undertaken development of a *2035 Master Plan* to provide for needed academic facilities, additional housing on campus, recreation and athletics facilities, and other support facilities on the Cal Poly campus.

The previous *Master Plan* was published in 2001 and most of the main campus facilities have been developed to accommodate the 20,944-headcount enrollment at the University, as of the 2015/2016 academic year. Under the current planning effort, Cal Poly anticipates reaching a 25,000 headcount by 2035 through steady growth due to desirability of the University as well statewide goals, among others.

2.1 Purpose and Applicability for the Water Supply Assessment

The purpose of this report is to evaluate the water demand projections for the California Polytechnic State University, San Luis Obispo (Cal Poly or University) *2035 Master Plan* for purposes of evaluation under the California Environmental Quality Act (CEQA). For ease of review, the content generally follows Senate Bill 610 (SB 610) for Water Supply Assessments (WSA). However, the project is not subject to SB 610 as this regulation applies only to cities and counties. The University does not meet the definition of a city or county under SB 610 but is subject to CEQA. This WSA relies on best available water data from a baseline year of 2015, consisting of water source data provided by the City of San Luis Obispo, Cal Poly, and their subcontractors and consultants.

2.2 Regulatory Setting

This section provides an overview of local, state, and federal regulations in the potable and non-potable water supply development and to protect water quality and water quantity. The Environmental Protection Agency (EPA) administers the Federal Safe Drinking Water Act, which establishes drinking water quality standards and attainment programs. The California State Water Resources Control Board, through Regional Water Boards, administers water resources through state regulations including the California Water Code.

2.2.1 Federal Regulations

2.2.1.1 Safe Drinking Water Act

Under the Safe Drinking Water Act (SDWA), EPA sets legal limits on the levels of certain contaminants in drinking water. The legal limits reflect both the level that protects human health and the level that water systems can achieve using the best available technology. Besides prescribing these legal limits, EPA rules set water testing schedules and methods that water systems must follow. The rules also list acceptable techniques for treating contaminated water.

2.2.1.2 Ground Water Rule

The Ground Water Rule (GWR) was established in 2006 by the EPA to reduce the risk of illness caused by microbial contamination in public ground water systems (GWS). The GWR establishes a risk-targeted approach to identify GWSs susceptible to fecal contamination and requires corrective action to correct significant deficiencies and source water fecal contamination in all public GWSs. Cal Poly does not source potable groundwater but does use groundwater from onsite wells for non-potable, agricultural purposes.

2.2.1.3 Surface Water Treatment Rule

The Surface Water Treatment Rule (SWTR) seeks to prevent waterborne diseases caused by viruses, Legionella, and Giardia lamblia. These disease-causing microbes are present at varying concentrations in most surface waters. The rule requires that water systems filter and disinfect water from surface water sources to reduce the occurrence of unsafe levels of these microbes. The SWTR also monitors treatment processes and their effectiveness at removing the waterborne diseases. The City provides compliance with this regulation at the water treatment plant through a capacity rights and contractual water treatment agreement with Cal Poly (City of San Luis Obispo, 1964).

2.2.2 State Regulations

2.2.2.1 Water Code Section 10912.

Section 10912 (also contained in CEQA Guidelines Section 15083.5) identifies development projects that cities and counties as the water provider must review and consider for impacts on the water supply. Cal Poly, partnered with the City for water treatment and conveyance, provides their own water supply and is the lead agency for review under CEQA (Whale Rock Commission, Revised December 2013; City of San Luis Obispo, 1964). Cal Poly is required to assess *2035 Master Plan* water supply needs under CEQA.

2.2.2.2 SB 610 and SB 221.

Senate Bill 610 became effective January 1, 2002, and requires cities and counties in connection with the California Environmental Quality Act (CEQA) to review and consider water supply assessments when evaluating certain development projects to determine if projected water supplies can meet the project's anticipated water demand. SB 610 also requires additional factors to be considered in the preparation of urban water management plans, water supply assessments, and for certain development projects that are otherwise subject to CEQA review. SB 221 requires similar analysis for subdivision maps that meet the threshold review criteria. Cal Poly is a state agency and is responsible for their own water supply via water rights to the Whale Rock Reservoir. Therefore, because Cal Poly is a state agency and not a city or county, SB610 and SB 221 are not applicable to this project.

2.2.2.3 Porter-Cologne Water Quality Control Act.

The State of California's Porter-Cologne Water Quality Control Act (California Water Code Section 13000 et seq.) goal is to put California's water resources to beneficial use to the fullest extent possible, limit wasteful practices, and promote conservation. The regulation covers diversion and water quality requirements for groundwater and surface water, among others. The California Water Resources Control Board and the Regional Water Quality Control Board administers the Act.

2.2.2.4 California State Water Resources Control Board

Responsibility for administering California water rights procedures lies with the California State Water Resources Control Board (SWRCB), which is also responsible for managing and administering various federal and state water quality control programs. Procedures are provided by statute, but the board has the authority to establish rules and regulations to help it carry out its work. All board activities are governed by state water policy and are administered in accordance with policies and procedures in the California Water Code. The project is located in the Central Coast Regional Board (Region 3).

2.2.2.5 California Department of Public Health's Division of Drinking Water and Environmental Management (DDWEM).

Within the DDWEM is the Drinking Water Program (DWP) which regulates public drinking water systems in the State of California. The Drinking Water Statutes and Regulations are issued through the DWP. The Drinking Water Statutes govern constituents in drinking water and include the California State Drinking Water Act. The California State Drinking Water Act provides acceptable levels and minimum level goals of all contaminants provided in the federal Safe Drinking Water Act. The Drinking Water Regulations govern operations of drinking water systems to ensure they meet the constituent levels outlined in the Statutes. The City provides compliance with this regulation at the water treatment plant through a capacity rights and contractual water treatment agreement with Cal Poly (City of San Luis Obispo, 1964).

2.2.2.6 Reclaimed Water for Reuse

The *California General Order* (2016-0068-DDW) is the policy guideline for reclaiming water for water reuse. This General Order is applicable to recycled water projects where recycled water is used or transported for non-potable uses. The WRF is a near-term construction project to balance water supply and wastewater needs. Cal Poly proposes to use the reclaimed water in landscaping, irrigation of sports complex, and agricultural irrigation. The California State Water Resources Control Board has permitting processes in place to support reuse of treated wastewater. As more fully discussed in the Wastewater Technical Memorandum for this project, water from the WRF will be reused and will replace the non-potable water currently provided from Whale Rock and this reuse water is included in this report for the water balance and sufficiency assessment.

2.2.3 Local Regulations

2.2.3.1 City of San Luis Obispo Public Works Department.

The City has adopted standard specifications as a guide for the standardization of water utility installations within the City (Resolution No. 10137). These specifications also identify Countywide Standards (such as water-sewer separation criteria) that have been accepted by the City Council upon the recommendation of the City Engineer. While Cal Poly is located outside of the City limits, these specifications outline requirements for water system installations, that apply to Cal Poly for connections to the City system.

2.2.3.2 Whale Rock Reservoir Commission.

The Whale Rock Reservoir provides water to the City, Cal Poly, the California Men's Colony, and the Cayucos Area Water Organizations. The Whale Rock Commission oversees the reservoir operations and is made up of representatives from the City, California Men's Colony, and Cal Poly, as well as representatives from the State Department of Water Resources. The City provides the staff for oversight of daily operations and maintenance activities. Cal Poly is a capacity owner of 33.71% of the Whale Rock Reservoir (Whale Rock Commission, Revised December 2013).

3 Existing Conditions

The *2035 Master Plan EIR* Project Description provides a full detail of the existing Campus conditions. Below is a summary of the headcount, buildings, and other features based on year 2015, the base year for evaluation under CEQA. See Appendix A and B for the existing water distribution system map with connections to the City system and Exhibit 4 for existing land uses.

3.1 Environmental Setting and Project Site

For the purposes of the *2035 Master Plan* and this water supply evaluation, the area being evaluated consists of Cal Poly's approximately 1,321-acre main campus area and off campus properties as shown in Exhibits 1, 2, and 3. Located in San Luis Obispo County, California, the Cal Poly campus abuts the City to the south and west, and open space, ranch land, and public land to the north and east (Exhibit 1). The campus is generally bound by U.S. Highway 101 (US-101) to the north and east of California State Route 1 (CA-1), at 1 Grand Avenue, San Luis Obispo, California (Exhibit 1). The campus consists of rolling hills 10 miles inland from the Pacific Ocean and is dominated by coastal sage scrub plant community as well as drought-adapted chaparral and mixed oak woodland habitats, which is evident in the drab green and browns of the vegetation in Exhibit 2.

Cal Poly owns and operates several off-campus properties (see Table 3). These properties are included in this analysis to show existing and proposed water service delivery method and how that changes during the *2035 Master Plan* management period and changes to application of Cal Poly's allotment.

Table 3 Off-Campus Properties for Water Supply Analysis

Off Main Campus Property	Existing Wastewater Service Source	Existing Volumes (AFY)	Proposed Project Wastewater Service Source
Bella Moñtana Housing (existing residential development)	Cal Poly's allocation	Approximately 11-12 AFY	No change
Chorro St Lofts (City)	Cal Poly's allocation	1.3 AFY	City
Chorro Street Offices (City)	Cal Poly's allocation	0.05 AFY	City
Grand Ave Residences (3)	City		No change

*Information provided by Cal Poly.

Cal Poly has additional land holdings that are not included in the *2035 Master Plan*. This includes the Chorro Ranch, Serrano Ranch, Peterson Ranch, Escuela Ranch, and Chorro Residential properties, which are not serviced by Cal Poly's water supply for the main campus (Whale Rock

Reservoir or groundwater, as described below) but are instead serviced by other water sources including groundwater. These non-main campus properties are not included in this analysis as there are no proposed project elements nor are these land holdings serviced by the water supply system that is the subject of this WSA.

3.2 Student Enrollment and Other Campus Occupants

Student enrollment during the academic year 2015-2016 was 20,944 (headcount or student population). According to research conducted by Cal Poly, students who live on campus, especially during the first two years, are more successful academically, which means that Cal Poly needs to have on-campus housing available for at least the freshman and sophomore students as well as some upper division undergraduates. Currently Cal Poly provides a variety of housing options including traditional dormitories (multiple occupant rooms with common restrooms and limited to no kitchen facilities in the building) to apartment-style housing. In addition to students, Cal Poly provides housing options for faculty and staff.

3.3 Existing Buildings and Uses

Existing campus facilities comprise approximately 149 major buildings (Exhibit 4). Within the Academic Core, there are approximately 80 buildings that include student housing (residential), academic, administration, recreation, and support services. Recognizable facilities include the Robert E. Kennedy Library, the Julian A. McPhee University Union, ASI Recreation Center, Alex G. Spanos Stadium, Robert A. Mott Athletics Center, several galleries, and the Performing Arts Center. The Project Description in the 2035 Master Plan EIR includes additional details on these existing buildings. Since the metered and Corrected Adjusted 2015 average annual water demands used as the basis of this analysis capture all existing water demand from existing buildings (Section 3.10), further details on existing buildings square footage and type of existing buildings is not required on a granular level for this analysis.

3.4 Agricultural Lands, Open Space and Landscape Areas

The campus is defined by its natural setting punctuated by dramatic topography and views of the Morros volcanic peaks, rolling hills, rock outcroppings, and stands of trees and vegetation. The campus retains visual connection to the surrounding landscape by strategically siting building massing in a manner that does not block or obstruct surrounding vistas. Open spaces, abundant trees and landscaping, including the iconic Dexter Lawn, reinforce the campus's connection with its surroundings. There are extensive opportunities for connecting with nature through a trails system and other unorganized and casual outdoor opportunities in addition to the maintained sports fields. Agricultural land is located within the North Campus and West Campus to the north of the Academic Core (Exhibit 4 illustrates existing agricultural land locations, open space, and landscape areas). Existing water demand for irrigation of the agricultural lands is approximately 320 AFY (285,658 GPD). Irrigation demands for other open space and landscape areas is not reported separately from the total Cal Poly metered demand. Section 3.8 below provides more detailed description of these areas including water conservation efforts.

3.5 Cal Poly's Water Supply Sources

Cal Poly meets current potable water demands through the surface water rights from Whale Rock Reservoir (Whale Rock), which also supplies irrigation demands for on campus landscaping and recreational fields. Non-potable agricultural demands are met through a portion of the Whale

Rock water right as well as groundwater wells managed by Cal Poly and the entitlement of untreated water provided by the City. Cal Poly has also implemented extensive water conservation efforts to reduce waste and unnecessary water uses, which are discussed below in Section 3.8

As one of the original developers of Whale Rock, Cal Poly retains water rights to 33.71% of the available capacity, which under the current Safe Annual Yield (SAY) calculation is 959 acre-feet per year (AFY), or 856,082 gallons per day (gpd). Other owners of Whale Rock water include the City and the California Men's Colony (CMC) and the three entities compose the Whale Rock Commission.

SAY is an analysis to determine the average quantity of water that can be withdrawn from a water source long term, accounting for critical drought conditions. The analysis method is based on U.S. Environmental Protection Agency (EPA) methodology and the analysis is conducted periodically by the City in partnership with the other reservoir share owners. The most recent analysis, completed in partnership between Cal Poly and the City of San Louis Obispo in 2017, accounted for potential climate change impacts by incorporating the most conservative model published by the EPA - the 2060 Hot/Dry climate model. Under this scenario, the SAY for Cal Poly's share of Whale Rock is 959 AFY (856,082 gpd) through 2060. This means that Cal Poly can reliably withdraw up to 959 AFY (856,082 gpd) through at least the year 2060. This analysis takes into consideration current climate change models and adaptive management plans. This value does not include storage capacity (sometimes referred to as banking of unused water from previous years) nor does it include less conservative safe annual yields, which vary between 907 AFY (809,662 gpd) and 1,043 AFY (931,067 gpd) (Elliot, P.E., 2017).

The City conveys treated, potable water to the Cal Poly Academic Core from the Stenner Canyon water treatment plant as well as untreated, non-potable water for agricultural purposes from Whale Rock (City of San Luis Obispo, 1964 and updates; City of San Luis Obispo, December 2015; Watearth, Inc., 2018). The maximum available is the SAY of 959 AFY (856,082 gpd) for both uses.

Groundwater withdrawals by Cal Poly are only for agricultural purposes and provide 120 AFY (107,122 gpd) of water. The College of Agriculture, Food and Environmental Sciences manages a series of reservoirs on campus for water storage and groundwater infiltration. Cal Poly proposes no changes in quantity or use on campus, so this results in no net change for the *2035 Master Plan* and is not included in this water supply evaluation. Table 4 summarizes water supply sources for Cal Poly.

Table 4: Summary of Existing Water Supply Sources for Cal Poly

Water Supply	Current Water Supply (AFY)	Current Water Supply (GPD)
Whale Rock Reservoir	959	856,082
Groundwater	120	107,122
TOTAL	1,079	963,204

3.6 Cal Poly's Water System

Cal Poly is responsible for their own water supplies and thus are the responsible purveyor for meeting future water needs. Cal Poly owns and maintains water supply conveyance piping, including providing fire flows to their buildings, throughout the campus (Hartman Engineering, 2019; Watearth, Inc., 2018). However, through a series of agreements and collaboration as discussed in Section 3.7 below, the City provides water treatment and water conveyance to the campus for potable and non-potable water (see Figure 1 and Appendices A and B). Figure 1 shows where Cal Poly connections occur for the potable and non-potable water lines. Currently, approximately 320 AFY of Cal Poly's 959 AFY of water right from Whale Rock remains untreated and supplies agriculture water (grapes and avocados, three ag use connections, and sports complex). The City's 24-inch potable water main line goes through campus and Cal Poly has seven connections, all of which are metered.

Appendix A includes the *Cal Poly Utility Atlas*, which illustrates the location and size of all of Cal Poly's on campus water distribution system lines and associated diameters along with elevated storage tanks and ground storage tank. The Academic Core of Cal Poly includes a one-million-gallon ground storage tank, a 30,000-gallon elevated storage tank, and a 500,000-gallon elevated storage tank for reliable service of potable water demands and to provide adequate volume for firefighting purposes.

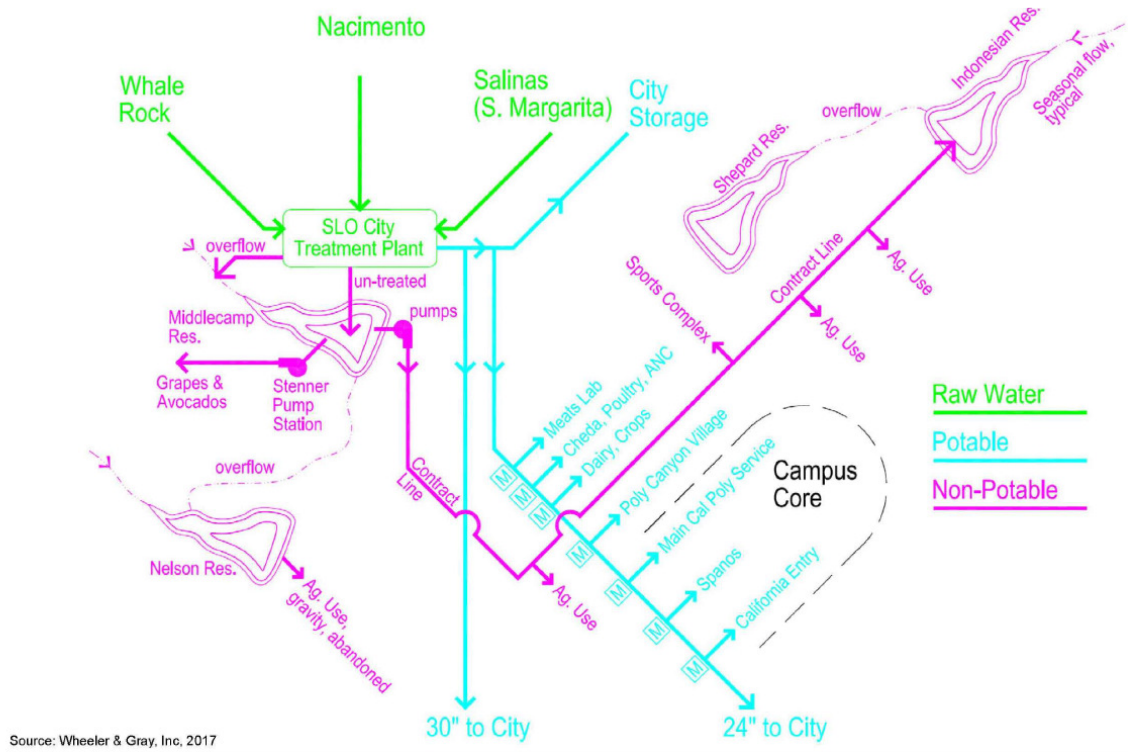

Figure 1: Schematic of City Water Supply System

3.7 Water Agreements with City

As indicated above, Cal Poly's primary water supply source includes water rights to surface water in Whale Rock (Hartman Engineering, 2019). Cal Poly also has agreements with the City to treat and convey potable water from the City's water treatment plant at Stenner Canyon to the Cal Poly campus (City of San Luis Obispo, 1964 and updates; Hartman Engineering, 2019). Through a variety of agreements and cost sharing for system upgrades, Cal Poly has rights to up to 1,000 AFY (892,682 gpd) of water treatment at the City's Stenner Canyon water treatment plant.

3.8 Cal Poly Existing Water Conservation Measures

As more fully described in Section 2, in 2014 and 2015, Governor Brown issued a series of executive orders to declare a drought state of emergency and requiring immediate implementation of water conservation efforts to address the extended drought that began in 2011. In response to and in conjunction with the Campus Administrative Policies to promote a wide array of sustainable practices related to water conservation, energy conservation, alternative transportation, and new building construction, Cal Poly implemented a comprehensive drought response water management program for short-term policies and long-range measures to conform to state-mandated water-efficiency programs and water use reductions (Watearth, Inc., 2018; Veium, 2017 Drought Response Performance, 2018).

While these water conservation efforts are not specifically a project element, they are a feature that works to manage the water supply needs and the conservation efforts are included in the water supply assessment. Anticipated water savings from the water conservation measures described below is approximately 20 AFY (17,854 gpd) by 2020 and 40 AFY (35,708 gpd) (Water Savers, LLC, 2014; California Polytechnic State Unversity, San Luis Obispo; AquaCents Water Management, Inc, 2017; Clay, PhD & Hostic, CSFM, CGM, 2016; Green Building Research Center, 2012; Hartman Engineering, 2019; Veium, 2017 Drought Response Performance, 2018).

3.8.1 Existing Indoor Water Conservation Measures

Cal Poly undertook an audit to identify existing indoor water uses that do not meet current water efficiency standards. The audit, completed by Water Savers, identified fixtures including toilets, urinals, faucets, and showerheads in existing buildings for replacement with low flow alternatives. Approximately 50% of the fixtures were replaced by the end of 2018.

3.8.2 Existing Outdoor Water Conservation Measures

Irrigation typically accounts for the largest consumer of outdoor water uses. Water-conservation became a greater issue in April 2015 with Governor Brown's Executive Order B-29-15, which increased and expedited initial water conservation goals from 20% by 2020 to 25% by February 2016. As described below, replacement of turf with drought resistant plants and xeriscapes as well as upgrades to the irrigation system resulted in 31% reduction in water use between 2014 and 2016, which exceeded the Governor's 2016 water conservation goal. On the Cal Poly campus, the irrigation areas include general landscape, athletic and recreational fields, and agriculture.

3.8.2.1 General Landscape.

Cal Poly's landscape irrigation accounted for 33% of total water use (360 AFY) on campus in 2015 (Clay, PhD & Hostic, CSFM, CGM, 2016). In 2015, with the ongoing drought and rise of turf removal as a water-conservation measure across the state, Cal Poly embarked on a substantial reduction of turf grass. Cal Poly Facilities Department identified low-value turf area, which are generally peripheral areas that do not have high-use for recreation or sports, for example between campus buildings, adjacent to sport areas, parkway areas, and the university entrance. As of approximately January 2019, Cal Poly eliminated 13.6 acres of irrigated turf areas, which accounted for approximately 28% of campus turf. Cal Poly developed a new landscape aesthetic for the campus with a plant palette centered on a mix of native California plants, Mediterranean-climate adapted plants, and other drought-tolerant (low water use) plants. This includes but is not limited to native Palo Verde trees, barrel cacti, and drought-tolerant groundcovers like ice plant and sedum (Clay, PhD & Hostic, CSFM, CGM, 2016). Along with the reduction in turf grass, extensive mulching provided improve soil moisture retention in planting beds. Irrigation system performance for remaining turf and flower beds was also improved with more efficient equipment and weather based digital controls.

3.8.2.2 Athletic and Recreational Fields

The Cal Poly Sports Complex is composed of three synthetic turf fields, four natural grass turf fields, three softball diamonds, and five outdoor basketball courts. The three synthetic turf fields used for recreational and intramural sports were converted from natural grass in 2009, resulting in a substantial reduction in irrigation water. The annual water savings from these fields is approximately 25.2 AFY (22,496 gpd) (Green Building Research Center, 2012). These savings are reflected in the 2015 baseline average annual water demand for Cal Poly.

The University continued installations of artificial turf with “Cal Poly I Field” in 2017, decreasing use of irrigation water on approximately 2.5 acres. Artificial turf requires watering during rare high heat and low wind events for surface cooling as well as for cleaning for hygienic purposes. Other athletic fields that use natural grass will use Aqua Cents technology, which is a water absorbing polymer that retains up to 400 times its weight in water, holding that water near root zone (Water Savers, LLC, 2014). The primary athletic field for sports, Spanos Field, employs this technology, maintaining water near the root zone longer than lawn areas without the applied polymer. Case studies demonstrate a 45% reduction in irrigation needs and this technology is planned for continued use on athletic fields and applied to remaining fields by 2025. Application of this technology to specified turf areas is expected to result in irrigation savings of 18 AFY (16,068 gpd).

3.8.2.3 Agriculture

While not directly related to water conservation efforts under the *2035 Master Plan*, in the summer of 2014, recent operational and technological advancements have increased the efficiency of agricultural water use. All existing sprinklers were replaced with smaller nozzles in the crop’s units and pastures. The reduction in nozzles decreased water use in sprinkler irrigation by 33%. Additionally, micro-emitters were installed to irrigate all the orchard crops which allow for low pressure spraying, misting or dripping of water on the crops. The Ag Department reuses wastewater from dairy and swine washdown areas for use as irrigation water for animal feed fields, per industry standard (Green Building Research Center, 2012). Agricultural water management uses soil moisture tensiometers to determine the timing of irrigation based on soil and crop requirements.

3.9 Cal Poly Average Annual Water Demands

Cal Poly's metered 2015 average annual water demand is used as the baseline for this analysis with the Corrected Adjusted demand of 813,288 GPD (0.813 MGD) provided by Cal Poly used to most accurately represent baseline conditions and account for construction and water conservation measures implemented between 2015 and current conditions at Cal Poly (California Polytechnic State University, San Luis Obipso, 2019; Veium, Cal Poly Master Plan Water Supply Assessment Technical Memo for Corrected Adjusted 2015 Demands, a. 2018). The 2015 baseline value is used in calculating Average Day Demands (ADD) projections through 2035 in Section 4.9 of this report and forms the basis for determining if Cal Poly has adequate water supply capacity through 2035. The baseline demand is combined with projected demand increases and decreases to create an average annual daily demand, which is equal to the ADD. This is further discussed in Section 4 below.

The 2015 baseline and analysis period water demand projections are also used to estimate peak daily demands (PDD) and peak hourly (PHD) demands used in the WaterCAD modeling of the City's water distribution system.

3.10 Cal Poly Peak Daily and Peak Hourly Water Demands

PDD and PHD are calculated for the base year and analysis years, using factors from the *City of San Luis Obispo 2015 Water Master Plan* (City of San Luis Obispo, December 2015). This document lists a Maximum Day Demand Factor of 1.5 times ADD, citing the City of San Luis Obispo Water Treatment Plant Records, dated October 4, 2012, as the standard. It also lists a Peak Hour Demand Factor of either 3.375 or 4.0 times ADD, depending on the zone. Generally, this source shows that zones with demands less than 295,000 GPD use the 3.375 factor and zones with demands greater than 295,000 GPD use the 4.0 factor. The report cites Title 22 and Metcalf & Eddy design handbook as the standards for these PHD factors (Tchobanoglous, Burton, & Metcalf & Eddy, 1991). While Cal Poly falls within various City pressure zones, a factor of 4.0 is used as it is reflective of Cal Polys entire water demand.

These values of 1.5 times ADD and 4.0 times ADD are applied to the ADD projections in Table 15 to estimate PDD and PHD for analysis years for use in the WaterCAD model of the City's water distribution system. The estimated PDD and PHD are 1.220 MGD and 3.253 MGD, respectively for the 2015 baseline year with an ADD of 813,288 GPD.

3.11 Cal Poly Seasonal Water Demands

Cal Poly and other universities have non-standard water usage patterns due to inconsistent occupation over the academic school year as compared to residential and other non-residential water users that have consistent year-round occupation and use. The university academic calendar for the baseline year for water demand in this assessment (2015), shows occupancy commencing September 14, 2015, and finishing June 11, 2016 for a period of nine months. No changes to the academic calendar are foreseeable for the duration of the *2035 Master Plan*, meaning that existing and proposed buildings expect full occupancy of nine months annually.

This fluctuating occupancy yields a dynamic where water demands are affected due to significantly lower occupancy of housing and use of academic and other facilities in the summer months. Irrigation and other basic building demands remain through the summer break so the water demand is higher than the wetter academic calendar year. July and August are the full months with lower student population and higher irrigation demand.

Seasonal use of the campus also impacts the City's Water Resources Reclamation Facility (City WRRF) due to the reduced contribution from the campus during the summer months while the majority of the student and staff population is away and thereby reducing the available source of recyclable water during peak irrigation months for City clients.

Adjusted summer demand factors were calculated from water use data based on water bills from the and are summarized in Table 5 below.

Table 5: Approximate Monthly Total Water Use Values

Total Water Use (MG/Month)		
	2013	**2014**
Jan	13.0	22.5
Feb	15.0	14.5
Mar	18.0	17.0
Apr	25.0	21.0
May	28.0	36.5
Jun	30.0	31.0
Jul	28.0	32.0
Aug	27.0	27.5
Sep	34.0	29.5
Oct	31.5	32.5
Nov	21.5	29.0
Dec	21.5	9.5
Average	24.4	25.2
Average (Oct - May)	21.7	22.8
Average (July - August)	27.5	29.8

The average water use for the full school in session months (approximately October to May) is approximately 21.7 and 22.8 MG/month, respectively, or an average of 89.7% of the yearly average water use. Similarly, the average water use for the summer months (approximately July to August) are approximately 27.5 and 29.8 MG/month, respectively, or an average of 115.5% of the yearly average water use. These percentages are then be applied to average annual demand to estimate approximate seasonal demand (or academic year vs. summer). Using these percentages, the 2015 baseline academic year demand and summer demand is 729,805 GPD and 938,685 GPD, respectively with an ADD of 813,288 GPD.

3.12 Cal Poly Fire Flows

Water distributions systems must reliably supply water for everyday demands as well as fire-fighting needs. Fire flow is the amount of water needed for fire protection in a given area and is quantified in terms of flowrate, pressure, and duration. Fire flow requirements are closely related to land use (land use type, occupancy, potential life hazard). Unlike traditional developments where the local municipality is accountable for fire flows, Cal Poly is the responsible party for providing sufficient fire flow through its own on campus water storage and infrastructure. It is assumed that fire flow is adequate for existing buildings that would have been required to meet current codes at the time of design and construction and that deficiencies (if any) will be corrected with improvements to be developed as part of the *Cal Poly Draft Utility Master Plan*, which is not available for inclusion in the *2035 Master Plan EIR*. However, given Cal Poly's responsibility for providing adequate fire flow capacity, fire flows for proposed residential and non-residential buildings are addressed at a conceptual, planning-level in this Water Supply Evaluation in Section 4.13.

4 Proposed Project Elements for Water

The *2035 Master Plan EIR* Project Description provides a full detail of the proposed project elements. This section describes how proposed project elements such as proposed residential and non-residential buildings that support increased headcount, the proposed WRF, and indoor and outdoor water conservation impact the on-campus and downstream City water distribution and treatment systems. See Exhibit 5 and Appendix C for proposed land uses and WRF location.

4.1 Student Enrollment and Other Campus Occupants

The projected headcount for enrollment during the academic year 2035-2036 is 25,000. This is a net increase of 4,056 students from 2015-2016 academic year. For water demand calculation purposes, only buildings are directly used in determining water demand needs. The type and size of proposed residential and non-residential buildings and recreational facilities is a function of the proposed student headcount as well as the necessary faculty and support staff to support the additional students.

4.2 Proposed Buildings and Uses

Cal Poly proposes to construct residential and non-residential (academic, administrative, recreational, and other support services) buildings in support of the projected increase in student enrollment and corresponding increase in academic and other supporting staff. Many of the near-term projects will be delivered via PPP projects, which include the Slack and Grand Residential Neighborhood, the University-based Retirement Community, Health Center, and the Tech Center Expansion. Remaining residential and non-residential projects could follow either a traditional delivery method or a PPP delivery method depending on funding mechanism.

Table 6 lists all planned non-residential buildings and the GSF associated with each non-residential building. Table 7 provides a summary of potential phased construction of all non-residential buildings types to be completed by 2035 under the *2035 Master Plan*. This includes 585,638 GSF for residential projects and 704,362 GSF for non-residential buildings. The exact year of construction is unknown for each building, so the general rate of construction for each specific building is distributed linearly over the life of the Master Planning horizon between the years 2022 and 2035. Interim years of 2020, 2025, and 2030 were evaluated as well to identify changes in water demands over the life of the project.

Table 6: Total Residential, Academic, Administrative, and Support Space Growth Projections

Enrollment Year	Total GSF	Total Cumulative GSF
MP EIR Base Year 2015–2020	*0*	*0*
2020-2022	*0*	*0*
2022–2023	*184,000*	*184,000*
2024–2026	*276,000*	*460,000*
2027–2029	*276,000*	*736,000*
2030–2032	*276,000*	*1,012,000*
2033 - 2035	*278,000*	***1,290,000***

Based on *2035 Master Plan Draft Environmental Impact Report (EIR)* Project Description.

Table 7: Proposed New Construction Non-Residential Buildings for 2022 to 2035

Facility	Anticipated Completion	Size (GSF)
Academic Center Library Addition	2022 - 2035	114,000
Classroom and Offices Building	2022 - 2035	72,000
Beef Cattle Evaluation Center (BCEC) Expansion	2022 - 2035	10,000
Engineering Projects Buildings	2022 - 2035	71,000
Facilities Operations Complex	2022 - 2035	108,000
Davidson Music Center Renovation/Addition	2022 - 2035	22,600
Building 19 - Dining Commons Renovation and Addition	2022 - 2035	44,000
Operations and Farm Shop Relocation	2022 - 2035	51,000
IT Services Consolidation	2022 - 2035	15,000
Vista Grande Dining Complex[1]	2020 - 2035	38,965
Fermentation Sciences[1]	2022 - 2035	N/A
Health Center[2]	2022 - 2035	32,797
Tech Park Expansion[2]	2022 - 2035	125,000
TOTAL NON-RESIDENTIAL PROJECTS		704,362

[1] This building was reviewed for CEQA under the 2001 Amendment but was not constructed by 2015, therefore it is not included in the 2015 Corrected Adjusted baseline flows. This facility is included here to incorporate the wastewater flows for this review.

[2] These are projects with known Public Private Partnerships (PPP).

Table 8 lists proposed residential buildings included in the 2035 Master Plan along with proposed year of completion and number of beds with a total of 8,230 beds planned by 2035 (California Polytechnic State University, San Luis Obipso, 2019). Proposed student residential projects are not yet named and include five projects with a total of 7,200 beds by 2035. Non-student housing for faculty and staff include the Slack and Grand Residential Neighborhood and the University-based Retirement Community, for a total of 1,030 beds by 2035. This is a total of 8,230 beds for all residential building types by 2035.

Table 8: Proposed Residential Buildings for 2022 to 2035

Facility	Anticipated Completion	Size (# of Bed)
Unnamed Residential	2022	2,000 beds
Slack and Grand Residential Neighborhood[1]	2023	630 beds
Unnamed Residential	2024	600 beds
Unnamed Residential	2027	1,500 beds
Unnamed Residential	2031	1,500 beds
Unnamed Residential	2035	1,600 beds
University-based Retirement Community[1]	2028	400 beds
TOTAL RESIDENTIAL PROJECTS		8,230 beds

[1] Non-Student Housing.

4.3 Agricultural Lands, Open Space and Landscape Areas

Open space and landscape areas have varying requirements for water with active water conservation efforts underway for open space and landscape areas through turf removal and replacement of landscape areas with low to no water landscaping. In addition, open space areas that do not have turf removal area are allowed to brown instead of irrigating through the summer (Clay, PhD & Hostic, CSFM, CGM, 2016). Due to lack of recycled water distribution infrastructure, recycled water will likely not be available to serve the Academic Core until 2029 or beyond. Cal Poly does not propose construction of a recycled water distribution system for landscape irrigation in the Academic Core as part of the *2035 Master Plan* nor is it a capital improvement project. Recycled water for landscape irrigation may be used on the new development adjacent to recycled infrastructure near the north campus core.

The recycled water from the on-campus WRF is intended to replace non-potable water used for irrigation of agricultural lands among other uses from the Whale Rock water right, which is currently supplied through the City's non-potable water system (Hartman Engineering, 2019; California Waterboard, 2019). As indicated in Section 3.4, existing water allotted for irrigation of the agricultural lands is approximately 320 AFY (285,658 GPD) of surface water from Whale Rock and 120 AFY (107,122 GPD) of groundwater (Hartman Engineering, 2019). There is adequate demand for the 190 AFY (169,621 GPD) of reclaimed water treated by the first phase of the WRF within the agricultural lands alone. The irrigation demand for the agricultural lands is 84% of the ultimate WRF capacity of 380 AFY (339,342 GPD).

4.4 Cal Poly's Water System

Changes to the Cal Poly water distribution system and operation are not planned as part of the *2035 Master Plan* with the exception of the planned first phase of the WRF slated to be online in 2022 in the likely scenario and 2026 in the worst-case scenario and the second phase of the WRF online in 2028 under both scenarios. The WRF is discussed in further detail in Section 4.9 as it relates to providing tertiary treated reclaimed wastewater for use in on-campus irrigation. The *Cal Poly Draft Utility Master Plan* is currently under development separate from the *2035 Master Plan* and *2035 Master Plan EIR* efforts and slated for completion in 2020. This study may identify Capital Improvements Plan (CIP) projects related to Cal Poly's water distribution system. Additionally, during planning and detailed design for individual projects it may be determined that other water distribution system improvements or service lines to individual buildings and facilities are required.

4.5 Cal Poly's Water Supply Sources

No changes to Cal Poly's existing water supply sources or SAY of 959 AFY (856,082 GPD) are planned as part of the *2035 Master Plan*. The water demand projections discussed in Section 4.10.7 are based on the SAY. For informational purposes, capacity related to the upper-end of the SAY of 1,043 AFY (931,067 GPD) is also included.

4.6 Water Agreements with City

No change to Cal Poly's current water treatment and conveyance agreements with the City are planned as part of the *2035 Master Plan*. However, a capacity analysis of the City's water distributions system between Cal Poly's discharge point and the City WRRF is included in Section 5. If impacts on the City's water distribution system are identified, this capacity analysis is intended to provide data related to available capacity and potential capacity share between Cal Poly and the City.

4.7 City Water Distribution System

Cal Poly does not propose changes to the connection point with the City's water distribution system as part of the *2035 Master Plan*. However, a capacity analysis of the City's water distribution system between Cal Poly's connection points between the campus system and the City system is included in Section 5. This capacity analysis is intended to evaluate and quantify potential impacts on the City's water distribution system related to buildout of the *2035 Master Plan* for both the likely scenario of the first phase of the WRF being online by 2022 and the worst-case scenario of the first phase of the WRF being online by 2026. As stated previously, the City provides potable and non-potable water to Cal Poly and the WRF is intended to replace the non-portable water supply without changing the total quantity from the Whale Rock allotment. The City's water distribution system as it relates to conveying Cal Poly's potable water demands is discussed in further detail in Section 5.2.

4.8 Cal Poly Water Conservation Measures

As described in Section 3.8, Cal Poly has undertaken water conservation efforts in response to a series of executive orders in 2014 and 2015 declaring a drought state of emergency by Governor Brown. In response and in conjunction with the Cal Poly Sustainability Policy to promote a wide array of sustainable practices related to water conservation, energy conservation, alternative transportation, and new building construction, Cal Poly implemented a comprehensive drought response water management program for short-term policies and long-range measures to conform to state-mandated water-efficiency programs and water use reductions. While these measures are not a project element, they do impact the water supplies needed by the campus under existing and proposed conditions. They are credited towards the *2035 Master Plan* with a total anticipated water savings is approximately 20 AFY by 2020 and 40 AFY thereafter.

4.9 Recycled Water

Planning for and expanding the use of recycled water serves the dual benefit of decreasing potable water use, thereby increasing supply and reliability of potable water in surface reservoirs. Progressive policies and actions for recycled water are necessary as projected recycled water demands for Cal Poly expansion projects are anticipated at 190 ac-ft in 2022, with an additional 190 ac-ft by 2028. *Title 22*, described in Section 2, provides guidelines on using recycle water for non-potable uses and Cal Poly has identified three primary areas for application of recycled water: primarily for agricultural fields but also can be used in landscaped areas and the sports complexes.

4.9.1 Cal Poly Water Reclamation Facility (WRF)

Cal Poly plans to construct an on-campus WRF in the agricultural area in the West Campus within the agricultural area in the north (Exhibit 5). This is a project element of the *2035 Master Plan* and Cal Poly proposes to develop a package plant using a bio reactive membrane filter with ultraviolet disinfection to treat Cal Poly's wastewater to tertiary standards for use as reclaimed water. The footprint of the WRF would occupy an area of approximately 0.5 acres, which would include the treatment plant, a 900-square foot (sq. ft.) classroom/laboratory and a 900-sq. ft. operations and maintenance room.

The WRF is intended to process up to 380 AFY (0.34 MGD) but final design could range between 235 to 440 AFY (0.21 to 0.39 MGD) (Hartman Engineering, 2019; Veium, Cal Poly Master Plan Water Supply Assessment Technical Memo for Corrected Adjusted 2015 Demands, a. 2018). The package treatment plant would be constructed in two equally-sized phases of 190 AFY (169,621 GPD) each. In the likely scenario, the first phase of the WRF is anticipated to be online no later than 2022 with the second phase online in 2028. In the worst-case scenario, the first phase of the WRF is anticipated to be online in 2026 with the second phase online in 2028 (Table 9). While the WRF is a near-term project, this analysis is being performed at a program level-of-detail.

Table 9: Likely WRF Scenario and Worst-Case WRF Scenario and Phasing

	WRF Capacity (AFY)				WRF Capacity (GPD)			
Scenario	2022	2026	2028	2035	2022	2026	2028	2035
Likely	190	190	380	380	169,621	169,621	339,242	339,242
Worst-Case	0	190	380	380	0	169,621	339,242	339,242

The major use for the reclaimed water is for irrigation of agricultural fields and limited landscape and sports fields areas. Cal Poly may use some of the WRF-treated water as make-up water for wastewater discharges to the City's wastewater system, if the City requires Cal Poly to maintain specific discharge limits, or for mixing with untreated Cal Poly wastewater effluent to better meet permit requirements. Quantities will be determined as needed to meet operational requirements.

New wastewater infrastructure would be required for operations of the WRF, which would consist of two sewer lift stations and pumps to send the waste through the WRF to the ponds on campus to meet all the recycled water requirements (Hartman Engineering, 2019; Watearth, Inc., 2018). Two pump stations would be associated with pumping raw wastewater to the WRF and a pump at the WRF to send recycled water to the reservoir system. The proposed WRF would also require expansion of the existing reservoir system to a maximum (total) of 100 AF. If the existing reservoir system cannot be expanded, then the University may potentially construct two additional reservoirs for recycled water storage from the WRF.

4.10 Cal Poly Average Annual Water Demands

Cal Poly proposes an incremental increase in headcount and capital improvement projects during the planning horizon through 2035. New and renovated/expanded facilities are divided into residential and non-residential buildings to project water demands. This analysis calculates the projected wastewater flows at various stages of the *2035 Master Plan* implementation (analysis years 2020, 2025, 2030, and 2035) as compared to the 2015 baseline year.

The following sections discuss residential average annual water demands, non-residential average annual water demands, water demand reductions due to indoor and outdoor water conservation measures, changes in water supply take from Cal Poly's Whale Rock allocation and the City's water treatment and distribution systems, and changes in how water demands from two off-campus buildings (Chorro Street and Chorro Lofts) are allocated. Residential and non-residential buildings are listed separately and individual projects listed as individual line items to facilitate future planning.

Water demand projections are provided through buildout of the *2035 Master Plan* and include a likely scenario of the first phase of the WRF being online in 2022 and a worst-case scenario of the first phase of the WRF being online in 2026. Total average annual water demands, increases in average annual water demands, and proposed changes in average annual water demands served by the City's water treatment and distribution systems are included. The water demand projections are also used to estimate ADD, PDD, and PDH used in the WaterCAD modeling of the City's water distribution system in Section 4.12 and seasonal demands in Section 4.13.

The water demand projections are based on the following assumptions:

1. Whale Rock remains the primary potable water source for the anticipated water demands of Cal Poly.
2. Agreements in place for Cal Poly portion of Whale Rock remain the same (33.71%) throughout the *2035 Master Plan*.
3. Baseline water demand year is 2015, which corresponds to a student population of 20,944 (Veium, Cal Poly Master Plan Water Supply Assessment Technical Memo for Corrected Adjusted 2015 Demands, a. 2018).
4. Water use factors are from the City of San Luis Obispo unless otherwise noted.
5. The Water Supply Evaluation is a 20-year projection of water demands from proposed developments on the Cal Poly San Luis Obispo campus with a base year of 2015.
6. The WSA includes anticipated water demand data from existing and proposed developments and irrigated areas.
7. Agricultural areas remain unchanged between existing and proposed conditions and therefore is not included in the changed conditions.
8. The Cal Poly proposed WRF is a near-term construction project element with the first phase planned to be online in 2022 under the likely scenario and 2026 under the worst-case scenario. The second phase is planned to be online in 2028 under either scenario.
9. Proposed developments are phased over the 20-year master planning period ending in 2035; full buildout anticipated in 2035 with completion of new undergraduate student housing.
10. The analysis is conducted in five-year increments through the *2035 Master Plan* timeframe and include 2020, 2025, 2030, and 2035 as well as the 2015 baseline year.

4.10.1 Residential Average Annual Water Demands

Calculation of proposed water demands for residential projects is based on the number of beds of the project, which takes into account shared restrooms and operation of the building even when unoccupied. Residential average annual water demand projections are based on the following assumptions:

1. Note that the traditional terminology of gallons per capita per day (GPCD) is not used in this analysis as residential buildings on university campuses have different water demand and wastewater flow patterns than typical single-family or multi-family residential users as they typically do not include kitchens. Additionally, water demands from classrooms, academic buildings, and other support facilities are evaluated separately from housing in the non-residential category using standard usage rates and building categories as described in Section 4.9.2.
2. All residential beds are occupied immediately after completion of the project.

3. For Slack and Grand and the University-based Retirement Community, an annual average water use per bed of 55 GPD/resident was assumed (Hartman Engineering, 2019; City of Santa Barbara, Water Resources Division, 2009).
4. For student housing, an annual average water use per bed of 25.8 GPD/resident is used, as calculated based on metered data from Cal Poly's existing Poly Canyon Village residential area from July 2016 to June 2017 (Hartman Engineering, 2019; City of Santa Barbara, Water Resources Division, 2009).

As shown in Table 10 below, a total average annual water demand increase from residential projects is estimated at 242,410 GPD by 2035. The first unnamed residential project is slated to be operational in 2022 with the fourth unnamed residential project slated to be operational in 2035. The Slack and Grand Residential Neighborhood PPP project is projected to contribute an annual average annual water demand of 33,957 GPD when it comes online in 2023. The University-based Retirement Community is projected to contribute an additional average annual water demand of 21,560 GPD in 2028.

Table 10: Projected Average Annual Water Demands from Residential Projects

Facility	Year Completed	# of Beds	Water Demand (GPD/ Bed)	Water Demand (GPD)
Student Housing Projects				
2,000 beds projected for 2022 (Unnamed)	2022	2,000	25.8	51,600
600 beds projected for 2024 (Unnamed)	2024	600	25.8	15,480
1,500 beds projected for 2027 (Unnamed)	2027	1,500	25.8	38,700
1,500 beds projected for 2031 (Unnamed)	2031	1,500	25.8	38,700
1,600 beds projected for 2035 (Unnamed)	2035	1,600	25.8	41,280
Subtotal Student Residential Projects		**7,200**		**185,760**
Non-Student Housing Projects				
Slack and Grand Residential Neighborhood[1]	2023	630	55	34,650
University-based Retirement Community[1]	2028	400	55	22,000
Subtotal Non-Student Residential Projects		**1,030**		**56,650**
TOTAL STUDENT AND NON-STUDENT PROJECTS		**8,230**		**242,410**

[1] These are projects with Public Private Partnerships (PPP).

4.10.2 Non-Residential Buildings Annual Average Water Demands

Water demands for the 704,362 GSF of non-residential (academic) buildings were estimated using demand factors per building surface area from the City of Santa Barbara Water Resources Division report *"Water Demand Factor Update Report"* (City of Santa Barbara, Water Resources Division, 2009), which lists water demand factors for different land use categories and building types including institutional, service commercial, industrial, office, and retail buildings based on square footage. This water demand source was selected based on the close geographical proximity to Cal Poly as well as the alignment of provided building categories that are consistent with categories proposed as part of Cal Poly's *2035 Master Plan* expansion. While the City provides domestic sewage generation factors for Average Dry-Weather Flow (ADWF), the categories are more limited and do not align as well with Cal Poly's specific proposed building types as does the City of Santa Barbara's data (City of Santa Barbara, Water Resources Division, 2009; City of San Luis Obispo, December 2015; City of San Luis Obispo Sewer System Management Plan Update, 2014).

Proposed non-residential buildings are assigned to the most similar usage category (Table 11) based on the (City of Santa Barbara, Water Resources Division, 2009). The institutional category is not used as it is only applicable for an entire institution and is not relevant for individual buildings within a larger institutional setting. The following provides a definition for the categories used in Table 11 (City of Santa Barbara, Water Resources Division, 2009), which are grouped by similar water demand uses:

- Office – general office space, business, professional, or research;
- Industrial – includes general industrial land uses including assembly, warehousing and storage, manufacturing, and constructed related services;
- Commercial Service – includes items such as restaurants, food service, live or movie theater, auto repair, and veterinary services.

These categories were assigned to each building, and average daily water demands and wastewater flows were estimated for each building as shown in Table 11 below. This water demand source lists metered water use for each building type based on metered data collected by the City of Santa Barbara in 2005 to 2006. Due to the timeframe of data collection, it is assumed that the metered data included a high percentage of low flow fixtures on new and retrofitted buildings and a lower percentage of older, higher flow fixtures that had yet to be replaced. Since all new Cal Poly facilities will be constructed with low-flow and ultra-low-flow fixtures to meet current standards and Cal Poly's sustainability goals, these values provide a conservative estimate for projections.

Where projects are partially or full replacement of existing buildings, the water demands and wastewater flows are calculated to only represent the increase in flow from the baseline, rather than the proposed building's entire flow. Average annual water demands are estimated at 53,960 GPD by 2035 for non-residential buildings.

Table 11: Projected Non-Residential Buildings Average Annual Water Demands

Facility	Year Completed	Size (GSF)	Category	Demand Factor (GPD/ GSF)	Annual Average Water Demand (GPD)
Academic Center Library Addition	2022 - 2035	114,000	Office	0.053562	6,106
Classroom and Offices Building	2022 - 2035	72,000	Office	0.053562	3,856
Beef Cattle Evaluation Center (BCEC) Expansion	2022 - 2035	10,000	Commercial Veterinary	0.151759	1,518
Engineering Projects Buildings	2022 - 2035	71,000	Industrial Assembly/ Manufacturer	0.071416	5,071
Facilities Operations Complex	2022 - 2035	108,000	Industrial	0.071416	7,713
Davidson Music Center Renovation/Addition	2022 - 2035	22,600	Office	0.053562	1,211
Building 19 - Dining Commons Renovation and Addition	2022 - 2035	44,000	Commercial Service	0.151759	6,677
Operations and Farm Shop Relocation	2022 - 2035	51,000	Commercial Auto Repair	0.151759	7,740
IT Services Consolidation	2022 - 2035	15,000	Office	0.053562	803
Fermentation Building	2022 - 2035	N/A	N/A	N/A	1,303
Vista Grande	2020 - 2035	38,965	33.3% Office/66.6% Commercial Service	0.119027	913
Health Center	2022 - 2035	32,797	Commercial Service	0.151759	4,977
Tech Park Expansion	2022 - 2035	125,000	50% Office/ 50% Industrial	0.062489	7,811
TOTAL NON-RESIDENTIAL PROJECTS		704,362			53,483

[1] This building was reviewed for CEQA under the 2001 Amendment but was not constructed by 2015, therefore it is not included in the 2015 Corrected Adjusted baseline flows. This facility is included here to incorporate the wastewater flows for this review.
[2] These are projects with known Public Private Partnerships (PPP).
[3] Indoor use factors taken from the City of Santa Barbara *Water Demand Factor Report* (City of Santa Barbara, Water Resources Division, 2009).

4.10.3 Indoor Water Conservation Measures

Cal Poly initiated an indoor water conservation project in 2014 including a detailed audit of existing fixtures (see Section 3.8). Approximately 50-percent of the fixture replacement was completed by the end of 2018 and the remaining low-flow and ultra-low flow plumbing fixture replacements should be completed by 2020. The water savings from indoor water conservation measures is captured in the water supply analysis in the conservation category. As new developments within the *Master Plan* are phased in, they will also be constructed with low and ultra-low flow plumbing fixtures. Cal Poly is committed to meeting or exceeding current building code requirements to make new developments within the *2035 Master Plan* among the most water efficient in the area.

Cal Poly expects to see an additional 5 AFY (4,463 GPD) indoor savings achieved linearly between 2019 and 2022, and another 5 AFY (4,463 GPD) of indoor savings achieved linearly between 2023 and 2025. This equates to a total of 10 AFY (8,927 GPD) of indoor water use savings achieved at 2025 (Veium, 2017 Drought Response Performance, 2018; California Polytechnic State Unversity, San Luis Obispo). These values are reflected in Table 12 and Appendix D.

4.10.4 Outdoor Water Conservation Measures

Cal Poly initiated outdoor water conservation measures as described in Outdoor Water Conservation Measures above and is committed to complete the proposed irrigation and turf replacement projects in the near term.

Cal Poly expects to see an additional 38 AFY (33,924 GPD) outdoor savings achieved linearly between 2019 and 2022, and another 38 AFY (33,924 GPD) of outdoor savings achieved linearly between 2022 and 2027 with the addition of CalSense Irrigation Controls. Additionally, there is an expected 9 AFY (8,035 GPD) of outdoor savings achieved linearly between 2020 and 2022, and another 9 AFY (8,035 GPD) of outdoor savings achieved linearly between 2023 and 2025 with the addition of AquaCents on turf areas. This equates to a total of 93 AFY (83,025 GPD) of outdoor water use savings achieved at 2027 (Water Savers, LLC, 2014).

Water conservation totals discussed in this section and in the Indoor Water Conservation Measures section above are summarized for analysis years 2020, 2025, 2030, and 2035 in Table 12 below.

Table 12: Summary of Projected Future Indoor and Outdoor Water Conservation Totals

	Conservation Estimates (GPD)			
Water Demand	**2020**	**2025**	**2030**	**2035**
Low Flow Plumbing Retrofits Phase I	2,232	4,464	4,464	4,464
Low Flow Plumbing Retrofits Phase II	0	4,464	4,464	4,464
CalSense Irrigation Controls - Phase I	16,962	33,924	33,924	33,924
CalSense Irrigation Controls - Phase II	0	22,616	33,924	33,924
Aquasense - Turf Areas Phase I	2,678	8,035	8,035	8,035
Aquasense - Turf Areas Phase II	0	8,035	8,035	8,035

Water Demand	Conservation Estimates (GPD) 2020	2025	2030	2035
TOTAL (Water Supply) (Total Conservation)	21,872	81,537	92,845	92,845
TOTAL (Indoor Conservation)	2,232	8,927	8,927	8,927
TOTAL (Outdoor Conservation)	19,640	72,610	83,918	83,918

4.10.5 Projected Future Landscape Demands

While Cal Poly is implementing low-water landscaping, the Proposed Student and Non-Student Housing projects are all projected to contribute to proposed landscape water. The total projected water demands of 0 gpd, 25,890 gpd, 31,246 gpd, and 43,744 gpd in 2020, 2025, 2030, and 2035, respectively are reflected in Table 13 below.

Table 13: Water Demands of Projected Landscape Projects

	Projected Water Demand (GPD)			
Project	2020	2025	2030	2035
TOTAL (Proposed Projects)	0	25,890	31,246	43,744

4.10.6 Reduction in Annual Average Wastewater Flows from Off-Campus Properties

As described in Section 3.1 and Table 3, two of Cal Poly's off-campus properties are being moved from Cal Poly's wastewater allocations to be served by the City's system. Chorro Street and Chorro Lofts are included in Cal Poly's 2015 baseline water demands and are removed from Cal Poly's water demands in all analysis years from 2020 to 2035. The average annual water demands are 47 GPD, 1,131 GPD, and 1,178 GPD for Chorro Street, Chorro Lofts, and the total of the two, respectively. This change is reflected in the "Off-Campus Properties" line item in Table 14 below.

4.10.7 Summary of Average Annual Water Demands

Table 14 summarizes the total average annual water demands for Cal Poly and the additional average annual water demands from all proposed residential, academic, and landscaping projects by analysis year along with all reductions in water demands, including effects of indoor and outdoor water conservation, and changes in how the allocation for off-campus properties are handled. For academic buildings, completion dates are not determined and buildings are assumed to be phased with GSF and associated water demands distributed linearly between 2022 and 2035. While it appears that demands increase over time, water demands from a given non-residential building remain constant once a specific building is operational. Total Cal Poly average annual water demands range from 791,037 GPD in 2020 to 1.054 MGD in 2035 representing a 29.6% increase over the 2015 baseline conditions demand of 813,288 GPD at full buildout of the *2035 Master Plan*.

Both a likely scenario and a worst-case scenario for the WRF being online and operational are included. It should be noted that while the WRF is not used for demand projections, the WRF allows Cal Poly to reduce their raw water demand portion of the SAY from Whale Rock Reservoir. In the likely scenario, the first phase of the WRF is online in 2022 and the second phase in 2028. In the worst-case scenario, the first phase of the WRF is online in 2026 and the second phase in 2028. In both scenarios, the WRF capacity is 190 AFY (169,621 GPD) in the first phase and expanded by 190 AFY (169,621 GPD) in the second phase to a total of 380 AFY (339,242 GPD). The WRF is reflected in analysis years 2025 (first phase) and 2030 (both phases online) for the likely scenario and 2030 (both phases online) for the worst-case scenario.

As shown, average annual water demands served by the SAY from Whale Rock and the City's treatment plant and water distribution system decrease from a 2015 baseline of 813,288 GPD to 620,904 GPD at full *2035 Master Plan* buildout in 2035 in both the likely and worst-case WRF scenarios, assuming all reclaimed water treated by the WRF is used for on-campus irrigation. In the likely scenario of the WRF online in 2022, for all analysis years from 2020 to 2035, average annual water demands are reduced below current levels by a high of 207,819 GPD in 2030 and a low of 22,251 GPD in 2020. The only difference between the likely and worst-case scenario related to water demands from Whale Rock and the City's treatment plant and water distribution system is that in 2025, the likely scenario reduces demands from the City's water distribution system by 110,2817 GPD whereas the worst-case scenario increases demands into the Cal Poly water distribution system by 59,334 GPD.

For all analysis years, Cal Poly has adequate water supply based on the SAY of 959 AFY (856,140 GPD) with available capacity ranging from 42,852 GPD in 2020 to 235,236 GPD in 2035 under both the likely and worst-case scenario of the WRF. Cal Poly has adequate water supply based in the critical year of 2025 even with the worst-case scenario of the WRF with an available capacity of 66,233 GPD. Under the likely case scenario of the WRF, Cal Poly has an available 235,854 GPD in 2025.

Under the likely scenario of the first phase of the WRF online in 2022, the WRF capacity is adequate to fully meet Cal Poly's additional average annual water demand needs for all key analysis and calendar years, including those years with near-term projects slated to be online. Adequate average annual water demands will be available for all residential and non-residential projects as scheduled without taking increased water from Whale Rock/City system as compared to baseline 2015 conditions. Even in the worst-case scenario of the first phase of the WRF online in 2026, Cal Poly has adequate water supply based on the SAY of 959 AFY (856,140 GPD).

If the first phase of the WRF is delayed beyond 2026, planned residential and non-residential buildings would need to be delayed until the WRF is online to avoid placing increased demands on the Whale Rock/City system as compared to 2015 baseline conditions. While not anticipated, even if the WRF is delayed until 2035 Cal Poly has adequate water from the SAY Whale Rock Reservoir.

Table 14: Summary of Annual Average Water Demands in GPD

Water Demand Source	Average Annual Water Demands (GPD) 2015	2020	2025	2030	2035
Baseline Water Demand	813,288	813,288	813,288	813,288	813,288
Student Residential Projects					
2,000 beds projected for 2022 (Unnamed)	0	0	51,600	51,600	51,600
600 beds projected for 2024 (Unnamed)	0	0	15,480	15,480	15,480
1,500 beds projected for 2027 (Unnamed)	0	0	0	38,700	38,700
1,500 beds projected for 2031 (Unnamed)	0	0	0	0	38,700
1,600 beds projected for 2035 (Unnamed)	0	0	0	0	41,280
Subtotal Traditional Residential Projects	**0**	**0**	**67,080**	**105,780**	**185,760**
Non-student Residential Projects					
Slack and Grand Residential Neighborhood[1]	0	0	34,650	34,650	34,650
University-based Retirement Community[1]	0	0	0	22,000	22,000
Subtotal Non-Student Residential Projects	**0**	**0**	**34,650**	**56,650**	**56,650**
Subtotal All Residential Projects	**0**	**0**	**101,730**	**162,430**	**242,410**
Non-Residential Projects					
Academic Center Library Addition	0	0	1,745	3,925	6,106
Classroom and Offices Building	0	0	1,102	2,479	3,856
Beef Cattle Evaluation Center (BCEC) Expansion	0	0	434	976	1,518
Engineering Projects Buildings	0	0	1,449	3,260	5,071
Facilities Operations Complex	0	0	2,204	4,958	7,713
Davidson Music Center Renovation/Addition	0	0	346	778	1,211
Building 19 - Dining Commons Renovation and Addition	0	0	1,908	4,293	6,677
Operations and Farm Shop Relocation	0	0	2,211	4,976	7,740
IT Services Consolidation	0	0	230	516	803
Fermentation Building[2]	0	0	372	838	1,303
Vista Grande[2]	0	0	261	587	913

Water Demand Source	Average Annual Water Demands (GPD) 2015	2020	2025	2030	2035
Health Center[1]	0	0	1,422	3,200	4,977
Tech Park Expansion[1]	0	0	2,232	5,021	7,811
TOTAL NON-RESIDENTIAL PROJECTS	**0**	**0**	**15,281**	**34,382**	**53,483**
Landscape Projects					
Subtotal Proposed Landscape Projects	**0**	**0**	**25,890**	**31,246**	**43,744**
Total Increased Water Demand	**0**	**0**	**142,900**	**228,058**	**339,637**
Reduction due to Indoor Conservation	0	2,232	8,927	8,927	8,927
Reduction due to Outdoor Conservation	0	19,640	72,610	83,918	83,918
Reduction due to Off-campus Properties	0	1,178	1,178	1,178	1,178
Reduction due to On-campus WRF (Likely Case)	0	0	169,621	339,242	339,242
Reduction due to On-campus WRF (Worst Case)	0	0	0	339,242	339,242
Total Reduced Flow (WRF Likely Case)	0	23,050	252,336	433,265	433,265
Total Reduced Flow (WRF Worst Case)	0	23,050	82,715	433,265	433,265
Total Cal Poly Demands Excluding WRF	813,288	790,238	873,473	947,323	1,058,902
Total Cal Poly Demands from Whale Rock/City System (Likely Case)	813,288	767,188	621,137	514,058	625,637
Total Cal Poly Demands from Whale Rock/City System (Worst Case)	813,288	767,188	790,758	514,058	625,637
Change in Cal Poly Demands from Whale Rock/City System (Likely Case)	0	(23,050)	(109,436)	(205,207)	(93,628)
Change in Cal Poly Demands from Whale Rock/City System (Worst Case)	0	(23,050)	60,185	(205,207)	(93,628)

Water Demand Source	Average Annual Water Demands (GPD) 2015	2020	2025	2030	2035
Difference in Safe Total Supply and Total Demand (Likely Case)	**42,852**	**88,952**	**235,003**	**342,082**	**230,503**
Difference in Safe Total Supply and Total Demand (Worse Case)	**42,852**	**88,952**	**65,382**	**342,082**	**230,503**
Difference in Upper Range of Supply and Total Demand (Likely Case)	117,842	163,942	309,993	417,072	305,493
Difference in Upper Range of Supply and Total Demand (Worst Case)	117,842	163,942	140,372	417,072	305,493

[1] These are projects with known Public Private Partnerships (PPP).

[2] This building was reviewed for CEQA under the 2001 Amendment but was not constructed by 2015, therefore it is not included in the 2015 Corrected Adjusted baseline flows. This facility is included here to incorporate the wastewater flows for this review.

4.11 Peak Daily Demands and Peak Hourly Demands

As indicated in section 3.10 above, peak factors of 1.5 and 4.0 were obtained from the *City of San Luis Obispo 2015 Water Master Plan* (Wallace Group, 2015) and used for PDD and PHD, respectively. PDD and PHD are calculated for baseline and analysis years by applying the applicable peaking factor to the ADD and then subtracting the capacity of the WRF from this peak value to obtain the peak water demand needed from the City's water distribution system (Table 15). Note that the potable water demand increases as compared to 2015 baseline even though total average annual water needed from the City decreases due to the WRF.

As shown, PDD from the City's water distribution system range from 823 GPD in 2020 to 909 GPD in 2025, 986 GPD in 2030, and 1,102 GPD in 2035, and PHD values range from 2,195 GPD in 2020 to 2,424 GPD in 2025, 2,628 GPD in 2030, and 2,938 GPD in 2035.

Table 15: Projected Peak Daily and Hourly Demands in GPM

	Average Annual Water Demands (GPM)				
Water Demand Source	**2015**	**2020**	**2025**	**2030**	**2035**
Total Cal Poly Demand	565	549	606	657	735
ADD (Total)	565	549	606	657	735
PDD (Total)	847	823	909	986	1,102
PHD (Total)	2,259	2,195	2,424	2,628	2,938

4.12 Seasonal Water Demands

Seasonal water demands for future years are calculated in Table 16 below based on projected annual average water demands and academic year and summer demand factors of 89.7% and 115.5%, respectively. As described, academic year demand refers to the months of September through June during the main academic year and summer demand refers to the demands in July and August when irrigation demand is highest and enrollment and on-campus occupancy is lowest. In 2035, the average annual demand is projected at 0.718 MGD, the academic year demand is projected at 0.609 MGD, and the summer demand projected at 0.882 MGD under both the likely and worst-case scenario of the WRF.

Table 16: Academic Year and Summer Average Day Water Demand Projections in GPD

Flow Item	Demand Factor	2015	2020	2025	2030	2035
		Water Demands (GPD)				
Total Cal Poly Water Demands						
Average Annual Water Demand	-	813,288	790,238	872,780	946,190	1,057,769
Academic Year (GPD)	89.7%	729,805	708,843	782,884	848,732	948,819
Summer Demand (GPD)	115.5%	939,348	912,725	1,008,061	1,092,849	1,221,723
Additional Supply due to On-campus WRF (Likely Case)		0	0	169,621	339,242	339,242
Additional Supply due to On-campus WRF (Worst Case)		0	0	0	339,242	339,242
Cal Poly Water Demands with Likely Case of WRF		**Water Demands (GPD)**				
Average Annual Water Demand	-	813,288	790,238	703,159	606,948	718,527
Academic Year	-	729,519	708,843	613,263	509,490	609,577
Summer Demand (GPD)	-	939,348	912,725	838,440	753,607	882,481
Cal Poly Water Demands with Worst-Case of WRF		**Water Demands (GPD)**				
Average Annual Water Demand	-	813,288	790,238	872,780	606,948	718,527
Academic Year	-	729,519	708,843	782,884	509,490	609,577
Summer Demand (GPD)	-	939,348	912,725	1,008,061	753,607	882,481

4.13 Fire Flows

Fire flows for Cal Poly are evaluated at a planning-level for proposed *2035 Master Plan* residential and non-residential buildings. While a more detailed evaluation of Cal Poly's on-campus water distribution system is underway as part of the *Cal Poly Utility Master Plan*, results of this study will not be available for inclusion in the *2035 Master Plan EIR*. However, system improvements will be identified to correct deficiencies (if any) within Cal Poly's existing water distribution system as well as to serve proposed expansion of facilities and increases in student and support population and to ensure that pressures are adequate to meet minimum fire flow requirements for planned buildings with consideration of the number of stories and building height. Capital Improvements Plan (CIP) projects will be identified and phased as part of the *Cal Poly Utility Master Plan*. Any improvements required within Cal Poly's on campus water distribution system (storage, lines, pumps, etc.) will be programmed and phased for specific calendar or academic years as part of this effort.

Since the *Cal Poly Utility Master Plan* is a planning-level effort to identify and phase CIP projects, fire flow and other required modeling and analysis will be performed during project-specific design to ensure compliance with all regulations related to fire flows and pressures. If project-specific analysis identifies the need for additional improvements (i.e., booster pumps, increase in water line size serving individual buildings, etc.) to boost pressures to meet fire flow requirements, those improvements will be incorporated into the project-specific design. In the case of booster pumps, appropriate backup pumps and power supply will also be provided. Detailed calculations for sizing and spacing of sprinklers will also be performed as part of project-specific design. Additional fire hydrants or building-based fire department connections (FDC)s will be included as part of project-specific designs to meet all firefighting criteria and regulations for new projects.

4.13.1 Fire Flow Capacity Requirements

Per the County of San Luis Obispo Fire Department's document *"Standard 1, Water Supply"*, fire flow is measured at "20 pounds per square inch (psi) residual pressure" (County of San Luis Obispo Fire Department). A minimum fire-flowrate of 1,000 gallons per minute (gpm) with a flow duration of one-hour is the required baseline fire flowrate and duration for "one- and two-family dwellings and group R-3 and R-4 buildings and townhouses" with an area less than 3,600 square feet (sq. ft.) per the 25 International Fire Code. The County of San Luis Obispo Fire Department exceeds the International Fire Code requirement, mandating the same flowrate (1,000 gpm), but requires a flow duration of two hours for one- and two-family dwellings. The San Luis Obispo County Fire Flows Standards provides minimum design requirements including that the minimum fire flow and flow duration for buildings other than one- and two-family dwellings shall be as specified in the California Fire Code (CFC) Appendix B (City of San Luis Obispo, 2013).

The *2035 Master Plan* consists of numerous building types with variations in total area. Fire flows and duration for larger buildings of differing construction types (IA, IB, IIA, IIIA, IV, V-A, IIB, IIIB, V-B) are listed in Table B105.2 of the 2015 International Fire Code (International Code Council, 2015). Based on the existing and proposed Cal Poly building types, sizes, and configurations, an overview of fire flow requirements applicable to Cal Poly are summarized in Table 17 below.

Table 17: Overview of Applicable Fire Flow Requirements for DEIR Proposed Buildings

Building	Building Type	Floor Area (GSF)	Required Fire Flow (gpm) Required Fire Flow, Unadjusted for Sprinklers (gpm)	Required Fire Flow, Adjusted for Sprinklers (gpm)	Required Fire Flow Duration (Hours)	Required Volume (Gallons)
Proposed Academic Buildings						
Academic Center Library Addition	Type II-A	114,000	4,750	1,188	4	285,000
Classroom and Offices Building	Type II-A	72,000	3,750	938	3	168,750
Beef Cattle Evaluation Center (BCEC) Expansion	Type II-A	10,000	1,500	375	2	45,000
Engineering Projects Buildings	Type II-A	71,000	3,750	938	3	168,750
Facilities Operations Complex	Type II-A	108,000	4,750	1,188	4	285,000
Davidson Music Center Renovation/Addition	Type II-A	22,600	2,250	563	2	67,500
Health Center	Type II-A	65,000	3,750	938	3	168,750
Tech Park Expansion	Type II-A	125,000	5,000	1,250	4	300,000
Building 19 - Dining Commons Renovation and Addition	Type II-A	44,000	3,000	750	3	135,000
Operations and Farm Shop Relocation	Type II-A	51,000	3,250	813	3	146,250
IT Services Consolidation	Type II-A	15,000	1,750	438	2	52,500
Proposed Residential Buildings						
Facilities	Type II-A	352,836	6,000	1,500	4	360,000
Creekside West	Type II-A	888,624	6,000	1,500	4	360,000
Creekside East	Type II-A	503,118	6,000	1,500	4	360,000
North Mtn. Redevelopment	Type II-A	264,627	6,000	1,500	4	360,000
Largest Existing Buildings						
Bldg 180. Baker Sceince	Type II-A	188,372	6,000	1,500	4	360,000
Bldg 35. Library	Type II-A	208,433	6,000	1,500	4	360,000
Bldg 21. Engineering West	Type II-A	121,640	5,000	1,250	4	300,000

As shown in this table, Cal Poly's fire flow requirements for proposed residential buildings is 1,500 gpm for four hours. Cal Poly's fire flow requirements for proposed non-residential buildings range from 375 gpm for two hours to 1,250 gpm for four hours. The greatest required volume is 360,000 gallons, to provide 1,500 gpm for four hours at each of the proposed residential buildings.

4.13.2 Cal Poly Fire Flow System Components and Main Line

Domestic water service is provided to the Cal Poly Academic Core by the City from four locations as described below and illustrated on the graphic included in Appendix A.

1. **Main Connection:** The main connection is for the Academic Core, located along California Boulevard just south of Highland Drive. It runs through Pump House #1. Pump House #1 does not boost City pressure. City pressure of about 125psi is adequate to push water up to the 1,000,000 gal Reservoir #1 at the top of the R1/K1 parking lots. Reservoir #1 is made of two separate 500,000 gal cells. Pumphouse #2, located at the south end of Reservoir #1, pumps water from Reservoir #1 up to the elevated Reservoirs #2 and #3. Much of this 12-inch line that runs through campus is aging, asbestos-containing transite pipe that is beyond its useful service life. This line travels through the two square "reservoirs" at the base of the hill next to the R1 parking lot.

2. **Second Connection:** The second connection in the Academic Core area provides service to Spanos Stadium from a 4-inch connection along California Boulevard. A 6-inch firewater connection in the same area provides service to two fire hydrants along California Boulevard at the north and south ends of the stadium. This pipe is assumed to be made of cast iron, but the material is not listed in the Utility Atlas.

3. **Third Connection:** The third line connects to the City's 24-inch main at the south end of the Academic Core at California Boulevard and Campus Way with a newer 12-inch C900 pipe (cast-iron-pipe-equivalent outside diameter polyvinyl chloride (PVC) pressure pipe). This serves the southwest side of the Academic Core, including the newly renovated Recreation Center. While the City provides water to these buildings and is not responsible for fire flows, there are hydrants in the vicinity which are connected to the 500,000 and 1,000,000 gallon storage tanks and Cal Poly is responsible for ensuring that fire flow requirements of the surrounding buildings are met.

4. **Fourth Connection:** The fourth water connection for the Academic Core is a 12-inch pipe that does not provide water to any of the Academic Core area, and currently only serves the Poly Canyon Village complex. Based on the "RFI 15" PDF, this pipe supplies the Poly Canyon Village complex, but the complex is also supplied by the Cal Poly elevated and ground storage tanks. It is assumed that fire flows need to be met by the Cal Poly storage only.

Appendix A includes the *Cal Poly Utility Atlas* and Appendix B provides the Water System Node Map, which illustrates the location and size of all of Cal Poly's on campus water distribution system lines and associated diameters along with elevated storage tanks and ground storage tank. The Academic Core of Cal Poly includes a one-million-gallon ground storage tank, a 30,000-gallon elevated storage tank, and a 500,000-gallon elevated storage tank for reliable service of potable water demands and to provide adequate volume for firefighting purposes.

As shown in Appendix A and B, the main line for fire flows connects to the City's water distribution system by feeding into the 1,000,000 and 500,000 gallon reservoirs through the Main Connection. These reservoirs then connect to Cal Poly's system through a 10-inch pipe to Cerro Vista and a 12-inch pipe that continues through the Cal Poly campus where it forms a loop underneath North Perimeter and South Perimeter roads, and connects under University Drive. The size of this main line varies from 10 to 12 inches. Based on the Water page of the *Cal Poly Utility Atlas* provided by Cal Poly, Cal Poly's fire flow system consists of the main line loop under North Perimeter and South Perimeter roads, smaller distribution lines leading off the main lines, and fire hydrants located throughout the campus as required to supply buildings. While the City is contractually obligated to deliver potable water to Cal Poly, this agreement does not extend to providing potable water for firefighting purposes. As such, water supply for firefighting purposes is stored within the 1,000,000-gallon ground storage tank and 500,000-gallon elevated storage tanks on the hillside to the east of campus for a total of 1.5 million gallons (MG) of storage.

4.13.3 Fire Fighting Volume Capacity

While the City is not contractually obligated to provide fire flows to Cal Poly, it is assumed that average daily or even peak daily or peak hourly demands would continue to be served by water delivered to Cal Poly from the City under fire conditions at Cal Poly or fire conditions within the City's system.

According to Cal Poly staff, on campus tanks are operated to ensure an adequate volume for firefighting purposes to meet or exceed criteria. This operation is not planned to be altered significantly as a result of planned growth and expansion and thus existing conditions (2015 baseline) and proposed 2035 conditions, as well as interim years, are assumed to provide a very similar volume of water for firefighting needs. Any changes in system operation that affect the operation and normal water levels in the on-campus water storage tanks that are proposed as part of the *Cal Poly Utility Master Plan* will comply with fire flow criteria. Therefore, this conceptual-level volume assessment is based upon on-campus ground storage and elevated storage tank volumes rather than being tied to future campus expansion or enrollment.

From a volume perspective, assuming all three tanks within the Academic Core are 50-percent full at the start of a fire, adequate volume (765,000 gallons) exists to provide 6,375 gpm over a two-hour duration fire, or 3,188 gpm over a four-hour duration fire. Even if the three tanks were only 25-percent full at the start of a fire, adequate volume (382,500 gallons) exists to provide 3,188 gpm over a two-hour duration or 1,594 gpm over a four-hour duration. The 500,000-gallon elevated storage tank would provide a flow of 4,167 gpm over a two-hour duration fire or 2,084 gpm over a four-hour duration fire if full at the start of a fire. If 75-percent full (375,000 gallons) at the start of a fire, the elevated storage tank would provide a flow of 3,125 gpm over a two-hour duration fire and 1,563 gpm over a four-hour duration fire. These values all meet the requirements summarized in Table 17 above.

4.13.4 Pressure Spot Checks/Assessments

While detailed water distribution system modeling and pressure checks for fire flow and all typical demand conditions will be performed as part of the *Cal Poly Utility Master Plan*, planning-level spot checks are performed as part of this current study. As shown in Table 18, four end points were selected based on being the furthest away from the elevated 1,000,000-gallon and 500,000-gallon reservoirs near the east end of the campus. Additionally, Yosemite Hall is listed at elevation 428 on Table 18 and is in the Residential East Campus which is at the far end from the reservoirs. These four locations are in close proximity to the various buildings listed in Table 18 below.

Table 18: Approximate Location of Fire Flow Spot Check Points

Building Number	Building Name	Identifier	Description	Location	Elevation (ft)
3	Business	Point D	This building is near the north-west corner of the academic core, farthest from the reservoirs	Just north of football stadium	294
114 T7	Yosemite Hall	Point F	This building is in the Residential East Campus, at the far end from the reservoirs	South of the reservoirs along Grand Avenue	428
171G	Poly Canyon Village	Point I	This building is near the highest point of the North Campus	North of the reservoirs along Village Drive	386
115	Chase	Point K	This building is near the south-west corner of the academic core, farthest from the reservoirs	Southeast of football stadium	290

Given the planning-level nature of these spot checks and available information, the following assumptions were used:

1. For certain segments, it was unclear where the pipe diameter changed from a larger diameter to a smaller diameter. The smaller, more conservative, diameter was applied to the entire length of pipe for these segments.
2. For each pathway, the "Demand along segment or at end of segment" value is the required fire flow for each location. To be conservative, these values were all set at 1,500 gpm, the maximum required fire flow for proposed and existing buildings.
3. Demand at each segment leading towards the final spot check location was set at 200 gpm (288,000 gpd), to conservatively approximate the upstream peak demands that will need to be met concurrently with fire flows.
4. Hazen Williams values are from the United States Army Corps of Engineers (United States Army Corps of Engineers, 1989), and pipe ages are assumed to be ten years for the recently replaced water main loop and for pipes leading to recently constructed areas, and 40 years old for all other pipes.
5. In general, the calculations assume that the entire flowrate to meet fire flow requirements occurs in one linear path through the distribution system. However, due to the large, interconnected layout of Cal Poly's distribution system, it was assumed that water will flow in parallel to meet fire demands. Initial calculations using one linear path through the system did not show adequate fire flow availability for pathways A to D and A to K, which are the two points that lie on the opposite side of the Campus Academic Core. It was assumed that fire flows to these locations would split at Point B and be conveyed along both the north and south portions of the main water line under North Perimeter Road and

South Perimeter Road. Thus, the following modifications have been made to the flowrates:

a. Segments B – C, C – D, B – J, and J – K have had flowrates changed from 1138, 938, 1,700, and 1,500, respectively to 569, 469, 850, and 750, respectively.

In order to spot check fire flow availability at various locations throughout the system, calculations were performed using a combination of the Hazen-Williams equation for friction loss, Bernoulli's equation for continuity of head, and various conversion factors. These calculations are summarized in Table 19 below. Segments of pipe are defined that connect the starting point (a reservoir or location with known head) and the end point (required flowrate and pressure at a proposed building). Assumptions are made regarding the demands at each segment, to reflect that the upstream portion of the pipe will generally have a higher flowrate than the downstream end, as water is removed from the system by users along the distribution system flow path.

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Table 19: Summary of Pressures at Flow Paths and Fire Flow Spot Check Points

		Starting Elevation (ft)	Starting Head (ft)	Starting Pressure (psi)	Diameter (inches)	Hazen-Williams C-value (unitless)	Length (ft)	Demand along segment or at end of segment (gpm)	Flowrate (gpm)	Velocity (ft/s)	Velocity Head (ft)	Headloss due to Friction (ft)	Ending Elevation (ft)	Ending Head (ft)	Ending Pressure (psi)
Point A to D															
Segment 1	A to B	675.00	675.00	0.00	12	90	2,889	200	1,650	4.68	0.34	**36.79**	381	638.6	**111.4**
Segment 2	B to C	381.00	638.55	111.40	10	115	1,258	200	725	2.96	0.14	**5.40**	310	633.3	**140.0**
Segment 3	C to D	310.00	633.29	139.96	6	75	2,050	1,250	625	7.09	0.78	**176.96**	294	457.1	**70.3**
Point A to F															
Segment 1	A to E	675.00	675.00	0.00	12	90	2,553	200	1,700	4.82	0.36	**34.35**	397	641.0	**105.5**
Segment 2	E to F	397.00	641.01	105.52	8	75	1,381	1,500	1,500	9.57	1.42	**148.53**	428	493.9	**27.9**
Point A to I															
Segment 1	A to G	675.00	675.00	0.00	10	90	1,981	200	1,900	7.76	0.93	**79.51**	432	596.4	**70.8**
Segment 2	G to H	432.00	596.42	70.81	8	80	817	200	1,700	10.85	1.82	**98.30**	422	500.0	**33.0**
Segment 3	H to I	422.00	499.95	32.97	10	115	3,121	1,500	1,500	6.13	0.58	**51.40**	386	449.1	**27.1**
Point A to K															
Segment 1	A to B	675.00	675.00	0.00	12	90	2,553	200	1,900	5.39	0.45	**42.20**	397	633.2	**102.1**
Segment 2	B to J	397.00	633.25	102.12	10	110	2,193	200	850	3.47	0.19	**13.71**	300	619.7	**138.4**
Segment 3	J to K	300.00	619.72	138.39	6	75	1,059	1,500	750	8.51	1.12	**128.08**	290	492.8	**87.3**

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As these approximate calculations above show, the existing system generally is adequate to meet the fire flow requirements of proposed projects. The *2035 Master Plan* increases the required flowrates at locations of housing buildings; however, certain existing buildings already classify as having the maximum required flowrate of 1,500 gpm, which applies to all buildings larger than 166,501 sq. ft. These planning-level fire flow spot checks show adequate pressures above 20 psi at all analyzed end points and at analyzed locations along each flow path. While approximate, estimated pressures under fire flow conditions range from 27 psi to 140 psi. Additionally, aging infrastructure and water lines used as fire lines will be identified in the *Cal Poly Utility Master Plan* for replacement. Replaced water lines will have smoother surfaces and improved capacity resulting in higher pressures during fire flow conditions and all operating conditions. Any CIP projects will improve the performance of the system under fire flow and a full range of operating conditions.

5 City Water Distribution System Conveyance Capacity

A detailed study of the Cal Poly water distribution system is currently underway as part of the *Cal Poly Utilities Master Plan*, but will not be available for inclusion in the *2035 Master Plan* EIR projected to be published in 2019. The City expressed concern that the additional potable water needs for the campus expansion could impact the City's potable and wastewater systems. This section provides the results of a high-level analysis of general capacity of the City water distribution system's capacity at the Cal Poly points of connection. To evaluate capacity of the City's water distribution system, Watearth obtained WaterCAD models of the City's water distribution system.

5.1 City Water Distribution System and WaterCAD Models

The City's water distribution system node/link map is included in Appendix B. A range of modeling scenarios is included in the City's water distribution system models, including: ADD, PDD, PDH, and City fire flow (FF) demands at current conditions and future conditions (+ FUTURE). While not tied to particular analysis years, current conditions represent 2015 baseline conditions and "+ Future" represents 2035 conditions. As discussed in Section 3.13 of this report, Cal Poly is responsible for meeting on campus fire flow demands and therefore, the City does not have a water distribution system model that includes fire flow demands within the Cal Poly campus.

WaterCAD Acronyms and Equivalents
ADD – Average Day Demand
MDD – Max Day Demand (WaterCAD)
PDD – Peak Daily Demand (Reported results)
PHF – Peak Hourly Flow(WaterCAD)
PDH – Peak Hourly Flow (Reported results)
FF – Fire Flow
+ Future – 2035 Master Plan Conditions

Cal Poly's water demands in the original model provided by the City in March 2019 are listed on the water system node map provided by the City are listed as:

- Average Day Demand (ADD) = 273 GPM
- Max Day Demand (MDD) = ADD * 1.5 = 409.6 GPM (assumed to be equivalent of Peak Daily Demand, or PDD)
- Peak Hourly Flow (PHF) = ADD * 3.4 = 928.2 GPM (assumed to be equivalent to Peak Hourly Demand, or PHD)

5.2 City Water Distribution System Key Analysis Points

The purpose of this evaluation of the City's system is to spot check capacity within the City's water distribution system. While it is not intended to be a comprehensive evaluation of the City's water distribution conveyance system, it provides valuable information for the CEQA process based on evaluations of capacities of water distribution system lines and analysis of potential for impacts from changes in Cal Poly's demands at five (5) key points within the City's water distribution system.

These five key points were selected to encompass Cal Poly's connection points to the City's water distribution system at a node upstream of the three Cal Poly connections, at each of the Cal Poly connections, and at a node further downstream of all Cal Poly connections approximately under California Boulevard and Foothill Boulevard, per input provided by the City at a November 16, 2018 meeting regarding water distribution system capacity (Watearth, Inc., 2018). All analysis points are downstream of Reservoir #2 (Node J-1102), which is the reservoir that feeds the "High Pressure Zone" that connects to Cal Poly (Wallace Group, 2015). According to the City staff, the water distribution is sized to provide necessary fire flows to downtown San Luis Obispo and no limits in capacity have been identified in the fire flow model and there are likely no water distribution system bottlenecks between the City Water Treatment Plant and the Cal Poly campus.

The five key points selected for analysis include:

1. Node J-1102, the first node downstream of San Luis Obispo Reservoir #2 which feeds Cal Poly through the High Pressure Zone;
2. Node J-1139, the node where the main line from San Luis Obispo Reservoir #2 changes from a 24-inch concrete cylinder pipe (CCP) pipe to a 24-inch polyvinyl chloride (PVC) pipe, approximately under the portion of the unnamed road that leads from Mt Bishop Road to the Cal Poly Student Experimental Farm adjacent to the Cal Poly Dairy. This is the first Cal Poly demand location;
3. Node J-24756 at Cal Poly's dedicated connection to Poly Canyon Village, located approximately under the intersection of California Boulevard and Highland Drive. This is the second Cal Poly demand location;
4. Node J-24757 at Cal Poly's connection to the 500,000 and 1,000,000 gallons reservoirs that supply the academic core, located approximately under the intersection of California Boulevard and the North Perimeter Road. This is the third and final Cal Poly demand location;
5. Node J-1074, downstream of Cal Poly's three connection locations located approximately under California Boulevard and Foothill Boulevard.

Table 20 and Table 21 below show the ADD, MDD, and PHD values at Junctions 1139, 24756, and 24757 in the original model provided by the City. These are similar to, but do not match the values listed on the water node map (Appendix B). While the existing City modeling scenarios are run for comparison purposes, as discussed in Section 5.2, all Cal Poly water demands used in this modeling effort are based on results obtained in the current study based on the *2035 Master Plan* as opposed to data currently in the City's WaterCAD model.

Table 20: Cal Poly Water Demands in City WaterCAD Models in GPM

	Demand - GPM					
	Existing ADD	Existing MDD	Existing PHD	ADD Exist + Future	MDD Exist + Future	PHD Exist + Future
J-1139	44	66	148	55	83	187
J-24756	1	2	4	1	2	5
J-24757	368	552	1,242	411	616	1,387

Table 21: Cal Poly Water Demands in City WaterCAD Models in GPD

	Demand - GPD					
	Existing ADD	Existing MDD	Existing PHD	ADD Exist + Future	MDD Exist + Future	PHD Exist + Future
J-1139	63,360	95,040	213,120	79,200	119,520	269,280
J-24756	1,440	2,880	5,760	1,440	2,880	7,200
J-24757	529,920	794,880	1,788,480	591,840	887,040	1,997,280

5.3 Water Demands Used in City Water Distribution System Analysis

Table 15 in Section 4.12 summarizes the calculated Cal Poly ADD (equal to annual average daily demands), PDD, and PHD demands for the analysis years of 2015, 2020, 2025, 2030, and 2035. These values represent the total demand of Cal Poly, but these values must be distributed among the different nodes that represent Cal Poly's connection points to the City system defined in Section 5.2 above.

It was determined that no Master Plan items will increase demand at Junctions 1139 and 24756, and thus these values can remain constant through the entire analysis period of 2015 to 2035. These values for ADD, PDD, and PHD are 3, 5, and 10 respectively for Junction 1139, and 50, 75, and 170 respectively for Junction 24756.

The last junction, 24757, will then receive the remainder of the demand. Demands have been assigned to Junction 24757 by subtracting the demands of Junctions 1139 and 24756 from the total demand. These values are all summarized in Table 22 below.

Table 22: Complete Demands Used for Modeling

	Average Annual Water Demands (GPM)				
Water Demand Source	**2015**	**2020**	**2025**	**2030**	**2035**
Total Cal Poly Demand	565	549	606	657	735
ADD (Total)	565	549	606	657	735
PDD (Total)	847	823	909	986	1,102
PHD (Total)	2,259	2,195	2,424	2,628	2,938
Constant Flows, per City Utilities Map	Modeling Flows (GPM)				
ADD (AG Buildings, Node J-1139)	3	3	3	3	3
PDD (AG Buildings, Node J-1139)	5	5	5	5	5
PHD (AG Buildings, Node J-1139)	10	10	10	10	10
ADD (Poly Canyon Village, Node J-24756)	50	50	50	50	50
PDD (Poly Canyon Village, Node J-24756)	75	75	75	75	75
PHD (Poly Canyon Village, Node J-24756)	170	170	170	170	170

Projected Variable Flows	Modeling Flows (GPM)				
ADD (Remaining Flows to Campus Core, Node J-24757)	512	496	553	604	682
PDD (Remaining Flows to Campus Core, Node J-24757)	768	744	830	906	1,022
PHD (Remaining Flows to Campus Core, Node J-24757)	2,079	2,015	2,244	2,448	2,758

5.4 City Water Distribution System Analysis Modeling Scenarios

A range of modeling scenarios is analyzed, including various City and Cal Poly under various conditions, including: ADD, PDD, PHD, and City FF. The following 30 modeling runs encompassing various timeframes and flow scenarios are evaluated:

a. **Runs 1 – 3:** ADD, PDD, and PHD for Baseline (2015) City demands and 2015 Cal Poly demands;
b. **Runs 4 – 6:** ADD, PDD, and PHD for Baseline (2015) City demands and 2020 Cal Poly demands;
c. **Runs 7 – 9:** ADD, PDD, and PHD for Baseline (2015) City demands and 2025 Cal Poly demands;
d. **Runs 10 – 12:** ADD, PDD, and PHD for 2035 City demands and 2025 Cal Poly demands;
e. **Runs 13 – 15:** ADD, PDD, and PHD for 2035 City demands and 2030 Cal Poly demands;
f. **Runs 16 – 18:** ADD, PDD, and PHD for 2035 City demands and 2035 Cal Poly demands;
g. **Run 19 – 21:** FF model with Baseline (2015) City demands and 2015, 2020, and 2025 Cal Poly MDD demands;
h. **Run 22 – 24:** FF model with 2035 City demands and 2025, 2030, and 2035 Cal Poly MDD demands.

Table 23 provides an overview of the model names, run numbers, Cal Poly water demand years or amount, and City water demand years. Table 15 above summarizes the values used in each of these runs at the points of connection to the City's water distribution system. These values are based on the water demand projections from Table 15 above. Note that the only model input data changed for this analysis are the demand values at Cal Poly's three points-of-connection to the City's water distribution system. Model input and output from each of these 24 runs is included in Appendix D.

Table 23: City's WaterCAD Modeling Runs and Names

		Cal Poly Water Demands Year or Amount					City Water Demands Year		Water Demand Condition			
Model Run Number	Model Name	2015 (Baseline)	2020	2025	2030	2035	2015 (Baseline)	2035 (Ultimate)	ADD	PDD	PH	City FF
1	City_ADD_2015 CP_2015	●					●		●			
2	City_PDD_2015 CP_2015	●					●			●		
3	City_PHD_2015 CP_2015	●					●				●	
4	City_ADD_2015 CP_2020		●				●		●			
5	City_PDD_2015 CP_2020		●				●			●		
6	City_PHD_2015 CP_2020		●				●				●	
7	City_ADD_2015 CP_2025			●			●		●			
8	City_PDD_2015 CP_2025			●			●			●		
9	City_PHD_2015 CP_2025			●			●				●	
10	City_ADD_2035 CP_2025			●				●	●			
11	City_PDD_2035 CP_2025			●				●		●		
12	City_PHD_2035 CP_2025			●				●			●	
13	City_ADD_2035 CP_2030				●			●	●			
14	City_PDD_2035 CP_2030				●			●		●		
15	City_PHD_2035 CP_2030				●			●			●	
16	City_ADD_2035 CP_2035					●		●	●			
17	City_PDD_2035 CP_2035					●		●		●		
18	City_PHD_2035 CP_2035					●		●			●	
19	City_PDD_FF_2015 CP_2015	●					●			●		●
20	City_PDD_FF_2015 CP_2020		●				●			●		●

Model Run Number	Model Name	Cal Poly Water Demands Year or Amount					City Water Demands Year		Water Demand Condition			
		2015 (Baseline)	2020	2025	2030	2035	2015 (Baseline)	2035 (Ultimate)	ADD	PDD	PH	City FF
21	City_PDD_FF_2015 CP_2025			●			●			●		●
22	City_PDD_FF_2035 CP_2025			●				●		●		●
23	City_PDD_FF_2035 CP_2030				●			●		●		●
24	City_PDD_FF_2035 CP_2035					●		●		●		●

ADD modeling runs are developed by duplicating the City's Existing ADD and Future ADD alternatives and renaming them to follow the naming convention developed for this project described above. PDD and PHD scenarios are modeled similarly using the City's existing scenarios and future PDD and PHD alternatives and scenarios. Scenarios are duplicated in a similar fashion for all scenarios as needed. Lastly, alternatives are modified to reflect the updated Cal Poly demands at each of the three nodes, as described in Table 22 above.

5.5 City Water Distribution System Analysis Modeling Results

WaterCAD input and output data is included in Table 22 and Appendix D for all nodes/links in the main line spanning from Reservoir #2 upstream of Cal Poly to Junction J-1044, approximately one mile south of Cal Poly under California Boulevard and Foothill Boulevard.

Hydraulic grade line (HGL) plots from Reservoir #2 to Junction J-1044 are included in the figures in Appendix E. As shown in these HGL plots, all HGL elevations are above the top of pipe elevation, meaning positive pressure is maintained in the line. HGL elevations are closer to top of pipe in the upstream portion of the system which is installed at a higher elevation, and pressures are lower. There are no apparent impacts downstream of Cal Poly, as the HGL stays well over 200 feet above top of pipe. It should be noted that the HGL plots only show the "worst case scenario", or highest demand condition for each year shown. For example, on the plot for Future ADD, only the 2035 HGL is shown, as it is expected that 2030 and 2025 will have HGL results of lesser concern, as there are lesser flows.

Table 24 summarizes modeled pressure and velocity at five key points within the City's wastewater collection system as described in Section 5.3. There are no runs that appear to significantly impact pressures downstream, and the maximum velocity is 4.39 feet per second at Key Location 1 for the 2035 Peak Hourly Demand run (run 18). Line items have been grouped so that pressures may more easily be compared year by year for each flow condition.

Upstream and downstream nodes are assigned inconsistently in the original WaterCAD model provided by the City. For example, if the nodes are not assigned consistently, one pipe could have 2,000 gpm and the adjacent pipe could have -2,000 gpm. The results below have been modified to report values based on the assumption that upstream nodes are closer to Reservoir #2 and downstream nodes are further from Reservoir #2.

Table 24: Summary of WaterCAD Modeling and Capacity Results At Five Key Locations In City Water Distribution System

Model Run Number	Model Name	Water Demands Year Cal Poly	Water Demands Year City	Cal Poly Demand (gpm)	Flow Condition	Key Location 1 - Junction 1102 Pressure (psi)	Key Location 1 - Junction 1102 US Flow Velocity (ft/s)	Key Location 2 - Junction 1139 Pressure (psi)	Key Location 2 - Junction 1139 US Flow Velocity (ft/s)	Key Location 3 - Junction 24756 Pressure (psi)	Key Location 3 - Junction 24756 US Flow Velocity (ft/s)	Key Location 4 - Junction 24757 Pressure (psi)	Key Location 4 - Junction 24757 US Flow Velocity (ft/s)	Key Location 5 - Junction 1074 Pressure (psi)	Key Location 5 - Junction 1074 US Flow Velocity (ft/s)
1	City_ADD_2015 CP_2015	2015	2015	512	ADD	9	0.38	98	0.38	112	0.34	112	0.02	122	0.01
4	City_ADD_2015 CP_2020	2020	2015	496	ADD	9	0.37	98	0.37	112	0.33	112	0.02	122	0.01
7	City_ADD_2015 CP_2025	2025	2015	553	ADD	9	0.41	98	0.40	112	0.37	112	0.02	122	0.01
10	City_ADD_2035 CP_2025	2025	2035	1,979	ADD	9	1.04	97	0.93	111	0.90	111	0.51	121	0.50
13	City_ADD_2035 CP_2030	2030	2035	2,004	ADD	9	1.07	97	0.96	111	0.92	111	0.50	121	0.49
16	City_ADD_2035 CP_2035	2035	2035	2,040	ADD	9	1.11	97	1.00	111	0.96	111	0.48	121	0.48
19	City_PDD_FF_2015 CP_2015	2015	2015	1,178	PDD_FF	7	0.75	96	0.74	111	0.69	111	0.15	120	0.14
22	City_PDD_FF_2035 CP_2025	2025	2035	1,030	PDD_FF	7	0.82	96	0.71	111	0.66	111	0.07	120	0.04
2	City_PDD_2015 CP_2015	2015	2015	2,432	PDD	12	1.20	100	1.19	114	1.13	114	0.59	124	0.51
5	City_PDD_2015 CP_2020	2020	2015	2,418	PDD	12	1.19	100	1.17	114	1.12	114	0.59	124	0.52
8	City_PDD_2015 CP_2025	2025	2015	2,464	PDD	12	1.23	100	1.22	114	1.17	114	0.58	124	0.50
11	City_PDD_2035 CP_2025	2025	2035	3,366	PDD	11	2.10	98	1.54	112	1.49	112	0.90	122	0.43
14	City_PDD_2035 CP_2030	2030	2035	3,388	PDD	11	2.13	98	1.58	112	1.52	112	0.88	122	0.41
17	City_PDD_2035 CP_2035	2035	2035	3,418	PDD	11	2.18	98	1.63	112	1.57	112	0.85	122	0.39

Model Run Number	Model Name	Water Demands Year		Cal Poly Demand (gpm)	Flow Condition	Key Location 1 - Junction 1102		Key Location 2 - Junction 1139		Key Location 3 - Junction 24756		Key Location 4 - Junction 24757		Key Location 5 - Junction 1074	
		Cal Poly	City			Pressure (psi)	US Flow Velocity (ft/s)	Pressure (psi)	US Flow Velocity (ft/s)	Pressure (psi)	US Flow Velocity (ft/s)	Pressure (psi)	US Flow Velocity (ft/s)	Pressure (psi)	US Flow Velocity (ft/s)
20	City_PDD_FF_2015 CP_2020	2020	2015	1,158	PDD_FF	7	0.74	96	0.73	111	0.67	111	0.15	120	0.14
23	City_PDD_FF_2035 CP_2030	2030	2035	1,070	PDD_FF	7	0.87	96	0.75	110	0.70	110	0.06	120	0.03
3	City_PHD_2015 CP_2015	2015	2015	4,979	PHD	7	2.58	92	2.56	105	2.50	105	1.03	115	0.97
6	City_PHD_2015 CP_2020	2020	2015	4,935	PHD	7	2.54	92	2.52	106	2.46	106	1.04	115	0.98
9	City_PHD_2015 CP_2025	2025	2015	5,060	PHD	7	2.73	91	2.71	105	2.59	105	1.00	114	0.95
12	City_PHD_2035 CP_2025	2025	2035	7,214	PHD	6	4.17	86	3.47	99	3.35	99	1.76	108	1.08
15	City_PHD_2035 CP_2030	2030	2035	7,286	PHD	6	4.26	85	3.57	98	3.45	98	1.72	107	1.05
18	City_PHD_2035 CP_2035	2035	2035	7,392	PHD	6	4.39	85	3.72	97	3.60	97	1.64	107	0.99
21	City_PDD_FF_2015 CP_2025	2025	2015	1,228	PDD_FF	7	0.79	96	0.78	111	0.73	111	0.14	120	0.14
24	City_PDD_FF_2035 CP_2035	2035	2035	1,132	PDD_FF	7	0.93	96	0.82	110	0.76	110	0.04	120	0.01

Additionally, Figure 2 to Figure 6 compare pressures at each key location for the various PHD flow conditions. ADD and PDD are excluded as those pressures are higher due to less overall system demands. The pressure at Key Location 5, downstream of Cal Poly changed as follows (this is similar to changes at other reported key locations):

- Decreased from 122 to 120 psi between 2015 and 2035 under the ADD condition;
- Decreased from 124 to 122 psi between 2015 and 2035 under the PDD condition;
- Decreased from 115 to 107 psi between 2015 and 2035 under the PHD condition.

As shown in Table 24 and Figure 2, pressures are low at Key Location 1 (J-1102) near the upstream end of the main line connecting to Reservoir #2, but these pressures are also low in the baseline scenarios. These low pressures are due to the high elevation and low pressures are not near any demand locations.

Water system pressures remain adequate for Key Locations 2 through 5 and well above minimum required pressures for all modeled demand conditions. The low pressures at Key Location 1 appear to be within current tolerances. WaterCAD modeling results indicate that no additional upgrades will be required to account for increased Cal Poly demands served by the City's potable water distribution system during the buildout of the *2035 Master Plan*.

Increased pumping to Reservoir #2 is expected to be required to both supply additional Cal Poly potable water demands served by the City's conveyance system, as well as additional City demands through 2035. This may require slight changes in operational practices, although settings in the City-provided WaterCAD model were adequate to turn on pumps as needed to maintain system flows and pressures. Increased flow rates to Cal Poly and to serve overall City demands will have minor to no effect on system aging as maximum velocities remain under 4.39 fps for all demand conditions modeled.

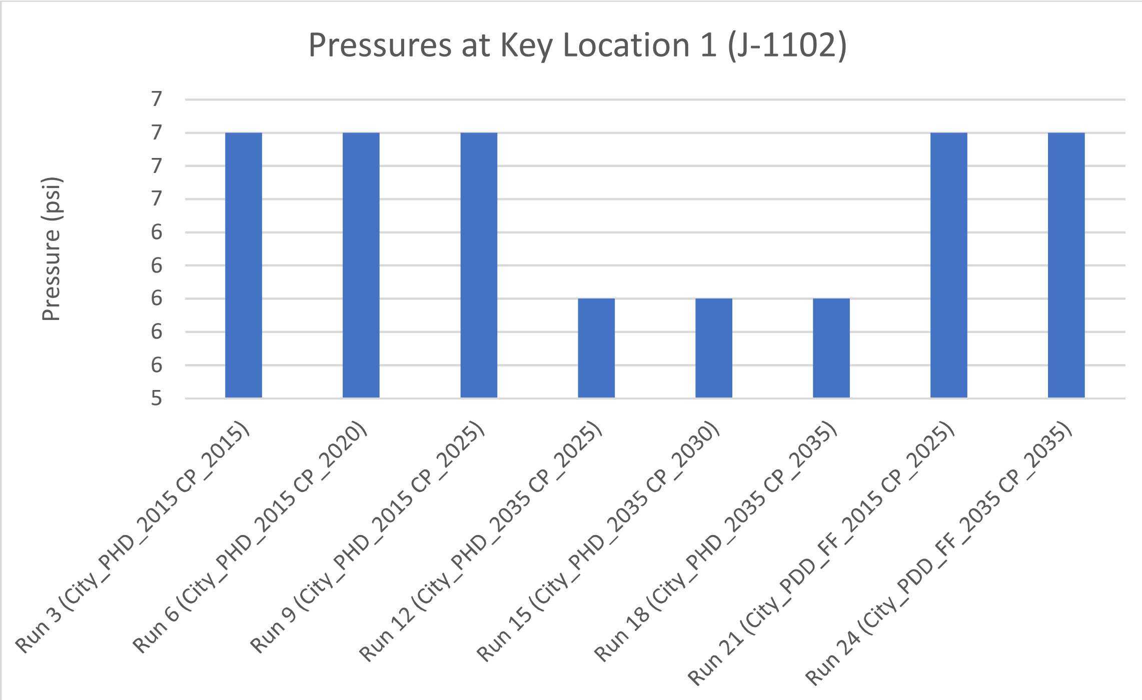

Figure 2: Comparison of Downstream Pressures at Key Location 1 for Various Flow Conditions

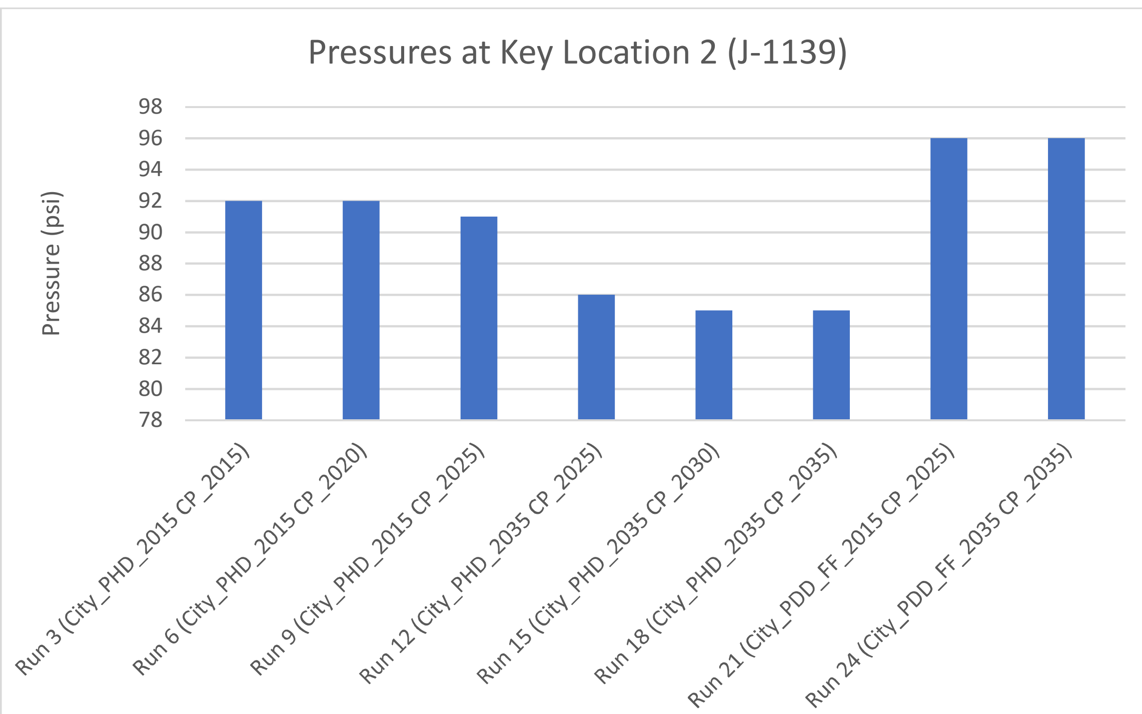

Figure 3: Comparison of Downstream Pressures at Key Location 2 for Various Flow Conditions

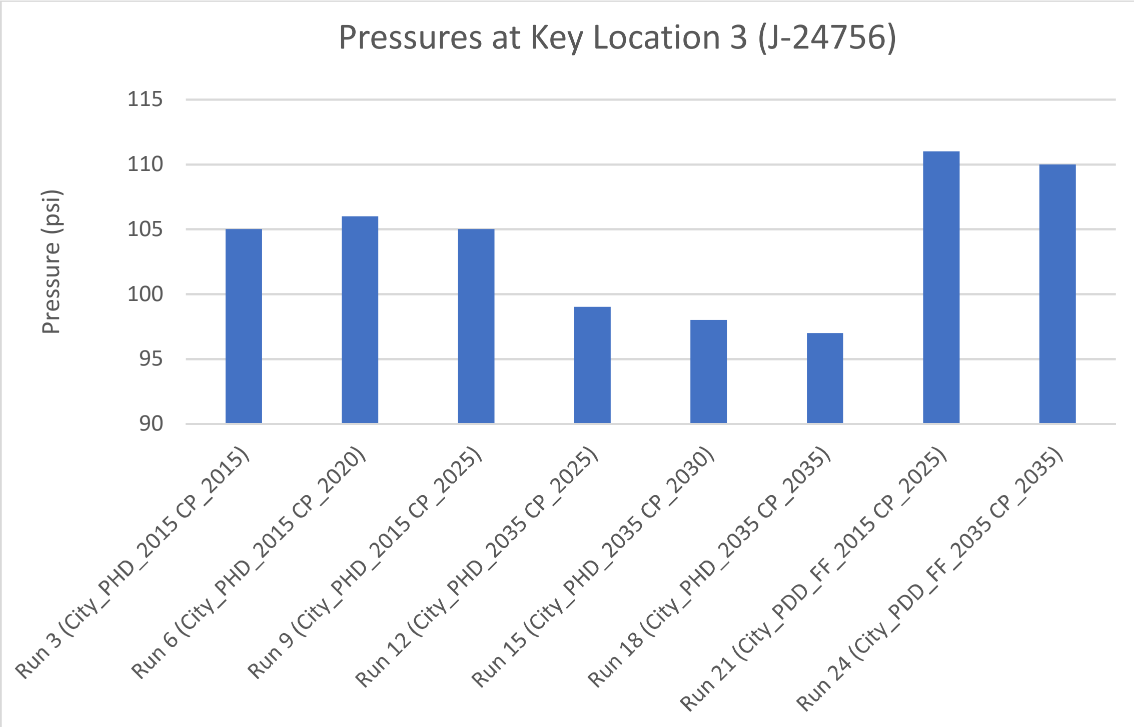

Figure 4: Comparison of Downstream Pressures at Key Location 3 for Various Flow Conditions

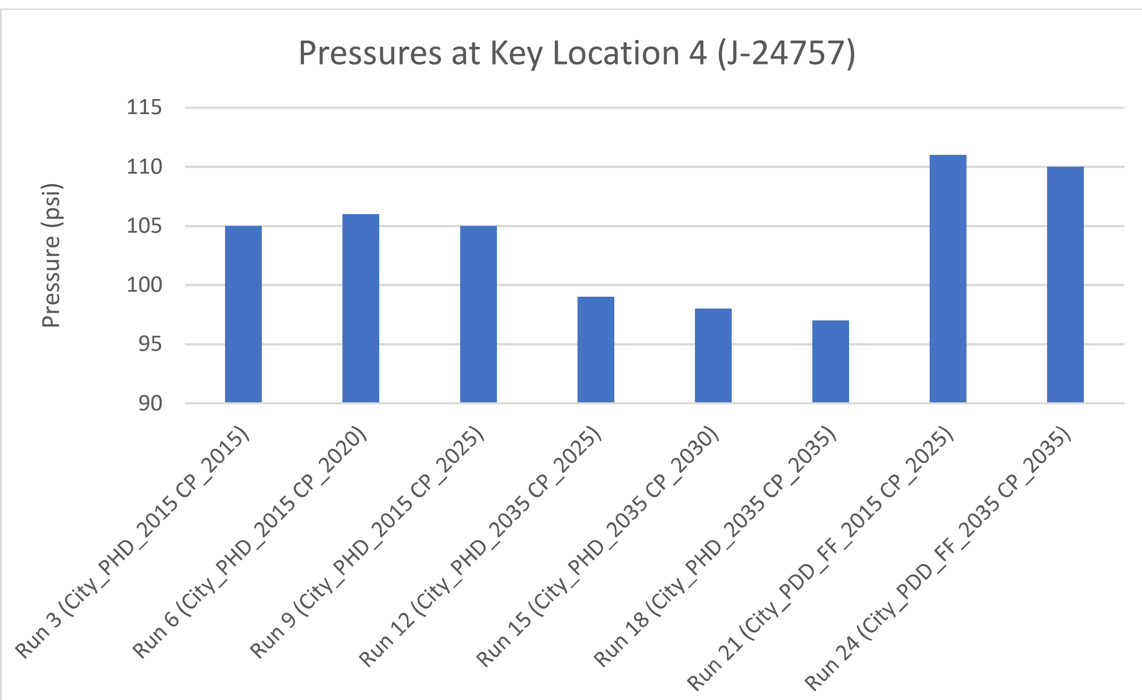

Figure 5: Comparison of Downstream Pressures at Key Location 4 for Various Flow Conditions

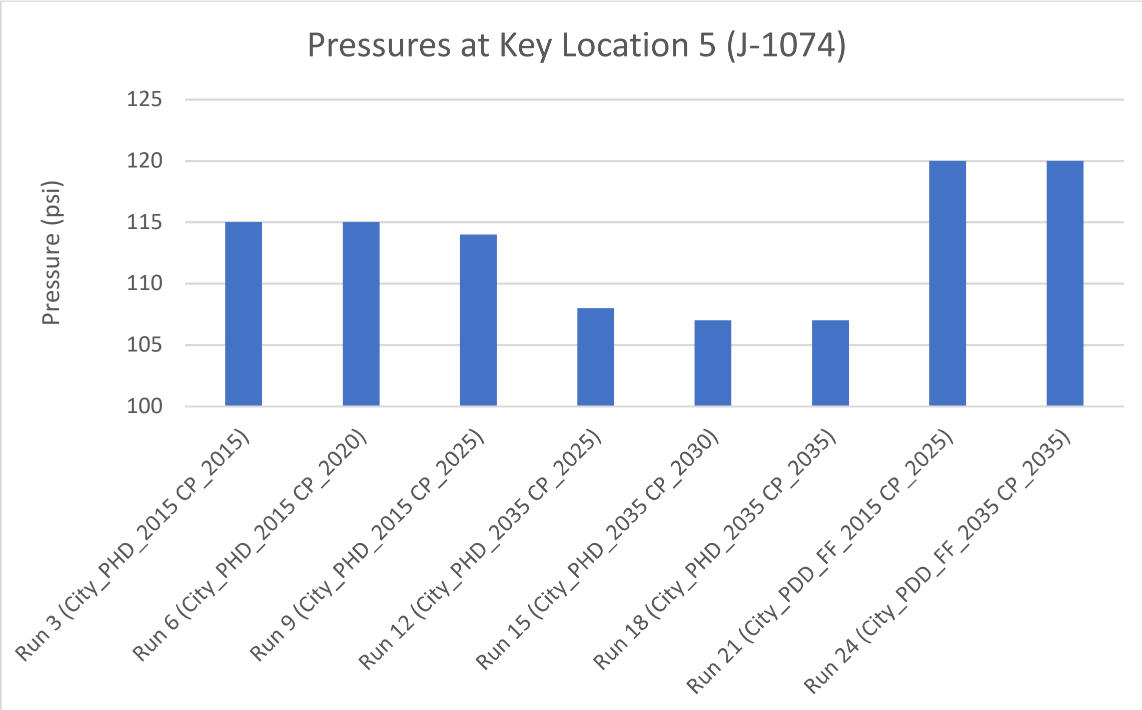

Figure 6: Comparison of Downstream Pressures at Key Location 5 for Various Flow Conditions

6 Conclusion on Adequacy of Water Supply Sufficiency

6.1 Potable Water Supply Using Recycled Water

In order to determine whether or not impacts would occur as a result of the proposed development within Cal Poly, 2015 is used as the baseline (existing conditions). Both a likely scenario with the first phase of the WRF being online in 2022 and a worst-case scenario of the first phase of the WRF being online in 2026 are evaluated. The first phase of capacity is 190 AFY (169,621 GPD). The second phase of the WRF is assumed to be online in 2028 and brings the total capacity to 380 AFY (339,242 GPD) for both scenarios. For downstream City water distribution system capacity, the available capacity within the City's system is also considered. Below is a summary of conclusions and recommendations related to water demands and potential for impact related to development within Cal Poly through completion of the *2035 Master Plan*:

1. **Total Cal Poly Average Annual Water Demands:** Total Cal Poly average annual water demands range from 790,238 GPD (0.790 MGD) in 2020 to 1,058,902 GPD (1.058 MGD) in 2035 representing a 30.2% increase over the 2015 baseline conditions at full buildout of the *2035 Master Plan*.

2. **Whale Rock Reservoir:** Cal Poly's water right to a SAY of 959 AFY (856,082 GPD) from Whale Rock Reservoir is adequate to meet Cal Poly's average daily demands for potable water through 2020. Cal Poly proposes to build and bring online several residential and non-residential buildings between 2020 and 2025. During this interim period, there is not sufficient water supply from the Whale Rock water right if these new buildings are brought online prior to bringing the proposed WRF online. To meet water demands with the currently proposed development schedule, Phase 1 of the WRF should be brought online before the proposed buildings or another alternative water source secured. Phase 2 of the WRF should be brought online prior to 2030 to ensure sufficient water supply.

3. **Available Water Supply:** As a *2035 Master Plan* element projected to be online or operational in 2022, the WRF provides adequate reclaimed water supply to serve proposed additional water demands from Cal Poly while maintaining potable water demands served by Cal Poly's share in Whale Rock Reservoir at or below 2015 baseline conditions for analysis years 2020, 2025, 2030, and 2035. While the WRF has no effect on Cal Poly's projected 2020 water demand of 790,238 GPD since it will not be operational until 2022, which is less than the 2015 baseline year due to indoor and outdoor water conservation yielding a reduction in average daily demand of 23,050 GPD. While not specifically analyzed, water conservation and the WRF are also adequate to limit potable water demands at or below Cal Poly's 2015 baseline conditions demands for the years between 2019 and 2025 assuming Phase 1 of the WRF is online in 2022.

   With the first phase of the 190 AFY (169,621 GPD) WRF online in 2022, Cal Poly has an excess reclaimed water supply 109,436 GPD, 205,207 GPD, and 93,628 GPD for analysis years 2025, 2030, and 2035, respectively. This excess supply in interim analysis years provides greater flexibility if funding is made available to bring proposed residential and non-residential buildings online sooner than anticipated in the phasing used for this analysis.

4. **Seasonal Water Demands:** Seasonal water demands for future years are calculated in Table 16 based on projected annual average water demands and academic year and summer demand factors of 89.7% and 115.5%, respectively as discussed in Section 4.12. As described, academic year demand refers to the months of September through June during the main academic year and summer demand refers to the demands in July and August when irrigation demand is highest and enrollment and on-campus occupancy is lowest. In 2035, the average annual demand is projected at 0.718 MGD, the academic year demand is projected at 0.609 MGD, and the summer demand projected at 0.882 MGD under both the likely and worst-case scenario of the WRF.

5. **Fire Flows:** With full build-out of the *2035 Master Plan* facilities on-campus storage is adequate to provide the required volume of water for fire-fighting purposes for all building fire flow requirements provided that operations are managed to ensure adequate tank volumes at all times. Assuming a minimum volume of 375,000 gallons is maintained in the on-campus storage tanks at all times, adequate volume is available to provide fire fighting volume for a 1,500 GPM, four-hour duration fire, which generates the highest volume requirement of all proposed building types.

   Planning-level fire flow spot checks show adequate pressures above 20 psi at all analyzed end points and at analyzed locations along each flow path. While approximate, estimated pressures under fire flow conditions range from 27 psi to 140 psi, depending on location and pressure zone. Additionally, aging infrastructure and water lines used as fire lines will be identified in the *Cal Poly Draft Utility Master Plan* for replacement. Replaced water lines will have smoother surfaces and improved capacity resulting in higher pressures during fire flow conditions and all operating conditions. Any CIP projects will improve the performance of the system under fire flow and a full range of operating conditions.

6. **City Conveyance Capacity:** Based on the results of the WaterCAD modeling, there is adequate City potable water conveyance capacity under ADD, PDD, PHD, and PDD + City FF for all Cal Poly flow conditions modeled. While there are slight decreases in pressures at the five key locations (Table 23 and Figure 2 to Figure 6), all pressures remain adequate and well above minimum required pressures for all modeled demand conditions. The low pressures at Key Location 1 (high elevation) appear to be within current City tolerances and the change from baseline conditions is minimal. WaterCAD modeling results indicate that no additional upgrades will be required to account for increased Cal Poly demands served by the City's potable water distribution system during the buildout of the *2035 Master Plan*.

   Increased pumping to Reservoir #2 is expected to be required to both supply additional Cal Poly potable water demands served by the City's conveyance system, as well as additional City demands through 2035. This may require slight changes in operational practices, although settings in the City-provided WaterCAD model were adequate to turn on pumps as needed to maintain system flows and pressures. Increased flow rates to Cal Poly and to serve overall City demands will have minor to no effect on system aging as maximum velocities remain under 4.39 fps for all demand conditions modeled.

7. **Future WRF Expansion:** The planned 380 AFY (0.34 MGD) WRF is adequate to maintain wastewater flows from Cal Poly into the City's system at or below existing levels once it is online through the full buildout of the *2035 Master Plan*. At the 2035 analysis year, there is a projected excess treatment capacity of 141,213 GPD, which provides an excess capacity of 13%. We recommend additional planned buildings or conversion of irrigated areas to recycled water from the on-campus WRF be evaluated as compared to utilizing excess WRF capacity for mixing with untreated wastewater effluent from Cal Poly to provide a combined effluent with lower constituent levels.

   If required for additional reclaimed irrigation water, proposed future residential or non-residential buildings, or for mixing with untreated wastewater effluent, future expansion of the WRF is an option to provide additional reclaimed water. Because of the modular nature of package treatment plants, the WRF can be readily expanded if needed in the future provided adjacent land space is available at the time.

8. **Additional Water Conservation:** While Cal Poly has already implemented and plans to progressively implement water conservation measures as part of the *2035 Master Plan* and ongoing sustainability and potable water use reduction measures, we recommend Cal Poly continue to evaluate opportunities to further apply advanced indoor water conservation measures and process measures to reduce water demands and associated wastewater flows from both residential and non-residential buildings.

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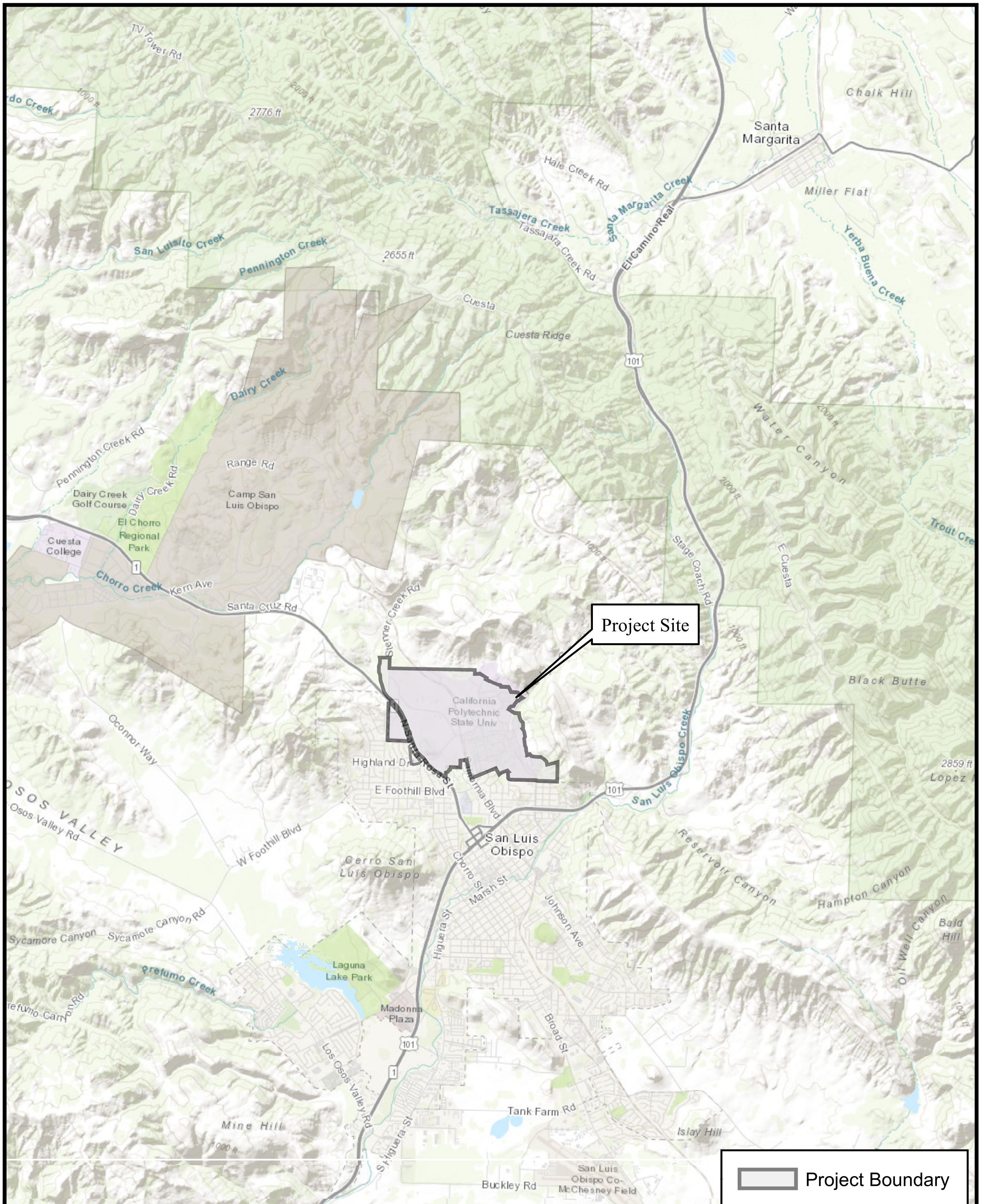
Exhibits



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CALIFORNIA POLYTECHNIC STATE UNIVERSITY
SAN LUIS OBISPO 2035 MASTER PLAN
WATER SUPPLY ASSESSMENT

VICINITY MAP

Watearth™
Water Resources + Green Infrastructure

Date: Mar 21, 2019

Exhibit 1

Sources:
Cal Poly Master Plan Comprehensive, November 2017
The City of San Luis Obispo Open GIS Data, 2018

0 Feet 1,500

Datum: NAD83
Units: US Feet

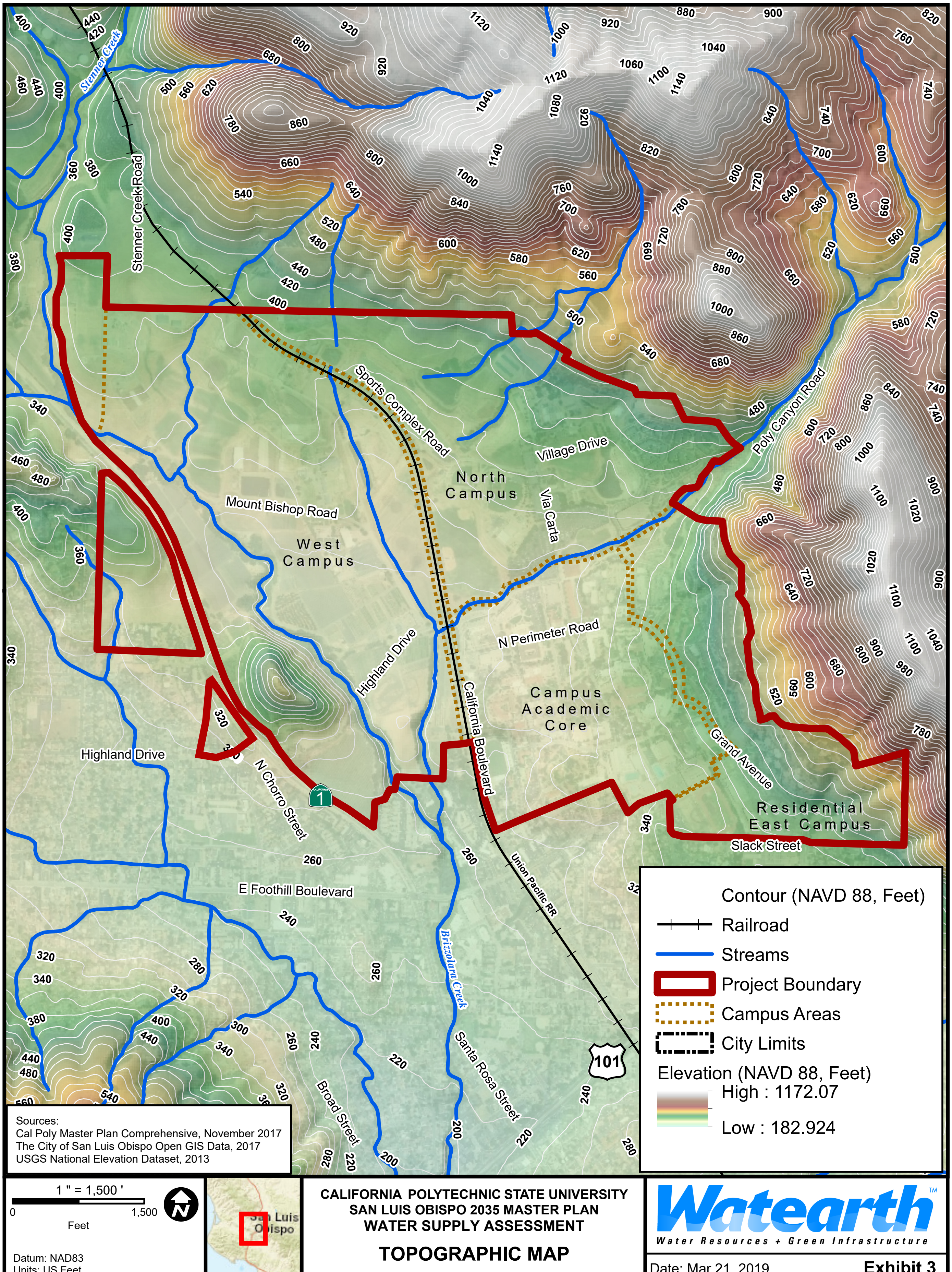
CALIFORNIA POLYTECHNIC STATE UNIVERSITY
SAN LUIS OBISPO 2035 MASTER PLAN
WATER SUPPLY ASSESSMENT

AERIAL MAP

Watearth™
Water Resources + Green Infrastructure

Date: Mar 21, 2019

Exhibit 2



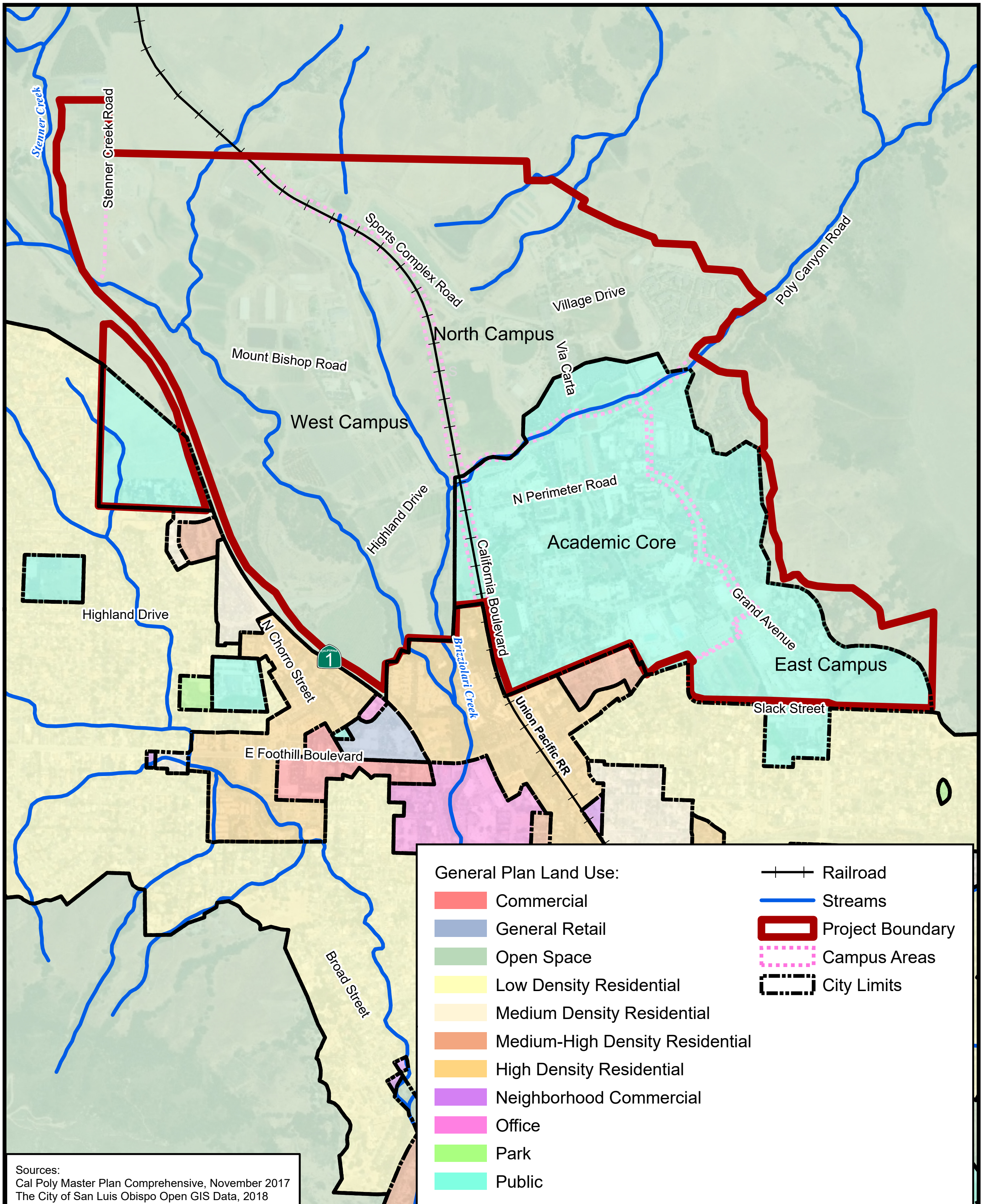
CALIFORNIA POLYTECHNIC STATE UNIVERSITY
SAN LUIS OBISPO 2035 MASTER PLAN
WATER SUPPLY ASSESSMENT

TOPOGRAPHIC MAP

Watearth™
Water Resources + Green Infrastructure

Date: Mar 21, 2019

Exhibit 3



1 " = 1,500 '
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Feet

Datum: NAD83
Units: US Feet

San Luis Obispo

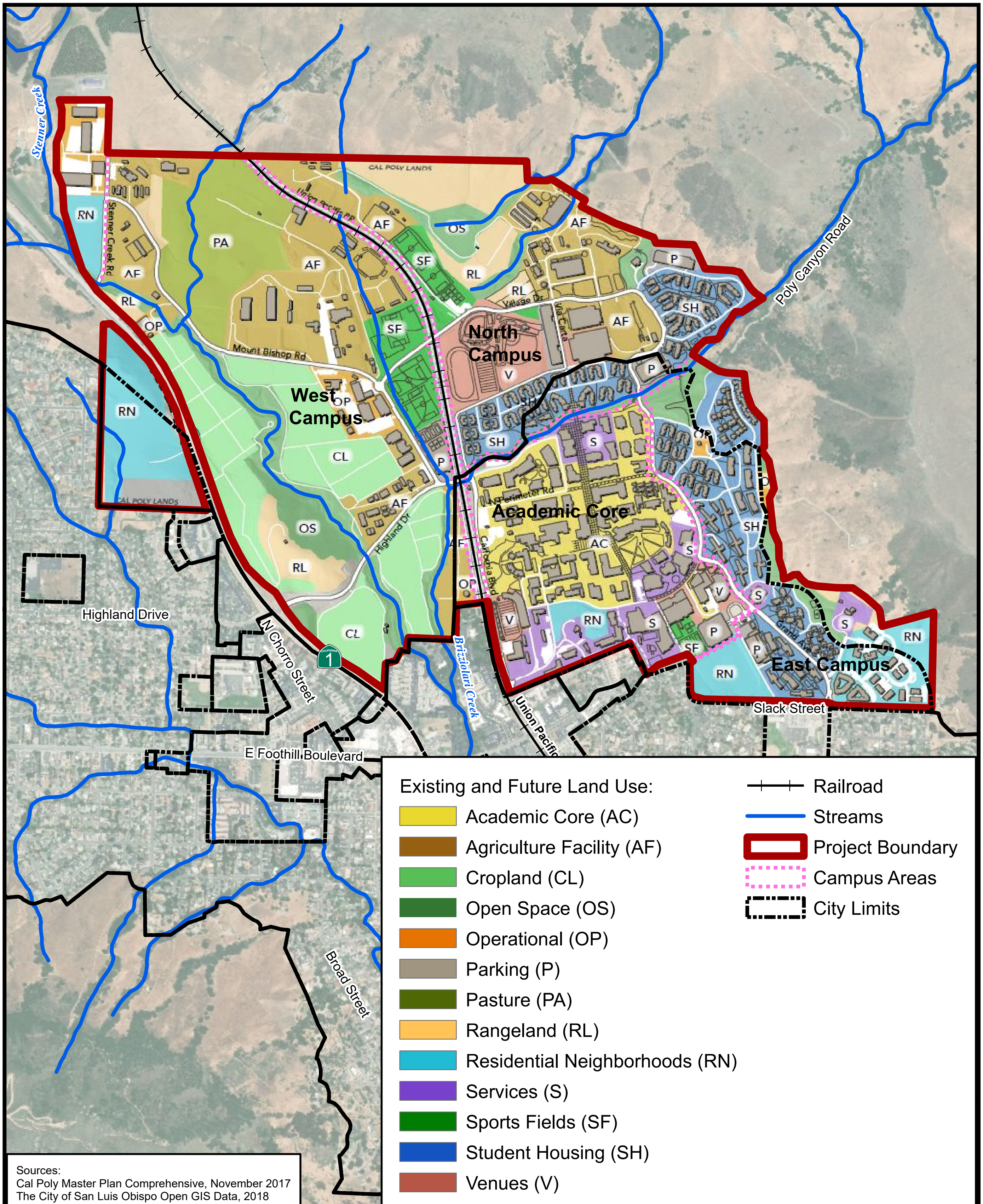
CALIFORNIA POLYTECHNIC STATE UNIVERSITY
SAN LUIS OBISPO 2035 MASTER PLAN
WATER SUPPLY ASSESSMENT

EXISTING LAND USE

Watearth
Water Resources + Green Infrastructure

Date: Mar 21, 2019

Exhibit 4



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Datum: NAD83
Units: US Feet

San Luis Obispo

CALIFORNIA POLYTECHNIC STATE UNIVERSITY
SAN LUIS OBISPO 2035 MASTER PLAN
WATER SUPPLY ASSESSMENT

PROPOSED LAND USE

Watearth™
Water Resources + Green Infrastructure

Date: Mar 21, 2019

Exhibit 5

APPENDIX

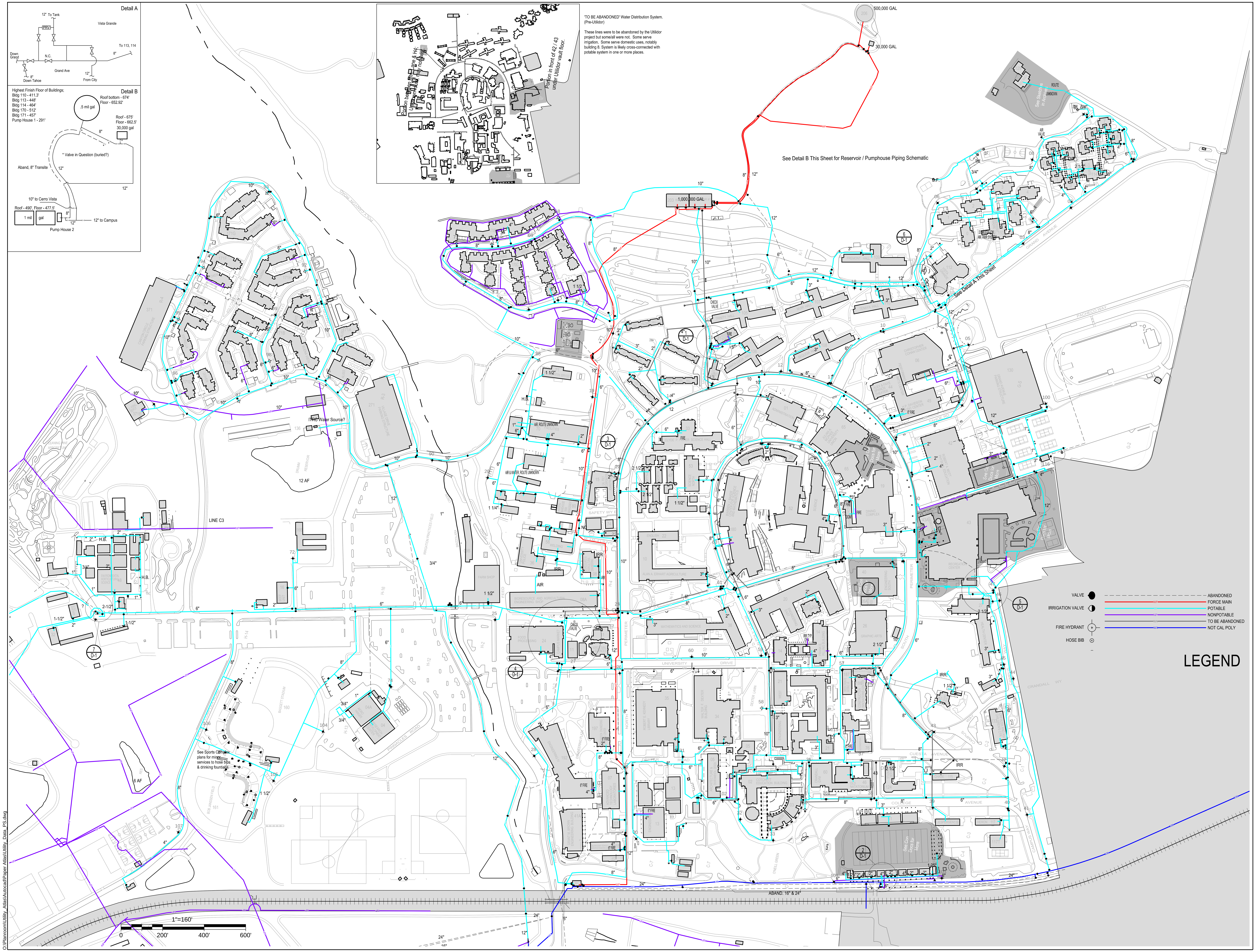
A – Cal Poly Utility Atlas

B - City of San Luis Obispo WaterCAD Node Map

C – Proposed Development

D – WaterCAD Model Output Data

E – WaterCAD Hydraulic Grade Line Figures



NORTH
SCALE
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File Information	
Date	
Drawn	Rex
Plot Date	4.8.2016
File Name	Utility_Data_PS.dwg
PSTab	46 Water Core
Plot By	Rex M Wolf

UTILITY ATLAS
WATER
Campus Core

For most current data see O:\Planroom\Utility_Atlas\Acrobat\E_Atlas.pdf

CAL POLY
SAN LUIS OBISPO
Facility Services
Facilities Planning and Capital Projects

Utilities

0 125 250 500 750 1,000 Feet

1 inch = 600 feet

Legend

PIPE

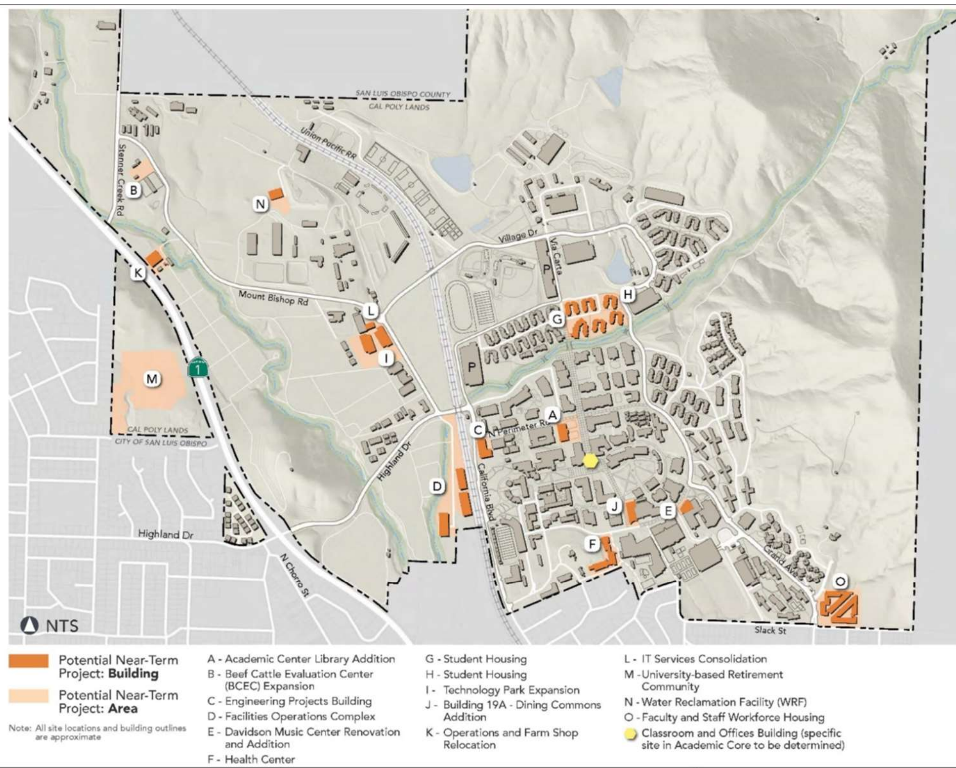
DIAM (in.)

- 4
- 6
- 8
- 10
- 12
- 14
- 16
- 18
- 20
- 24
- 27
- 30
- 43

Conceptual layout printed on
Date: 12/11/2018.
Information depicted requires field verification.
Utilities Engineer: M. Barcenas

Appendix C

Proposed Development and Near-Term Projects



Data Source: Cal Poly Master Plan 2035

SWCA ENVIRONMENTAL CONSULTANTS

Near-Term Projects

Cal Poly San Luis Obispo Water Supply Assessment and Wastewater Feasibility Modeling
Watearth, Inc.
Job No. 2018.0314.1-CA
4/3/2019

TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 1 (City_ADD_2015 CP_2015)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	542	736	Ductile Iron	24	537	530	539	532	0.012	0.38	550	550	542	535	11	18	6	9	0	736
2	60206	P-333	J-1102	J-24754	542	6,242	CCP	24	530	400	532	402	0.012	0.38	550	550	535	405	18	148	9	65	736	6,978
3	60209	P-335	J-24754	J-24755	541	1,073	CCP	24	400	370	402	372	0.012	0.38	550	550	405	375	148	178	65	78	6,978	8,051
4	60208	P-334	J-24755	_J-1139	535	3,587	CCP	24	370	323	372	325	0.012	0.38	550	550	375	328	178	225	78	98	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	532	2,322	PVC	24	323	290	325	292	0.012	0.38	550	550	328	295	225	258	98	112	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	482	338	PVC	24	290	290	292	292	0.012	0.34	550	550	295	295	258	258	112	112	13,960	14,298
7	60218	P-341	_J-24757	J-24758	30	1,262	PVC	24	290	279	292	281	0.012	0.02	550	550	295	284	258	269	112	117	14,298	15,560
8	60221	P-343	J-24758	J-24759	31	680	PVC	24	279	275	281	277	0.012	0.02	550	550	284	280	269	273	117	119	15,560	16,240
9	60220	P-342	J-24759	J-1074	39	633	PVC	24	275	267	277	269	0.012	0.03	550	550	280	272	273	280	119	122	16,240	16,873
10	58628	989	J-1074	J-1060	10	1,152	PVC	24	267	267	269	269	0.012	0.01	550	550	272	272	280	281	122	122	16,873	18,025
11	58528	3105	J-1060	J-1105	172	234	PVC	24	267	263	269	265	0.012	0.12	550	550	272	268	281	285	122	124	18,025	18,259
12	58569	998	J-1105	J-1124	210	363	Ductile Iron	16	263	262	264	264	0.012	0.34	550	550	267	267	286	286	124	124	18,259	18,622
13	60427	P-424	J-24800	J-1124	253	1,331	Ductile Iron	16	296	262	297	264	0.012	0.40	549	550	300	267	252	286	124	110	18,622	19,953
14	60428	P-425	J-24800	J-1099	253	157	Ductile Iron	16	296	300	297	301	0.012	0.40	549	549	300	304	252	248	110	108	19,953	20,110
15	58516	5214	J-1099	J-1100	251	180	Ductile Iron	16	300	303	301	305	0.012	0.40	549	549	304	308	248	245	108	107	20,110	20,290
16	58526	5220	J-1100	J-1104	250	223	Ductile Iron	16	303	293	305	294	0.012	0.40	549	549	308	297	245	255	107	111	20,290	20,513
17	58612	4429	J-1104	J-1044	250	626	Cast Iron	16	293	250	294	251	0.012	0.40	549	549	297	254	255	298	111	130	20,513	21,139

Cal Poly San Luis Obispo Water Supply Assessment and Wastewater Feasibility Modeling
Watearth, Inc.
Job No. 2018.0314.1-CA
4/3/2019

TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 2 (City_PDD_2015 CP_2015)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	1,690	736	Ductile Iron	24	537	530	539	532	0.012	1.20	557	557	542	535	18	25	9	12	0	736
2	60206	P-333	J-1102	J-24754	1,690	6,242	CCP	24	530	400	532	402	0.012	1.20	557	555	535	405	25	155	12	67	736	6,978
3	60209	P-335	J-24754	J-24755	1,689	1,073	CCP	24	400	370	402	372	0.012	1.20	555	555	405	375	153	183	67	80	6,978	8,051
4	60208	P-334	J-24755	_J-1139	1,680	3,587	CCP	24	370	323	372	325	0.012	1.19	555	554	375	328	183	230	80	100	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	1,675	2,322	PVC	24	323	290	325	292	0.012	1.19	554	554	328	295	229	262	100	114	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	1,600	338	PVC	24	290	290	292	292	0.012	1.13	554	554	295	295	262	262	114	114	13,960	14,298
7	60218	P-341	_J-24757	J-24758	832	1,262	PVC	24	290	279	292	281	0.012	0.59	554	554	295	284	262	273	114	119	14,298	15,560
8	60221	P-343	J-24758	J-24759	830	680	PVC	24	279	275	281	277	0.012	0.59	554	554	284	280	273	277	119	121	15,560	16,240
9	60220	P-342	J-24759	J-1074	818	633	PVC	24	275	267	277	269	0.012	0.58	554	554	280	272	277	284	121	124	16,240	16,873
10	58628	989	J-1074	J-1060	722	1,152	PVC	24	267	267	269	269	0.012	0.51	554	554	272	272	284	285	124	124	16,873	18,025
11	58528	3105	J-1060	J-1105	480	234	PVC	24	267	263	269	265	0.012	0.34	554	554	272	268	285	289	124	126	18,025	18,259
12	58569	998	J-1105	J-1124	407	363	Ductile Iron	16	263	262	264	264	0.012	0.65	554	553	267	267	290	290	126	126	18,259	18,622
13	60427	P-424	J-24800	J-1124	349	1,331	Ductile Iron	16	296	262	297	264	0.012	0.56	553	553	300	267	256	289	126	111	18,622	19,953
14	60428	P-425	J-24800	J-1099	349	157	Ductile Iron	16	296	300	297	301	0.012	0.56	553	553	300	304	256	252	111	110	19,953	20,110
15	58516	5214	J-1099	J-1100	345	180	Ductile Iron	16	300	303	301	305	0.012	0.55	553	553	304	308	252	249	110	108	20,110	20,290
16	58526	5220	J-1100	J-1104	345	223	Ductile Iron	16	303	293	305	294	0.012	0.55	553	553	308	297	249	259	108	113	20,290	20,513
17	58612	4429	J-1104	J-1044	344	626	Cast Iron	16	293	250	294	251	0.012	0.55	553	553	297	254	259	302	113	131	20,513	21,139

Cal Poly San Luis Obispo Water Supply Assessment and Wastewater Feasibility Modeling
Watearth, Inc.
Job No. 2018.0314.1-CA
4/3/2019

TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 3 (City_PHD_2015 CP_2015)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	3,631	736	Ductile Iron	24	537	530	539	532	0.012	2.58	547	546	542	535	8	15	4	7	0	736
2	60206	P-333	J-1102	J-24754	3,631	6,242	CCP	24	530	400	532	402	0.012	2.58	546	540	535	405	14	144	7	61	736	6,978
3	60209	P-335	J-24754	J-24755	3,629	1,073	CCP	24	400	370	402	372	0.012	2.57	540	539	405	375	138	168	61	73	6,978	8,051
4	60208	P-334	J-24755	_J-1139	3,609	3,587	CCP	24	370	323	372	325	0.012	2.56	539	536	375	328	167	214	73	92	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	3,604	2,322	PVC	24	323	290	325	292	0.012	2.56	536	534	328	295	211	244	92	105	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	3,529	338	PVC	24	290	290	292	292	0.012	2.50	534	533	295	295	242	242	105	105	13,960	14,298
7	60218	P-341	_J-24757	J-24758	1,450	1,262	PVC	24	290	279	292	281	0.012	1.03	533	533	295	284	241	253	105	110	14,298	15,560
8	60221	P-343	J-24758	J-24759	1,447	680	PVC	24	279	275	281	277	0.012	1.03	533	533	284	280	252	256	110	112	15,560	16,240
9	60220	P-342	J-24759	J-1074	1,418	633	PVC	24	275	267	277	269	0.012	1.01	533	533	280	272	256	264	112	115	16,240	16,873
10	58628	989	J-1074	J-1060	1,371	1,152	PVC	24	267	267	269	269	0.012	0.97	533	533	272	272	264	264	115	115	16,873	18,025
11	58528	3105	J-1060	J-1105	1,568	234	PVC	24	267	263	269	265	0.012	1.11	533	533	272	268	264	268	115	117	18,025	18,259
12	58569	998	J-1105	J-1124	1,509	363	Ductile Iron	16	263	262	264	264	0.012	2.41	533	532	267	267	269	269	117	117	18,259	18,622
13	60427	P-424	J-24800	J-1124	1,667	1,331	Ductile Iron	16	296	262	297	264	0.012	2.66	529	532	300	267	231	265	117	101	18,622	19,953
14	60428	P-425	J-24800	J-1099	1,667	157	Ductile Iron	16	296	300	297	301	0.012	2.66	529	528	300	304	231	227	101	99	19,953	20,110
15	58516	5214	J-1099	J-1100	1,658	180	Ductile Iron	16	300	303	301	305	0.012	2.65	528	528	304	308	227	224	99	97	20,110	20,290
16	58526	5220	J-1100	J-1104	1,657	223	Ductile Iron	16	303	293	305	294	0.012	2.64	528	527	308	297	223	234	97	101	20,290	20,513
17	58612	4429	J-1104	J-1044	1,654	626	Cast Iron	16	293	250	294	251	0.012	2.64	527	526	297	254	233	276	101	119	20,513	21,139

Cal Poly San Luis Obispo Water Supply Assessment and Wastewater Feasibility Modeling
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TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 4 (City_ADD_2015 CP_2020)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	527	736	Ductile Iron	24	537	530	539	532	0.012	0.37	550	550	542	535	11	18	6	9	0	736
2	60206	P-333	J-1102	J-24754	527	6,242	CCP	24	530	400	532	402	0.012	0.37	550	550	535	405	18	148	9	65	736	6,978
3	60209	P-335	J-24754	J-24755	526	1,073	CCP	24	400	370	402	372	0.012	0.37	550	550	405	375	148	178	65	78	6,978	8,051
4	60208	P-334	J-24755	_J-1139	520	3,587	CCP	24	370	323	372	325	0.012	0.37	550	550	375	328	178	225	78	98	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	517	2,322	PVC	24	323	290	325	292	0.012	0.37	550	550	328	295	225	258	98	112	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	467	338	PVC	24	290	290	292	292	0.012	0.33	550	550	295	295	258	258	112	112	13,960	14,298
7	60218	P-341	_J-24757	J-24758	29	1,262	PVC	24	290	279	292	281	0.012	0.02	550	550	295	284	258	269	112	117	14,298	15,560
8	60221	P-343	J-24758	J-24759	30	680	PVC	24	279	275	281	277	0.012	0.02	550	550	284	280	269	273	117	119	15,560	16,240
9	60220	P-342	J-24759	J-1074	38	633	PVC	24	275	267	277	269	0.012	0.03	550	550	280	272	273	280	119	122	16,240	16,873
10	58628	989	J-1074	J-1060	9	1,152	PVC	24	267	267	269	269	0.012	0.01	550	550	272	272	280	281	122	122	16,873	18,025
11	58528	3105	J-1060	J-1105	172	234	PVC	24	267	263	269	265	0.012	0.12	550	550	272	268	281	285	122	124	18,025	18,259
12	58569	998	J-1105	J-1124	210	363	Ductile Iron	16	263	262	264	264	0.012	0.34	550	550	267	267	286	286	124	124	18,259	18,622
13	60427	P-424	J-24800	J-1124	253	1,331	Ductile Iron	16	296	262	297	264	0.012	0.40	550	550	300	267	252	286	124	110	18,622	19,953
14	60428	P-425	J-24800	J-1099	253	157	Ductile Iron	16	296	300	297	301	0.012	0.40	550	549	300	304	252	248	110	108	19,953	20,110
15	58516	5214	J-1099	J-1100	251	180	Ductile Iron	16	300	303	301	305	0.012	0.40	549	549	304	308	248	245	108	107	20,110	20,290
16	58526	5220	J-1100	J-1104	250	223	Ductile Iron	16	303	293	305	294	0.012	0.40	549	549	308	297	245	255	107	111	20,290	20,513
17	58612	4429	J-1104	J-1044	250	626	Cast Iron	16	293	250	294	251	0.012	0.40	549	549	297	254	255	298	111	130	20,513	21,139

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TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 5 (City_PDD_2015 CP_2020)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	1,671	736	Ductile Iron	24	537	530	539	532	0.012	1.19	557	557	542	535	18	25	9	12	0	736
2	60206	P-333	J-1102	J-24754	1,671	6,242	CCP	24	530	400	532	402	0.012	1.19	557	555	535	405	25	155	12	67	736	6,978
3	60209	P-335	J-24754	J-24755	1,671	1,073	CCP	24	400	370	402	372	0.012	1.18	555	555	405	375	153	183	67	80	6,978	8,051
4	60208	P-334	J-24755	_J-1139	1,661	3,587	CCP	24	370	323	372	325	0.012	1.18	555	554	375	328	183	230	80	100	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	1,656	2,322	PVC	24	323	290	325	292	0.012	1.17	554	554	328	295	229	262	100	114	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	1,581	338	PVC	24	290	290	292	292	0.012	1.12	554	554	295	295	262	262	114	114	13,960	14,298
7	60218	P-341	_J-24757	J-24758	837	1,262	PVC	24	290	279	292	281	0.012	0.59	554	554	295	284	262	273	114	119	14,298	15,560
8	60221	P-343	J-24758	J-24759	836	680	PVC	24	279	275	281	277	0.012	0.59	554	554	284	280	273	277	119	121	15,560	16,240
9	60220	P-342	J-24759	J-1074	823	633	PVC	24	275	267	277	269	0.012	0.58	554	554	280	272	277	284	121	124	16,240	16,873
10	58628	989	J-1074	J-1060	728	1,152	PVC	24	267	267	269	269	0.012	0.52	554	554	272	272	284	285	124	124	16,873	18,025
11	58528	3105	J-1060	J-1105	483	234	PVC	24	267	263	269	265	0.012	0.34	554	554	272	268	285	289	124	126	18,025	18,259
12	58569	998	J-1105	J-1124	410	363	Ductile Iron	16	263	262	264	264	0.012	0.65	554	554	267	267	290	290	126	126	18,259	18,622
13	60427	P-424	J-24800	J-1124	352	1,331	Ductile Iron	16	296	262	297	264	0.012	0.56	553	554	300	267	256	290	126	111	18,622	19,953
14	60428	P-425	J-24800	J-1099	352	157	Ductile Iron	16	296	300	297	301	0.012	0.56	553	553	300	304	256	252	111	110	19,953	20,110
15	58516	5214	J-1099	J-1100	348	180	Ductile Iron	16	300	303	301	305	0.012	0.56	553	553	304	308	252	249	110	108	20,110	20,290
16	58526	5220	J-1100	J-1104	348	223	Ductile Iron	16	303	293	305	294	0.012	0.55	553	553	308	297	249	259	108	113	20,290	20,513
17	58612	4429	J-1104	J-1044	346	626	Cast Iron	16	293	250	294	251	0.012	0.55	553	553	297	254	259	302	113	131	20,513	21,139

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TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 6 (City_PHD_2015 CP_2020)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	3,577	736	Ductile Iron	24	537	530	539	532	0.012	2.54	547	546	542	535	8	15	4	7	0	736
2	60206	P-333	J-1102	J-24754	3,577	6,242	CCP	24	530	400	532	402	0.012	2.54	546	540	535	405	14	144	7	61	736	6,978
3	60209	P-335	J-24754	J-24755	3,576	1,073	CCP	24	400	370	402	372	0.012	2.54	540	539	405	375	138	168	61	73	6,978	8,051
4	60208	P-334	J-24755	_J-1139	3,555	3,587	CCP	24	370	323	372	325	0.012	2.52	539	536	375	328	167	214	73	92	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	3,550	2,322	PVC	24	323	290	325	292	0.012	2.52	536	534	328	295	211	244	92	106	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	3,475	338	PVC	24	290	290	292	292	0.012	2.46	534	534	295	295	242	242	106	106	13,960	14,298
7	60218	P-341	_J-24757	J-24758	1,460	1,262	PVC	24	290	279	292	281	0.012	1.04	534	534	295	284	242	253	106	110	14,298	15,560
8	60221	P-343	J-24758	J-24759	1,457	680	PVC	24	279	275	281	277	0.012	1.03	534	534	284	280	253	257	110	112	15,560	16,240
9	60220	P-342	J-24759	J-1074	1,429	633	PVC	24	275	267	277	269	0.012	1.01	534	533	280	272	257	264	112	115	16,240	16,873
10	58628	989	J-1074	J-1060	1,377	1,152	PVC	24	267	267	269	269	0.012	0.98	533	533	272	272	264	265	115	115	16,873	18,025
11	58528	3105	J-1060	J-1105	1,570	234	PVC	24	267	263	269	265	0.012	1.11	533	533	272	268	265	269	115	117	18,025	18,259
12	58569	998	J-1105	J-1124	1,509	363	Ductile Iron	16	263	262	264	264	0.012	2.41	533	532	267	267	269	269	117	117	18,259	18,622
13	60427	P-424	J-24800	J-1124	1,667	1,331	Ductile Iron	16	296	262	297	264	0.012	2.66	529	532	300	267	232	265	117	101	18,622	19,953
14	60428	P-425	J-24800	J-1099	1,667	157	Ductile Iron	16	296	300	297	301	0.012	2.66	529	529	300	304	232	228	101	99	19,953	20,110
15	58516	5214	J-1099	J-1100	1,658	180	Ductile Iron	16	300	303	301	305	0.012	2.65	529	528	304	308	227	224	99	97	20,110	20,290
16	58526	5220	J-1100	J-1104	1,657	223	Ductile Iron	16	303	293	305	294	0.012	2.64	528	528	308	297	224	234	97	102	20,290	20,513
17	58612	4429	J-1104	J-1044	1,654	626	Cast Iron	16	293	250	294	251	0.012	2.64	528	526	297	254	233	276	102	119	20,513	21,139

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TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 7 (City_ADD_2015 CP_2025)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	581	736	Ductile Iron	24	537	530	539	532	0.012	0.41	550	550	542	535	11	18	6	9	0	736
2	60206	P-333	J-1102	J-24754	581	6,242	CCP	24	530	400	532	402	0.012	0.41	550	550	535	405	18	148	9	65	736	6,978
3	60209	P-335	J-24754	J-24755	580	1,073	CCP	24	400	370	402	372	0.012	0.41	550	550	405	375	148	178	65	78	6,978	8,051
4	60208	P-334	J-24755	_J-1139	574	3,587	CCP	24	370	323	372	325	0.012	0.41	550	550	375	328	178	225	78	98	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	571	2,322	PVC	24	323	290	325	292	0.012	0.40	550	550	328	295	225	258	98	112	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	521	338	PVC	24	290	290	292	292	0.012	0.37	550	550	295	295	258	258	112	112	13,960	14,298
7	60218	P-341	_J-24757	J-24758	32	1,262	PVC	24	290	279	292	281	0.012	0.02	550	550	295	284	258	269	112	117	14,298	15,560
8	60221	P-343	J-24758	J-24759	33	680	PVC	24	279	275	281	277	0.012	0.02	550	550	284	280	269	273	117	119	15,560	16,240
9	60220	P-342	J-24759	J-1074	41	633	PVC	24	275	267	277	269	0.012	0.03	550	550	280	272	273	280	119	122	16,240	16,873
10	58628	989	J-1074	J-1060	12	1,152	PVC	24	267	267	269	269	0.012	0.01	550	550	272	272	280	281	122	122	16,873	18,025
11	58528	3105	J-1060	J-1105	172	234	PVC	24	267	263	269	265	0.012	0.12	550	550	272	268	281	285	122	124	18,025	18,259
12	58569	998	J-1105	J-1124	210	363	Ductile Iron	16	263	262	264	264	0.012	0.33	550	550	267	267	286	286	124	124	18,259	18,622
13	60427	P-424	J-24800	J-1124	253	1,331	Ductile Iron	16	296	262	297	264	0.012	0.40	549	550	300	267	252	286	124	110	18,622	19,953
14	60428	P-425	J-24800	J-1099	253	157	Ductile Iron	16	296	300	297	301	0.012	0.40	549	549	300	304	252	248	110	108	19,953	20,110
15	58516	5214	J-1099	J-1100	251	180	Ductile Iron	16	300	303	301	305	0.012	0.40	549	549	304	308	248	245	108	107	20,110	20,290
16	58526	5220	J-1100	J-1104	250	223	Ductile Iron	16	303	293	305	294	0.012	0.40	549	549	308	297	245	255	107	111	20,290	20,513
17	58612	4429	J-1104	J-1044	250	626	Cast Iron	16	293	250	294	251	0.012	0.40	549	549	297	254	255	298	111	130	20,513	21,139

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TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 8 (City_PDD_2015 CP_2025)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	1,736	736	Ductile Iron	24	537	530	539	532	0.012	1.23	557	557	542	535	18	25	9	12	0	736
2	60206	P-333	J-1102	J-24754	1,736	6,242	CCP	24	530	400	532	402	0.012	1.23	557	555	535	405	25	155	12	67	736	6,978
3	60209	P-335	J-24754	J-24755	1,736	1,073	CCP	24	400	370	402	372	0.012	1.23	555	555	405	375	153	183	67	80	6,978	8,051
4	60208	P-334	J-24755	_J-1139	1,727	3,587	CCP	24	370	323	372	325	0.012	1.22	555	554	375	328	183	230	80	100	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	1,722	2,322	PVC	24	323	290	325	292	0.012	1.22	554	554	328	295	229	262	100	114	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	1,647	338	PVC	24	290	290	292	292	0.012	1.17	554	554	295	295	262	262	114	114	13,960	14,298
7	60218	P-341	_J-24757	J-24758	817	1,262	PVC	24	290	279	292	281	0.012	0.58	554	553	295	284	262	273	114	119	14,298	15,560
8	60221	P-343	J-24758	J-24759	815	680	PVC	24	279	275	281	277	0.012	0.58	553	553	284	280	273	276	119	120	15,560	16,240
9	60220	P-342	J-24759	J-1074	803	633	PVC	24	275	267	277	269	0.012	0.57	553	553	280	272	276	284	120	124	16,240	16,873
10	58628	989	J-1074	J-1060	709	1,152	PVC	24	267	267	269	269	0.012	0.50	553	553	272	272	284	285	124	124	16,873	18,025
11	58528	3105	J-1060	J-1105	470	234	PVC	24	267	263	269	265	0.012	0.33	553	553	272	268	285	289	124	126	18,025	18,259
12	58569	998	J-1105	J-1124	399	363	Ductile Iron	16	263	262	264	264	0.012	0.64	553	553	267	267	289	290	126	126	18,259	18,622
13	60427	P-424	J-24800	J-1124	342	1,331	Ductile Iron	16	296	262	297	264	0.012	0.55	553	553	300	267	256	289	126	111	18,622	19,953
14	60428	P-425	J-24800	J-1099	342	157	Ductile Iron	16	296	300	297	301	0.012	0.55	553	553	300	304	256	252	111	110	19,953	20,110
15	58516	5214	J-1099	J-1100	338	180	Ductile Iron	16	300	303	301	305	0.012	0.54	553	553	304	308	252	249	110	108	20,110	20,290
16	58526	5220	J-1100	J-1104	338	223	Ductile Iron	16	303	293	305	294	0.012	0.54	553	553	308	297	249	259	108	113	20,290	20,513
17	58612	4429	J-1104	J-1044	337	626	Cast Iron	16	293	250	294	251	0.012	0.54	553	553	297	254	259	302	113	131	20,513	21,139

Cal Poly San Luis Obispo Water Supply Assessment and Wastewater Feasibility Modeling
Watearth, Inc.
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TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 9 (City_PHD_2015 CP_2025)

Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Pipe Data									Elevations (ft)						US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
						Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)				
1	58613	6660	Reservoir 2	J-1102	3,855	736	Ductile Iron	24	537	530	539	532	0.012	2.73	547	546	542	535	8	15	4	7	0	736
2	60206	P-333	J-1102	J-24754	3,855	6,242	CCP	24	530	400	532	402	0.012	2.73	546	539	535	405	14	144	7	60	736	6,978
3	60209	P-335	J-24754	J-24755	3,853	1,073	CCP	24	400	370	402	372	0.012	2.73	539	538	405	375	137	167	60	73	6,978	8,051
4	60208	P-334	J-24755	_J-1139	3,832	3,587	CCP	24	370	323	372	325	0.012	2.72	538	534	375	328	166	213	73	91	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	3,822	2,322	PVC	24	323	290	325	292	0.012	2.71	534	532	328	295	209	242	91	105	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	3,652	338	PVC	24	290	290	292	292	0.012	2.59	532	532	295	295	240	240	105	105	13,960	14,298
7	60218	P-341	_J-24757	J-24758	1,408	1,262	PVC	24	290	279	292	281	0.012	1.00	532	532	295	284	240	251	105	109	14,298	15,560
8	60221	P-343	J-24758	J-24759	1,405	680	PVC	24	279	275	281	277	0.012	1.00	532	532	284	280	251	255	109	111	15,560	16,240
9	60220	P-342	J-24759	J-1074	1,377	633	PVC	24	275	267	277	269	0.012	0.98	532	532	280	272	255	262	111	114	16,240	16,873
10	58628	989	J-1074	J-1060	1,342	1,152	PVC	24	267	267	269	269	0.012	0.95	532	531	272	272	262	263	114	115	16,873	18,025
11	58528	3105	J-1060	J-1105	1,561	234	PVC	24	267	263	269	265	0.012	1.11	531	531	272	268	263	267	115	116	18,025	18,259
12	58569	998	J-1105	J-1124	1,507	363	Ductile Iron	16	263	262	264	264	0.012	2.40	531	531	267	267	267	268	116	116	18,259	18,622
13	60427	P-424	J-24800	J-1124	1,667	1,331	Ductile Iron	16	296	262	297	264	0.012	2.66	527	531	300	267	230	263	116	100	18,622	19,953
14	60428	P-425	J-24800	J-1099	1,667	157	Ductile Iron	16	296	300	297	301	0.012	2.66	527	527	300	304	230	226	100	98	19,953	20,110
15	58516	5214	J-1099	J-1100	1,658	180	Ductile Iron	16	300	303	301	305	0.012	2.65	527	526	304	308	225	222	98	96	20,110	20,290
16	58526	5220	J-1100	J-1104	1,657	223	Ductile Iron	16	303	293	305	294	0.012	2.64	526	526	308	297	222	232	96	101	20,290	20,513
17	58612	4429	J-1104	J-1044	1,654	626	Cast Iron	16	293	250	294	251	0.012	2.64	526	524	297	254	231	274	101	119	20,513	21,139

Cal Poly San Luis Obispo Water Supply Assessment and Wastewater Feasibility Modeling
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TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 10 (City_ADD_2035 CP_2025)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	1,467	736	Ductile Iron	24	537	530	539	532	0.012	1.04	550	550	542	535	11	18	6	9	0	736
2	60206	P-333	J-1102	J-24754	1,467	6,242	CCP	24	530	400	532	402	0.012	1.04	550	549	535	405	18	148	9	64	736	6,978
3	60209	P-335	J-24754	J-24755	1,467	1,073	CCP	24	400	370	402	372	0.012	1.04	549	549	405	375	147	177	64	77	6,978	8,051
4	60208	P-334	J-24755	_J-1139	1,319	3,587	CCP	24	370	323	372	325	0.012	0.94	549	548	375	328	177	224	77	97	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	1,316	2,322	PVC	24	323	290	325	292	0.012	0.93	548	548	328	295	223	256	97	111	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	1,266	338	PVC	24	290	290	292	292	0.012	0.90	548	548	295	295	256	256	111	111	13,960	14,298
7	60218	P-341	_J-24757	J-24758	713	1,262	PVC	24	290	279	292	281	0.012	0.51	548	548	295	284	256	267	111	116	14,298	15,560
8	60221	P-343	J-24758	J-24759	712	680	PVC	24	279	275	281	277	0.012	0.50	548	548	284	280	267	271	116	118	15,560	16,240
9	60220	P-342	J-24759	J-1074	702	633	PVC	24	275	267	277	269	0.012	0.50	548	548	280	272	271	278	118	121	16,240	16,873
10	58628	989	J-1074	J-1060	704	1,152	PVC	24	267	267	269	269	0.012	0.50	548	548	272	272	278	279	121	121	16,873	18,025
11	58528	3105	J-1060	J-1105	545	234	PVC	24	267	263	269	265	0.012	0.39	548	548	272	268	279	283	121	123	18,025	18,259
12	58569	998	J-1105	J-1124	499	363	Ductile Iron	16	263	262	264	264	0.012	0.80	548	547	267	267	284	284	123	123	18,259	18,622
13	60427	P-424	J-24800	J-1124	534	1,331	Ductile Iron	16	296	262	297	264	0.012	0.85	547	547	300	267	250	283	123	109	18,622	19,953
14	60428	P-425	J-24800	J-1099	618	157	Ductile Iron	16	296	300	297	301	0.012	0.99	547	547	300	304	250	246	109	107	19,953	20,110
15	58516	5214	J-1099	J-1100	615	180	Ductile Iron	16	300	303	301	305	0.012	0.98	547	547	304	308	246	242	107	105	20,110	20,290
16	58526	5220	J-1100	J-1104	615	223	Ductile Iron	16	303	293	305	294	0.012	0.98	547	547	308	297	242	253	105	110	20,290	20,513
17	58612	4429	J-1104	J-1044	614	626	Cast Iron	16	293	250	294	251	0.012	0.98	547	546	297	254	253	295	110	128	20,513	21,139

Cal Poly San Luis Obispo Water Supply Assessment and Wastewater Feasibility Modeling
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TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 11 (City_PDD_2035 CP_2025)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	2,957	736	Ductile Iron	24	537	530	539	532	0.012	2.10	557	556	542	535	18	25	9	11	0	736
2	60206	P-333	J-1102	J-24754	2,957	6,242	CCP	24	530	400	532	402	0.012	2.10	556	552	535	405	24	154	11	66	736	6,978
3	60209	P-335	J-24754	J-24755	2,956	1,073	CCP	24	400	370	402	372	0.012	2.10	552	552	405	375	150	180	66	79	6,978	8,051
4	60208	P-334	J-24755	_J-1139	2,178	3,587	CCP	24	370	323	372	325	0.012	1.54	552	550	375	328	180	227	79	98	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	2,173	2,322	PVC	24	323	290	325	292	0.012	1.54	550	549	328	295	225	258	98	112	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	2,098	338	PVC	24	290	290	292	292	0.012	1.49	549	549	295	295	257	257	112	112	13,960	14,298
7	60218	P-341	_J-24757	J-24758	1,268	1,262	PVC	24	290	279	292	281	0.012	0.90	549	549	295	284	257	269	112	117	14,298	15,560
8	60221	P-343	J-24758	J-24759	1,266	680	PVC	24	279	275	281	277	0.012	0.90	549	549	284	280	268	272	117	119	15,560	16,240
9	60220	P-342	J-24759	J-1074	1,252	633	PVC	24	275	267	277	269	0.012	0.89	549	549	280	272	272	280	119	122	16,240	16,873
10	58628	989	J-1074	J-1060	608	1,152	PVC	24	267	267	269	269	0.012	0.43	549	549	272	272	280	280	122	122	16,873	18,025
11	58528	3105	J-1060	J-1105	416	234	PVC	24	267	263	269	265	0.012	0.29	549	549	272	268	280	284	122	124	18,025	18,259
12	58569	998	J-1105	J-1124	368	363	Ductile Iron	16	263	262	264	264	0.012	0.59	549	549	267	267	285	285	124	124	18,259	18,622
13	60427	P-424	J-24800	J-1124	364	1,331	Ductile Iron	16	296	262	297	264	0.012	0.58	549	549	300	267	251	285	124	109	18,622	19,953
14	60428	P-425	J-24800	J-1099	406	157	Ductile Iron	16	296	300	297	301	0.012	0.65	549	549	300	304	251	247	109	108	19,953	20,110
15	58516	5214	J-1099	J-1100	402	180	Ductile Iron	16	300	303	301	305	0.012	0.64	549	549	304	308	247	244	108	106	20,110	20,290
16	58526	5220	J-1100	J-1104	402	223	Ductile Iron	16	303	293	305	294	0.012	0.64	549	549	308	297	244	255	106	111	20,290	20,513
17	58612	4429	J-1104	J-1044	401	626	Cast Iron	16	293	250	294	251	0.012	0.64	549	549	297	254	254	297	111	129	20,513	21,139

Cal Poly San Luis Obispo Water Supply Assessment and Wastewater Feasibility Modeling
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TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 12 (City_PHD_2035 CP_2025)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	5,875	736	Ductile Iron	24	537	530	539	532	0.012	4.17	547	544	542	535	8	15	4	6	0	736
2	60206	P-333	J-1102	J-24754	5,875	6,242	CCP	24	530	400	532	402	0.012	4.17	544	530	535	405	12	142	6	56	736	6,978
3	60209	P-335	J-24754	J-24755	5,873	1,073	CCP	24	400	370	402	372	0.012	4.16	530	527	405	375	128	158	56	68	6,978	8,051
4	60208	P-334	J-24755	_J-1139	4,909	3,587	CCP	24	370	323	372	325	0.012	3.48	527	522	375	328	155	202	68	86	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	4,899	2,322	PVC	24	323	290	325	292	0.012	3.47	522	518	328	295	197	230	86	99	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	4,729	338	PVC	24	290	290	292	292	0.012	3.35	518	518	295	295	226	226	99	99	13,960	14,298
7	60218	P-341	_J-24757	J-24758	2,485	1,262	PVC	24	290	279	292	281	0.012	1.76	518	517	295	284	226	237	99	103	14,298	15,560
8	60221	P-343	J-24758	J-24759	2,482	680	PVC	24	279	275	281	277	0.012	1.76	517	517	284	280	236	240	103	105	15,560	16,240
9	60220	P-342	J-24759	J-1074	2,450	633	PVC	24	275	267	277	269	0.012	1.74	517	517	280	272	240	248	105	108	16,240	16,873
10	58628	989	J-1074	J-1060	1,525	1,152	PVC	24	267	267	269	269	0.012	1.08	517	516	272	272	247	248	108	108	16,873	18,025
11	58528	3105	J-1060	J-1105	469	234	PVC	24	267	263	269	265	0.012	0.33	516	516	272	268	248	252	108	110	18,025	18,259
12	58569	998	J-1105	J-1124	297	363	Ductile Iron	16	263	262	264	264	0.012	0.47	516	516	267	267	253	253	110	110	18,259	18,622
13	60427	P-424	J-24800	J-1124	109	1,331	Ductile Iron	16	296	262	297	264	0.012	0.17	516	516	300	267	219	253	110	95	18,622	19,953
14	60428	P-425	J-24800	J-1099	243	157	Ductile Iron	16	296	300	297	301	0.012	0.39	516	516	300	304	219	215	95	94	19,953	20,110
15	58516	5214	J-1099	J-1100	251	180	Ductile Iron	16	300	303	301	305	0.012	0.40	516	516	304	308	215	212	94	92	20,110	20,290
16	58526	5220	J-1100	J-1104	253	223	Ductile Iron	16	303	293	305	294	0.012	0.40	516	516	308	297	212	222	92	97	20,290	20,513
17	58612	4429	J-1104	J-1044	255	626	Cast Iron	16	293	250	294	251	0.012	0.41	516	517	297	254	222	265	97	115	20,513	21,139

Cal Poly San Luis Obispo Water Supply Assessment and Wastewater Feasibility Modeling
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TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 13 (City_ADD_2035 CP_2030)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	1,507	736	Ductile Iron	24	537	530	539	532	0.012	1.07	550	550	542	535	11	18	6	9	0	736
2	60206	P-333	J-1102	J-24754	1,507	6,242	CCP	24	530	400	532	402	0.012	1.07	550	549	535	405	18	148	9	64	736	6,978
3	60209	P-335	J-24754	J-24755	1,507	1,073	CCP	24	400	370	402	372	0.012	1.07	549	548	405	375	147	177	64	77	6,978	8,051
4	60208	P-334	J-24755	_J-1139	1,357	3,587	CCP	24	370	323	372	325	0.012	0.96	548	548	375	328	176	223	77	97	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	1,354	2,322	PVC	24	323	290	325	292	0.012	0.96	548	548	328	295	223	256	97	111	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	1,304	338	PVC	24	290	290	292	292	0.012	0.92	548	548	295	295	256	256	111	111	13,960	14,298
7	60218	P-341	_J-24757	J-24758	700	1,262	PVC	24	290	279	292	281	0.012	0.50	548	547	295	284	256	267	111	116	14,298	15,560
8	60221	P-343	J-24758	J-24759	699	680	PVC	24	279	275	281	277	0.012	0.50	547	547	284	280	267	270	116	118	15,560	16,240
9	60220	P-342	J-24759	J-1074	689	633	PVC	24	275	267	277	269	0.012	0.49	547	547	280	272	270	278	118	121	16,240	16,873
10	58628	989	J-1074	J-1060	694	1,152	PVC	24	267	267	269	269	0.012	0.49	547	547	272	272	278	279	121	121	16,873	18,025
11	58528	3105	J-1060	J-1105	536	234	PVC	24	267	263	269	265	0.012	0.38	547	547	272	268	279	283	121	123	18,025	18,259
12	58569	998	J-1105	J-1124	491	363	Ductile Iron	16	263	262	264	264	0.012	0.78	547	547	267	267	283	284	123	123	18,259	18,622
13	60427	P-424	J-24800	J-1124	525	1,331	Ductile Iron	16	296	262	297	264	0.012	0.84	547	547	300	267	250	283	123	109	18,622	19,953
14	60428	P-425	J-24800	J-1099	607	157	Ductile Iron	16	296	300	297	301	0.012	0.97	547	547	300	304	250	246	109	107	19,953	20,110
15	58516	5214	J-1099	J-1100	604	180	Ductile Iron	16	300	303	301	305	0.012	0.96	547	547	304	308	246	242	107	105	20,110	20,290
16	58526	5220	J-1100	J-1104	604	223	Ductile Iron	16	303	293	305	294	0.012	0.96	547	547	308	297	242	253	105	110	20,290	20,513
17	58612	4429	J-1104	J-1044	603	626	Cast Iron	16	293	250	294	251	0.012	0.96	547	546	297	254	252	295	110	128	20,513	21,139

Cal Poly San Luis Obispo Water Supply Assessment and Wastewater Feasibility Modeling
Watearth, Inc.
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TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 14 (City_PDD_2035 CP_2030)

						Pipe Data									Elevations (ft)									
Link	**ID**	**Link Name**	**US Node**	**DS Node**	**Total Flow (gpm)**	**Length (ft)**	**Material**	**Diameter (in)**	**US Invert (ft)**	**DS Invert (ft)**	**US Top of Pipe (ft)**	**DS Top of Pipe (ft)**	**n-Value**	**Velocity (fps)**	**US Hydraulic Grade Line**	**DS Hydraulic Grade Line**	**US Natural Ground**	**DS Natural Ground**	**US HGL Above Top of Pipe (ft)**	**DS HGL Above Top of Pipe (ft)**	**US Pressure (psi)**	**DS Pressure (psi)**	**Starting Station (ft)**	**Ending Station (ft)**
1	58613	6660	Reservoir 2	J-1102	3,007	736	Ductile Iron	24	537	530	539	532	0.012	2.13	557	556	542	535	18	25	9	11	0	736
2	60206	P-333	J-1102	J-24754	3,007	6,242	CCP	24	530	400	532	402	0.012	2.13	556	552	535	405	24	154	11	66	736	6,978
3	60209	P-335	J-24754	J-24755	3,006	1,073	CCP	24	400	370	402	372	0.012	2.13	552	551	405	375	150	180	66	78	6,978	8,051
4	60208	P-334	J-24755	_J-1139	2,227	3,587	CCP	24	370	323	372	325	0.012	1.58	551	550	375	328	179	226	78	98	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	2,222	2,322	PVC	24	323	290	325	292	0.012	1.58	550	549	328	295	225	258	98	112	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	2,147	338	PVC	24	290	290	292	292	0.012	1.52	549	549	295	295	257	257	112	112	13,960	14,298
7	60218	P-341	_J-24757	J-24758	1,241	1,262	PVC	24	290	279	292	281	0.012	0.88	549	549	295	284	257	268	112	117	14,298	15,560
8	60221	P-343	J-24758	J-24759	1,240	680	PVC	24	279	275	281	277	0.012	0.88	549	549	284	280	268	272	117	118	15,560	16,240
9	60220	P-342	J-24759	J-1074	1,226	633	PVC	24	275	267	277	269	0.012	0.87	549	549	280	272	272	280	118	122	16,240	16,873
10	58628	989	J-1074	J-1060	584	1,152	PVC	24	267	267	269	269	0.012	0.41	549	549	272	272	280	280	122	122	16,873	18,025
11	58528	3105	J-1060	J-1105	396	234	PVC	24	267	263	269	265	0.012	0.28	549	549	272	268	280	284	122	124	18,025	18,259
12	58569	998	J-1105	J-1124	350	363	Ductile Iron	16	263	262	264	264	0.012	0.56	549	549	267	267	285	285	124	124	18,259	18,622
13	60427	P-424	J-24800	J-1124	343	1,331	Ductile Iron	16	296	262	297	264	0.012	0.55	549	549	300	267	251	285	124	109	18,622	19,953
14	60428	P-425	J-24800	J-1099	381	157	Ductile Iron	16	296	300	297	301	0.012	0.61	549	549	300	304	251	247	109	108	19,953	20,110
15	58516	5214	J-1099	J-1100	377	180	Ductile Iron	16	300	303	301	305	0.012	0.60	549	548	304	308	247	244	108	106	20,110	20,290
16	58526	5220	J-1100	J-1104	377	223	Ductile Iron	16	303	293	305	294	0.012	0.60	548	548	308	297	244	254	106	111	20,290	20,513
17	58612	4429	J-1104	J-1044	375	626	Cast Iron	16	293	250	294	251	0.012	0.60	548	548	297	254	254	297	111	129	20,513	21,139

Cal Poly San Luis Obispo Water Supply Assessment and Wastewater Feasibility Modeling
Watearth, Inc.
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TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 15 (City_PHD_2035 CP_2030)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	6,004	736	Ductile Iron	24	537	530	539	532	0.012	4.26	547	544	542	535	8	15	4	6	0	736
2	60206	P-333	J-1102	J-24754	6,004	6,242	CCP	24	530	400	532	402	0.012	4.26	544	529	535	405	12	142	6	56	736	6,978
3	60209	P-335	J-24754	J-24755	6,002	1,073	CCP	24	400	370	402	372	0.012	4.26	529	527	405	375	127	157	56	68	6,978	8,051
4	60208	P-334	J-24755	_J-1139	5,047	3,587	CCP	24	370	323	372	325	0.012	3.58	527	520	375	328	155	202	68	85	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	5,037	2,322	PVC	24	323	290	325	292	0.012	3.57	520	517	328	295	195	228	85	98	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	4,867	338	PVC	24	290	290	292	292	0.012	3.45	517	516	295	295	225	225	98	98	13,960	14,298
7	60218	P-341	_J-24757	J-24758	2,419	1,262	PVC	24	290	279	292	281	0.012	1.72	516	516	295	284	224	236	98	103	14,298	15,560
8	60221	P-343	J-24758	J-24759	2,416	680	PVC	24	279	275	281	277	0.012	1.71	516	516	284	280	235	239	103	104	15,560	16,240
9	60220	P-342	J-24759	J-1074	2,384	633	PVC	24	275	267	277	269	0.012	1.69	516	515	280	272	239	246	104	107	16,240	16,873
10	58628	989	J-1074	J-1060	1,474	1,152	PVC	24	267	267	269	269	0.012	1.05	515	515	272	272	246	247	107	108	16,873	18,025
11	58528	3105	J-1060	J-1105	418	234	PVC	24	267	263	269	265	0.012	0.30	515	515	272	268	247	251	108	109	18,025	18,259
12	58569	998	J-1105	J-1124	247	363	Ductile Iron	16	263	262	264	264	0.012	0.39	515	515	267	267	251	251	109	109	18,259	18,622
13	60427	P-424	J-24800	J-1124	58	1,331	Ductile Iron	16	296	262	297	264	0.012	0.09	515	515	300	267	218	251	109	95	18,622	19,953
14	60428	P-425	J-24800	J-1099	294	157	Ductile Iron	16	296	300	297	301	0.012	0.47	515	515	300	304	218	214	95	93	19,953	20,110
15	58516	5214	J-1099	J-1100	303	180	Ductile Iron	16	300	303	301	305	0.012	0.48	515	515	304	308	214	211	93	92	20,110	20,290
16	58526	5220	J-1100	J-1104	304	223	Ductile Iron	16	303	293	305	294	0.012	0.49	515	515	308	297	211	221	92	96	20,290	20,513
17	58612	4429	J-1104	J-1044	307	626	Cast Iron	16	293	250	294	251	0.012	0.49	515	515	297	254	221	264	96	115	20,513	21,139

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TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 16 (City_ADD_2035 CP_2035)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	1,568	736	Ductile Iron	24	537	530	539	532	0.012	1.11	550	550	542	535	11	18	6	9	0	736
2	60206	P-333	J-1102	J-24754	1,568	6,242	CCP	24	530	400	532	402	0.012	1.11	550	549	535	405	18	148	9	64	736	6,978
3	60209	P-335	J-24754	J-24755	1,567	1,073	CCP	24	400	370	402	372	0.012	1.11	549	548	405	375	147	177	64	77	6,978	8,051
4	60208	P-334	J-24755	_J-1139	1,414	3,587	CCP	24	370	323	372	325	0.012	1.00	548	548	375	328	176	223	77	97	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	1,411	2,322	PVC	24	323	290	325	292	0.012	1.00	548	547	328	295	223	256	97	111	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	1,361	338	PVC	24	290	290	292	292	0.012	0.96	547	547	295	295	255	255	111	111	13,960	14,298
7	60218	P-341	_J-24757	J-24758	679	1,262	PVC	24	290	279	292	281	0.012	0.48	547	547	295	284	255	267	111	116	14,298	15,560
8	60221	P-343	J-24758	J-24759	678	680	PVC	24	279	275	281	277	0.012	0.48	547	547	284	280	266	270	116	118	15,560	16,240
9	60220	P-342	J-24759	J-1074	668	633	PVC	24	275	267	277	269	0.012	0.47	547	547	280	272	270	278	118	121	16,240	16,873
10	58628	989	J-1074	J-1060	677	1,152	PVC	24	267	267	269	269	0.012	0.48	547	547	272	272	278	279	121	121	16,873	18,025
11	58528	3105	J-1060	J-1105	521	234	PVC	24	267	263	269	265	0.012	0.37	547	547	272	268	278	283	121	123	18,025	18,259
12	58569	998	J-1105	J-1124	477	363	Ductile Iron	16	263	262	264	264	0.012	0.76	547	547	267	267	283	283	123	123	18,259	18,622
13	60427	P-424	J-24800	J-1124	510	1,331	Ductile Iron	16	296	262	297	264	0.012	0.81	547	547	300	267	249	283	123	108	18,622	19,953
14	60428	P-425	J-24800	J-1099	589	157	Ductile Iron	16	296	300	297	301	0.012	0.94	547	547	300	304	249	245	108	107	19,953	20,110
15	58516	5214	J-1099	J-1100	587	180	Ductile Iron	16	300	303	301	305	0.012	0.94	547	547	304	308	245	242	107	105	20,110	20,290
16	58526	5220	J-1100	J-1104	586	223	Ductile Iron	16	303	293	305	294	0.012	0.94	547	547	308	297	242	252	105	110	20,290	20,513
17	58612	4429	J-1104	J-1044	585	626	Cast Iron	16	293	250	294	251	0.012	0.93	547	546	297	254	252	295	110	128	20,513	21,139

Cal Poly San Luis Obispo Water Supply Assessment and Wastewater Feasibility Modeling
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TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 17 (City_PDD_2035 CP_2035)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	3,080	736	Ductile Iron	24	537	530	539	532	0.012	2.18	557	556	542	535	18	25	9	11	0	736
2	60206	P-333	J-1102	J-24754	3,080	6,242	CCP	24	530	400	532	402	0.012	2.18	556	552	535	405	24	154	11	66	736	6,978
3	60209	P-335	J-24754	J-24755	3,079	1,073	CCP	24	400	370	402	372	0.012	2.18	552	551	405	375	150	180	66	78	6,978	8,051
4	60208	P-334	J-24755	_J-1139	2,300	3,587	CCP	24	370	323	372	325	0.012	1.63	551	550	375	328	179	226	78	98	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	2,295	2,322	PVC	24	323	290	325	292	0.012	1.63	550	549	328	295	225	258	98	112	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	2,220	338	PVC	24	290	290	292	292	0.012	1.57	549	549	295	295	257	257	112	112	13,960	14,298
7	60218	P-341	_J-24757	J-24758	1,198	1,262	PVC	24	290	279	292	281	0.012	0.85	549	549	295	284	257	268	112	117	14,298	15,560
8	60221	P-343	J-24758	J-24759	1,197	680	PVC	24	279	275	281	277	0.012	0.85	549	548	284	280	268	272	117	118	15,560	16,240
9	60220	P-342	J-24759	J-1074	1,183	633	PVC	24	275	267	277	269	0.012	0.84	548	548	280	272	271	279	118	122	16,240	16,873
10	58628	989	J-1074	J-1060	546	1,152	PVC	24	267	267	269	269	0.012	0.39	548	548	272	272	279	280	122	122	16,873	18,025
11	58528	3105	J-1060	J-1105	364	234	PVC	24	267	263	269	265	0.012	0.26	548	548	272	268	280	284	122	124	18,025	18,259
12	58569	998	J-1105	J-1124	321	363	Ductile Iron	16	263	262	264	264	0.012	0.51	548	548	267	267	284	285	124	124	18,259	18,622
13	60427	P-424	J-24800	J-1124	309	1,331	Ductile Iron	16	296	262	297	264	0.012	0.49	548	548	300	267	251	284	124	109	18,622	19,953
14	60428	P-425	J-24800	J-1099	340	157	Ductile Iron	16	296	300	297	301	0.012	0.54	548	548	300	304	251	247	109	107	19,953	20,110
15	58516	5214	J-1099	J-1100	336	180	Ductile Iron	16	300	303	301	305	0.012	0.54	548	548	304	308	247	244	107	106	20,110	20,290
16	58526	5220	J-1100	J-1104	336	223	Ductile Iron	16	303	293	305	294	0.012	0.54	548	548	308	297	244	254	106	110	20,290	20,513
17	58612	4429	J-1104	J-1044	335	626	Cast Iron	16	293	250	294	251	0.012	0.53	548	548	297	254	254	297	110	129	20,513	21,139

Cal Poly San Luis Obispo Water Supply Assessment and Wastewater Feasibility Modeling
Watearth, Inc.
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TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 18 (City_PHD_2035 CP_2035)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	6,197	736	Ductile Iron	24	537	530	539	532	0.012	4.39	547	544	542	535	8	15	4	6	0	736
2	60206	P-333	J-1102	J-24754	6,197	6,242	CCP	24	530	400	532	402	0.012	4.39	544	528	535	405	12	142	6	55	736	6,978
3	60209	P-335	J-24754	J-24755	6,195	1,073	CCP	24	400	370	402	372	0.012	4.39	528	525	405	375	126	156	55	67	6,978	8,051
4	60208	P-334	J-24755	_J-1139	5,255	3,587	CCP	24	370	323	372	325	0.012	3.73	525	519	375	328	153	200	67	85	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	5,245	2,322	PVC	24	323	290	325	292	0.012	3.72	519	515	328	295	194	227	85	97	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	5,075	338	PVC	24	290	290	292	292	0.012	3.60	515	514	295	295	223	223	97	97	13,960	14,298
7	60218	P-341	_J-24757	J-24758	2,317	1,262	PVC	24	290	279	292	281	0.012	1.64	514	514	295	284	222	234	97	102	14,298	15,560
8	60221	P-343	J-24758	J-24759	2,314	680	PVC	24	279	275	281	277	0.012	1.64	514	514	284	280	233	237	102	103	15,560	16,240
9	60220	P-342	J-24759	J-1074	2,282	633	PVC	24	275	267	277	269	0.012	1.62	514	513	280	272	237	244	103	107	16,240	16,873
10	58628	989	J-1074	J-1060	1,397	1,152	PVC	24	267	267	269	269	0.012	0.99	513	513	272	272	244	245	107	107	16,873	18,025
11	58528	3105	J-1060	J-1105	342	234	PVC	24	267	263	269	265	0.012	0.24	513	513	272	268	245	249	107	108	18,025	18,259
12	58569	998	J-1105	J-1124	171	363	Ductile Iron	16	263	262	264	264	0.012	0.27	513	513	267	267	249	250	108	109	18,259	18,622
13	60427	P-424	J-24800	J-1124	19	1,331	Ductile Iron	16	296	262	297	264	0.012	0.03	513	513	300	267	216	249	94	109	18,622	19,953
14	60428	P-425	J-24800	J-1099	372	157	Ductile Iron	16	296	300	297	301	0.012	0.59	513	513	300	304	216	212	94	92	19,953	20,110
15	58516	5214	J-1099	J-1100	380	180	Ductile Iron	16	300	303	301	305	0.012	0.61	513	513	304	308	212	209	92	91	20,110	20,290
16	58526	5220	J-1100	J-1104	382	223	Ductile Iron	16	303	293	305	294	0.012	0.61	513	513	308	297	209	219	91	95	20,290	20,513
17	58612	4429	J-1104	J-1044	384	626	Cast Iron	16	293	250	294	251	0.012	0.61	513	514	297	254	219	262	95	114	20,513	21,139

Cal Poly San Luis Obispo Water Supply Assessment and Wastewater Feasibility Modeling
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TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 19 (City_PDD_FF_2015 CP_2015)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	1,063	736	Ductile Iron	24	537	530	539	532	0.012	0.75	547	547	542	535	8	15	4	7	0	736
2	60206	P-333	J-1102	J-24754	1,063	6,242	CCP	24	530	400	532	402	0.012	0.75	547	546	535	405	15	145	7	63	736	6,978
3	60209	P-335	J-24754	J-24755	1,062	1,073	CCP	24	400	370	402	372	0.012	0.75	546	546	405	375	144	174	63	76	6,978	8,051
4	60208	P-334	J-24755	_J-1139	1,053	3,587	CCP	24	370	323	372	325	0.012	0.75	546	546	375	328	174	221	76	96	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	1,048	2,322	PVC	24	323	290	325	292	0.012	0.74	546	546	328	295	221	254	96	111	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	973	338	PVC	24	290	290	292	292	0.012	0.69	546	546	295	295	254	254	111	111	13,960	14,298
7	60218	P-341	_J-24757	J-24758	205	1,262	PVC	24	290	279	292	281	0.012	0.15	546	546	295	284	254	265	111	115	14,298	15,560
8	60221	P-343	J-24758	J-24759	204	680	PVC	24	279	275	281	277	0.012	0.14	546	546	284	280	265	269	115	117	15,560	16,240
9	60220	P-342	J-24759	J-1074	191	633	PVC	24	275	267	277	269	0.012	0.14	546	546	280	272	269	276	117	120	16,240	16,873
10	58628	989	J-1074	J-1060	198	1,152	PVC	24	267	267	269	269	0.012	0.14	546	546	272	272	276	277	120	121	16,873	18,025
11	58528	3105	J-1060	J-1105	333	234	PVC	24	267	263	269	265	0.012	0.24	546	546	272	268	277	281	121	122	18,025	18,259
12	58569	998	J-1105	J-1124	350	363	Ductile Iron	16	263	262	264	264	0.012	0.56	546	546	267	267	282	282	122	122	18,259	18,622
13	60427	P-424	J-24800	J-1124	390	1,331	Ductile Iron	16	296	262	297	264	0.012	0.62	545	546	300	267	248	282	122	108	18,622	19,953
14	60428	P-425	J-24800	J-1099	390	157	Ductile Iron	16	296	300	297	301	0.012	0.62	545	545	300	304	248	244	108	106	19,953	20,110
15	58516	5214	J-1099	J-1100	386	180	Ductile Iron	16	300	303	301	305	0.012	0.62	545	545	304	308	244	241	106	105	20,110	20,290
16	58526	5220	J-1100	J-1104	385	223	Ductile Iron	16	303	293	305	294	0.012	0.61	545	545	308	297	241	251	105	109	20,290	20,513
17	58612	4429	J-1104	J-1044	384	626	Cast Iron	16	293	250	294	251	0.012	0.61	545	545	297	254	251	294	109	128	20,513	21,139

Cal Poly San Luis Obispo Water Supply Assessment and Wastewater Feasibility Modeling
Watearth, Inc.
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TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 20 (City_PDD_FF_2015 CP_2020)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	1,041	736	Ductile Iron	24	537	530	539	532	0.012	0.74	547	547	542	535	8	15	4	7	0	736
2	60206	P-333	J-1102	J-24754	1,041	6,242	CCP	24	530	400	532	402	0.012	0.74	546	547	535	405	15	145	7	63	736	6,978
3	60209	P-335	J-24754	J-24755	1,041	1,073	CCP	24	400	370	402	372	0.012	0.74	546	546	405	375	144	174	63	76	6,978	8,051
4	60208	P-334	J-24755	_J-1139	1,031	3,587	CCP	24	370	323	372	325	0.012	0.73	546	546	375	328	174	221	76	96	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	1,026	2,322	PVC	24	323	290	325	292	0.012	0.73	546	546	328	295	221	254	96	111	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	951	338	PVC	24	290	290	292	292	0.012	0.67	546	546	295	295	254	254	111	111	13,960	14,298
7	60218	P-341	_J-24757	J-24758	207	1,262	PVC	24	290	279	292	281	0.012	0.15	546	546	295	284	254	265	111	115	14,298	15,560
8	60221	P-343	J-24758	J-24759	206	680	PVC	24	279	275	281	277	0.012	0.15	546	546	284	280	265	269	115	117	15,560	16,240
9	60220	P-342	J-24759	J-1074	193	633	PVC	24	275	267	277	269	0.012	0.14	546	546	280	272	269	276	117	120	16,240	16,873
10	58628	989	J-1074	J-1060	200	1,152	PVC	24	267	267	269	269	0.012	0.14	546	546	272	272	276	277	120	121	16,873	18,025
11	58528	3105	J-1060	J-1105	333	234	PVC	24	267	263	269	265	0.012	0.24	546	546	272	268	277	281	121	122	18,025	18,259
12	58569	998	J-1105	J-1124	350	363	Ductile Iron	16	263	262	264	264	0.012	0.56	546	546	267	267	282	282	122	122	18,259	18,622
13	60427	P-424	J-24800	J-1124	390	1,331	Ductile Iron	16	296	262	297	264	0.012	0.62	546	545	300	267	248	282	122	108	18,622	19,953
14	60428	P-425	J-24800	J-1099	390	157	Ductile Iron	16	296	300	297	301	0.012	0.62	545	545	300	304	248	244	108	106	19,953	20,110
15	58516	5214	J-1099	J-1100	386	180	Ductile Iron	16	300	303	301	305	0.012	0.62	545	545	304	308	244	241	106	105	20,110	20,290
16	58526	5220	J-1100	J-1104	385	223	Ductile Iron	16	303	293	305	294	0.012	0.61	545	545	308	297	241	251	105	109	20,290	20,513
17	58612	4429	J-1104	J-1044	384	626	Cast Iron	16	293	250	294	251	0.012	0.61	545	545	297	254	251	294	109	128	20,513	21,139

Cal Poly San Luis Obispo Water Supply Assessment and Wastewater Feasibility Modeling
Watearth, Inc.
Job No. 2018.0314.1-CA
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TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 21 (City_PDD_FF_2015 CP_2025)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	1,119	736	Ductile Iron	24	537	530	539	532	0.012	0.79	547	547	542	535	8	15	4	7	0	736
2	60206	P-333	J-1102	J-24754	1,119	6,242	CCP	24	530	400	532	402	0.012	0.79	547	546	535	405	15	145	7	63	736	6,978
3	60209	P-335	J-24754	J-24755	1,118	1,073	CCP	24	400	370	402	372	0.012	0.79	546	546	405	375	144	174	63	76	6,978	8,051
4	60208	P-334	J-24755	_J-1139	1,109	3,587	CCP	24	370	323	372	325	0.012	0.79	546	546	375	328	174	221	76	96	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	1,104	2,322	PVC	24	323	290	325	292	0.012	0.78	546	546	328	295	221	254	96	111	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	1,029	338	PVC	24	290	290	292	292	0.012	0.73	546	545	295	295	254	254	111	111	13,960	14,298
7	60218	P-341	_J-24757	J-24758	199	1,262	PVC	24	290	279	292	281	0.012	0.14	545	545	295	284	253	265	111	115	14,298	15,560
8	60221	P-343	J-24758	J-24759	198	680	PVC	24	279	275	281	277	0.012	0.14	545	545	284	280	265	268	115	117	15,560	16,240
9	60220	P-342	J-24759	J-1074	185	633	PVC	24	275	267	277	269	0.012	0.13	545	545	280	272	268	276	117	120	16,240	16,873
10	58628	989	J-1074	J-1060	193	1,152	PVC	24	267	267	269	269	0.012	0.14	545	545	272	272	276	277	120	121	16,873	18,025
11	58528	3105	J-1060	J-1105	331	234	PVC	24	267	263	269	265	0.012	0.23	545	545	272	268	277	281	121	122	18,025	18,259
12	58569	998	J-1105	J-1124	349	363	Ductile Iron	16	263	262	264	264	0.012	0.56	545	545	267	267	282	282	122	122	18,259	18,622
13	60427	P-424	J-24800	J-1124	390	1,331	Ductile Iron	16	296	262	297	264	0.012	0.62	545	545	300	267	248	281	122	108	18,622	19,953
14	60428	P-425	J-24800	J-1099	390	157	Ductile Iron	16	296	300	297	301	0.012	0.62	545	545	300	304	248	244	108	106	19,953	20,110
15	58516	5214	J-1099	J-1100	386	180	Ductile Iron	16	300	303	301	305	0.012	0.62	545	545	304	308	244	241	106	105	20,110	20,290
16	58526	5220	J-1100	J-1104	385	223	Ductile Iron	16	303	293	305	294	0.012	0.61	545	545	308	297	241	251	105	109	20,290	20,513
17	58612	4429	J-1104	J-1044	384	626	Cast Iron	16	293	250	294	251	0.012	0.61	545	545	297	254	251	294	109	128	20,513	21,139

Cal Poly San Luis Obispo Water Supply Assessment and Wastewater Feasibility Modeling
Watearth, Inc.
Job No. 2018.0314.1-CA
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TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 22 (City_PDD_FF_2035 CP_2025)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	1,157	736	Ductile Iron	24	537	530	539	532	0.012	0.82	547	547	542	535	8	15	4	7	0	736
2	60206	P-333	J-1102	J-24754	1,157	6,242	CCP	24	530	400	532	402	0.012	0.82	547	546	535	405	15	145	7	63	736	6,978
3	60209	P-335	J-24754	J-24755	1,157	1,073	CCP	24	400	370	402	372	0.012	0.82	546	546	405	375	144	174	63	76	6,978	8,051
4	60208	P-334	J-24755	_J-1139	1,010	3,587	CCP	24	370	323	372	325	0.012	0.72	546	546	375	328	174	221	76	96	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	1,005	2,322	PVC	24	323	290	325	292	0.012	0.71	546	546	328	295	221	254	96	111	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	930	338	PVC	24	290	290	292	292	0.012	0.66	546	546	295	295	254	254	111	111	13,960	14,298
7	60218	P-341	_J-24757	J-24758	100	1,262	PVC	24	290	279	292	281	0.012	0.07	546	546	295	284	254	265	111	115	14,298	15,560
8	60221	P-343	J-24758	J-24759	98	680	PVC	24	279	275	281	277	0.012	0.07	546	546	284	280	265	269	115	117	15,560	16,240
9	60220	P-342	J-24759	J-1074	84	633	PVC	24	275	267	277	269	0.012	0.06	546	546	280	272	269	276	117	120	16,240	16,873
10	58628	989	J-1074	J-1060	54	1,152	PVC	24	267	267	269	269	0.012	0.04	546	546	272	272	276	277	120	121	16,873	18,025
11	58528	3105	J-1060	J-1105	36	234	PVC	24	267	263	269	265	0.012	0.03	546	546	272	268	277	281	121	122	18,025	18,259
12	58569	998	J-1105	J-1124	54	363	Ductile Iron	16	263	262	264	264	0.012	0.09	546	546	267	267	282	282	122	122	18,259	18,622
13	60427	P-424	J-24800	J-1124	83	1,331	Ductile Iron	16	296	262	297	264	0.012	0.13	546	546	300	267	248	282	122	108	18,622	19,953
14	60428	P-425	J-24800	J-1099	114	157	Ductile Iron	16	296	300	297	301	0.012	0.18	546	546	300	304	248	244	108	106	19,953	20,110
15	58516	5214	J-1099	J-1100	118	180	Ductile Iron	16	300	303	301	305	0.012	0.19	546	546	304	308	244	241	106	105	20,110	20,290
16	58526	5220	J-1100	J-1104	118	223	Ductile Iron	16	303	293	305	294	0.012	0.19	546	546	308	297	241	251	105	109	20,290	20,513
17	58612	4429	J-1104	J-1044	120	626	Cast Iron	16	293	250	294	251	0.012	0.19	546	546	297	254	251	294	109	128	20,513	21,139

Cal Poly San Luis Obispo Water Supply Assessment and Wastewater Feasibility Modeling
Watearth, Inc.
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4/3/2019

TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 23 (City_PDD_FF_2035 CP_2030)

						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	1,220	736	Ductile Iron	24	537	530	539	532	0.012	0.87	547	547	542	535	8	15	4	7	0	736
2	60206	P-333	J-1102	J-24754	1,220	6,242	CCP	24	530	400	532	402	0.012	0.87	547	546	535	405	15	145	7	63	736	6,978
3	60209	P-335	J-24754	J-24755	1,219	1,073	CCP	24	400	370	402	372	0.012	0.86	546	546	405	375	144	174	63	76	6,978	8,051
4	60208	P-334	J-24755	_J-1139	1,068	3,587	CCP	24	370	323	372	325	0.012	0.76	546	546	375	328	174	221	76	96	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	1,063	2,322	PVC	24	323	290	325	292	0.012	0.75	546	545	328	295	221	254	96	110	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	988	338	PVC	24	290	290	292	292	0.012	0.70	545	545	295	295	253	253	110	110	13,960	14,298
7	60218	P-341	_J-24757	J-24758	82	1,262	PVC	24	290	279	292	281	0.012	0.06	545	545	295	284	253	265	110	115	14,298	15,560
8	60221	P-343	J-24758	J-24759	81	680	PVC	24	279	275	281	277	0.012	0.06	545	545	284	280	265	268	115	117	15,560	16,240
9	60220	P-342	J-24759	J-1074	67	633	PVC	24	275	267	277	269	0.012	0.05	545	545	280	272	268	276	117	120	16,240	16,873
10	58628	989	J-1074	J-1060	41	1,152	PVC	24	267	267	269	269	0.012	0.03	545	545	272	272	276	277	120	121	16,873	18,025
11	58528	3105	J-1060	J-1105	48	234	PVC	24	267	263	269	265	0.012	0.03	545	545	272	268	277	281	121	122	18,025	18,259
12	58569	998	J-1105	J-1124	66	363	Ductile Iron	16	263	262	264	264	0.012	0.11	545	545	267	267	281	282	122	122	18,259	18,622
13	60427	P-424	J-24800	J-1124	95	1,331	Ductile Iron	16	296	262	297	264	0.012	0.15	545	545	300	267	248	282	122	108	18,622	19,953
14	60428	P-425	J-24800	J-1099	127	157	Ductile Iron	16	296	300	297	301	0.012	0.20	545	545	300	304	248	244	108	106	19,953	20,110
15	58516	5214	J-1099	J-1100	131	180	Ductile Iron	16	300	303	301	305	0.012	0.21	545	545	304	308	244	241	106	105	20,110	20,290
16	58526	5220	J-1100	J-1104	132	223	Ductile Iron	16	303	293	305	294	0.012	0.21	545	545	308	297	241	251	105	109	20,290	20,513
17	58612	4429	J-1104	J-1044	133	626	Cast Iron	16	293	250	294	251	0.012	0.21	545	545	297	254	251	294	109	128	20,513	21,139

Cal Poly San Luis Obispo Water Supply Assessment and Wastewater Feasibility Modeling
Watearth, Inc.
Job No. 2018.0314.1-CA
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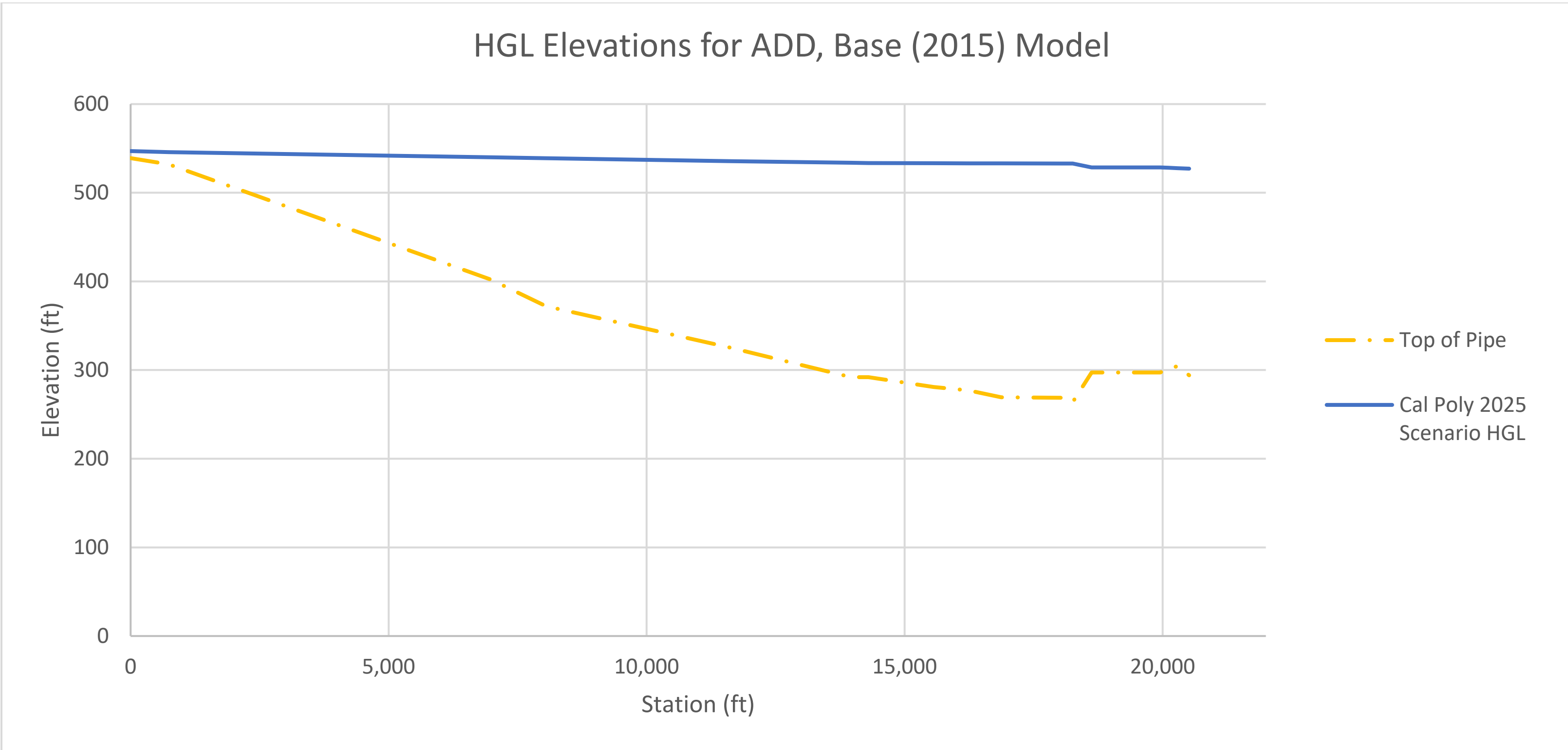
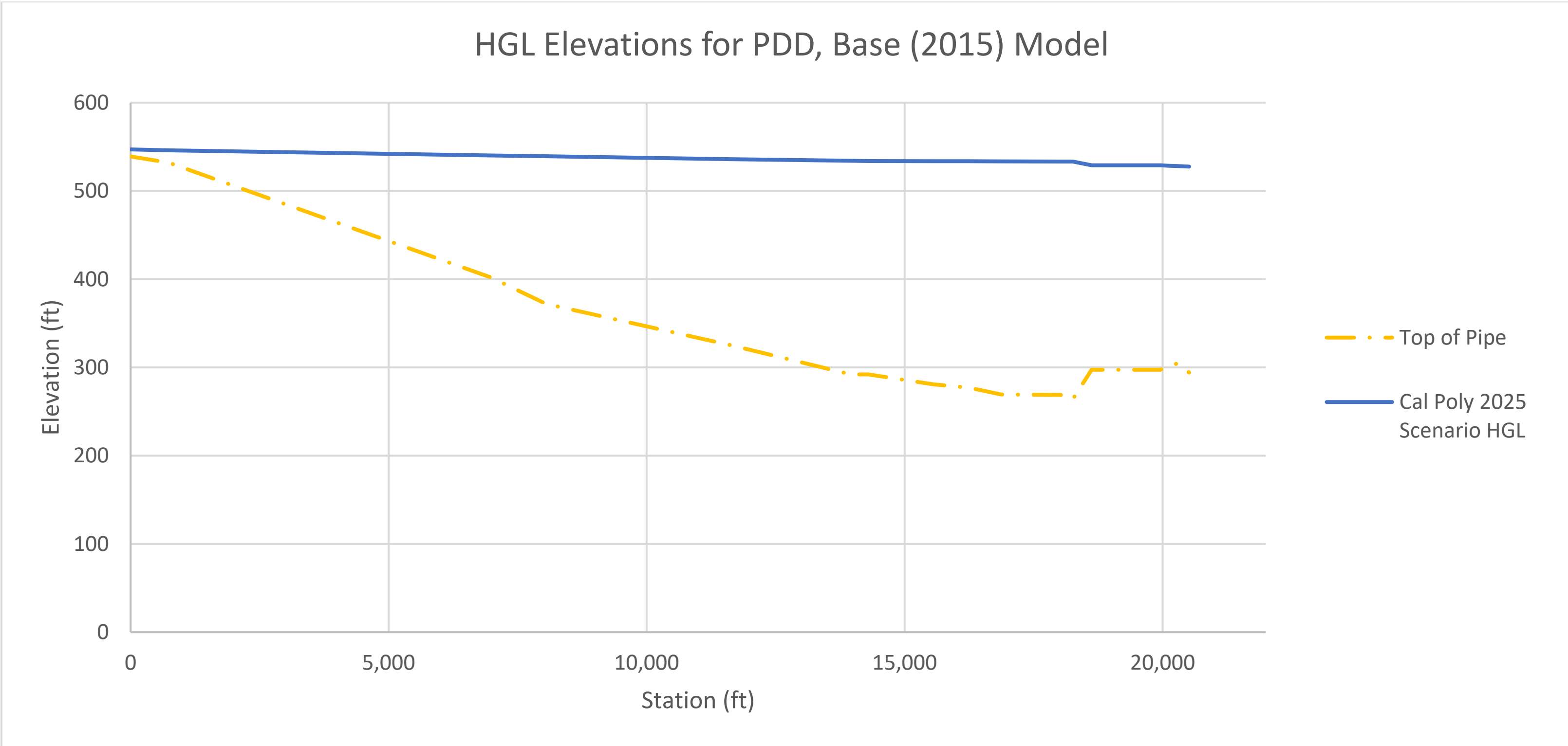
TABLE: DETAILED SEWERCAD MODELING RESULTS MODEL RUN 24 (City_PDD_FF_2035 CP_2035)

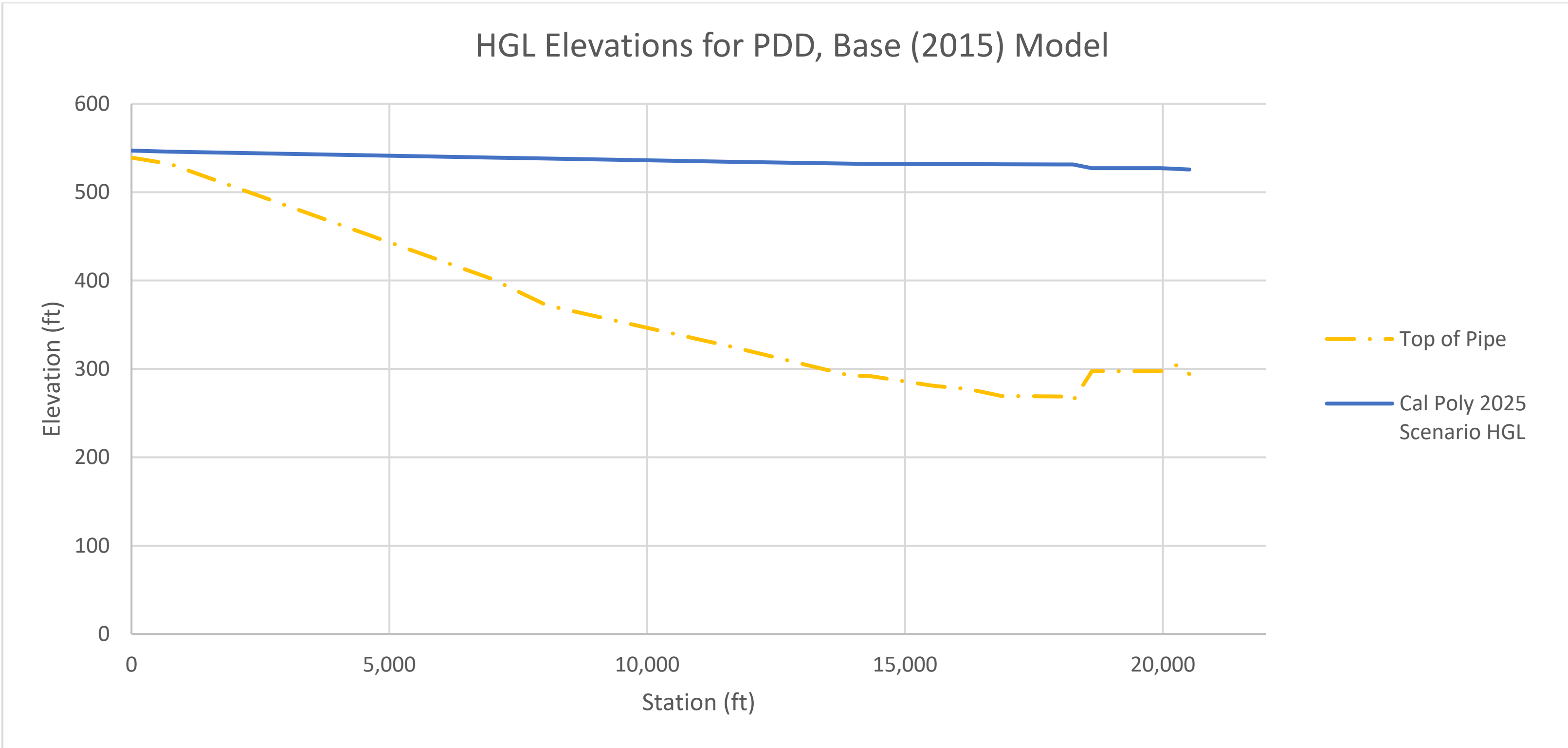
						Pipe Data									Elevations (ft)									
Link	ID	Link Name	US Node	DS Node	Total Flow (gpm)	Length (ft)	Material	Diameter (in)	US Invert (ft)	DS Invert (ft)	US Top of Pipe (ft)	DS Top of Pipe (ft)	n-Value	Velocity (fps)	US Hydraulic Grade Line	DS Hydraulic Grade Line	US Natural Ground	DS Natural Ground	US HGL Above Top of Pipe (ft)	DS HGL Above Top of Pipe (ft)	US Pressure (psi)	DS Pressure (psi)	Starting Station (ft)	Ending Station (ft)
1	58613	6660	Reservoir 2	J-1102	1,315	736	Ductile Iron	24	537	530	539	532	0.012	0.93	547	547	542	535	8	15	4	7	0	736
2	60206	P-333	J-1102	J-24754	1,315	6,242	CCP	24	530	400	532	402	0.012	0.93	547	546	535	405	15	145	7	63	736	6,978
3	60209	P-335	J-24754	J-24755	1,314	1,073	CCP	24	400	370	402	372	0.012	0.93	546	546	405	375	144	174	63	76	6,978	8,051
4	60208	P-334	J-24755	_J-1139	1,157	3,587	CCP	24	370	323	372	325	0.012	0.82	546	545	375	328	174	221	76	96	8,051	11,638
5	60212	P-337	_J-1139	_J-24756	1,152	2,322	PVC	24	323	290	325	292	0.012	0.82	545	545	328	295	220	253	96	110	11,638	13,960
6	60215	P-339	_J-24756	_J-24757	1,077	338	PVC	24	290	290	292	292	0.012	0.76	545	545	295	295	253	253	110	110	13,960	14,298
7	60218	P-341	_J-24757	J-24758	55	1,262	PVC	24	290	279	292	281	0.012	0.04	545	545	295	284	253	264	110	115	14,298	15,560
8	60221	P-343	J-24758	J-24759	53	680	PVC	24	279	275	281	277	0.012	0.04	545	545	284	280	264	268	115	117	15,560	16,240
9	60220	P-342	J-24759	J-1074	39	633	PVC	24	275	267	277	269	0.012	0.03	545	545	280	272	268	276	117	120	16,240	16,873
10	58628	989	J-1074	J-1060	20	1,152	PVC	24	267	267	269	269	0.012	0.01	545	545	272	272	276	276	120	120	16,873	18,025
11	58528	3105	J-1060	J-1105	67	234	PVC	24	267	263	269	265	0.012	0.05	545	545	272	268	276	281	120	122	18,025	18,259
12	58569	998	J-1105	J-1124	85	363	Ductile Iron	16	263	262	264	264	0.012	0.14	545	545	267	267	281	281	122	122	18,259	18,622
13	60427	P-424	J-24800	J-1124	114	1,331	Ductile Iron	16	296	262	297	264	0.012	0.18	545	545	300	267	248	281	122	108	18,622	19,953
14	60428	P-425	J-24800	J-1099	148	157	Ductile Iron	16	296	300	297	301	0.012	0.24	545	545	300	304	248	244	108	106	19,953	20,110
15	58516	5214	J-1099	J-1100	152	180	Ductile Iron	16	300	303	301	305	0.012	0.24	545	545	304	308	244	241	106	105	20,110	20,290
16	58526	5220	J-1100	J-1104	153	223	Ductile Iron	16	303	293	305	294	0.012	0.24	545	545	308	297	241	251	105	109	20,290	20,513
17	58612	4429	J-1104	J-1044	154	626	Cast Iron	16	293	250	294	251	0.012	0.25	545	545	297	254	251	294	109	128	20,513	21,139

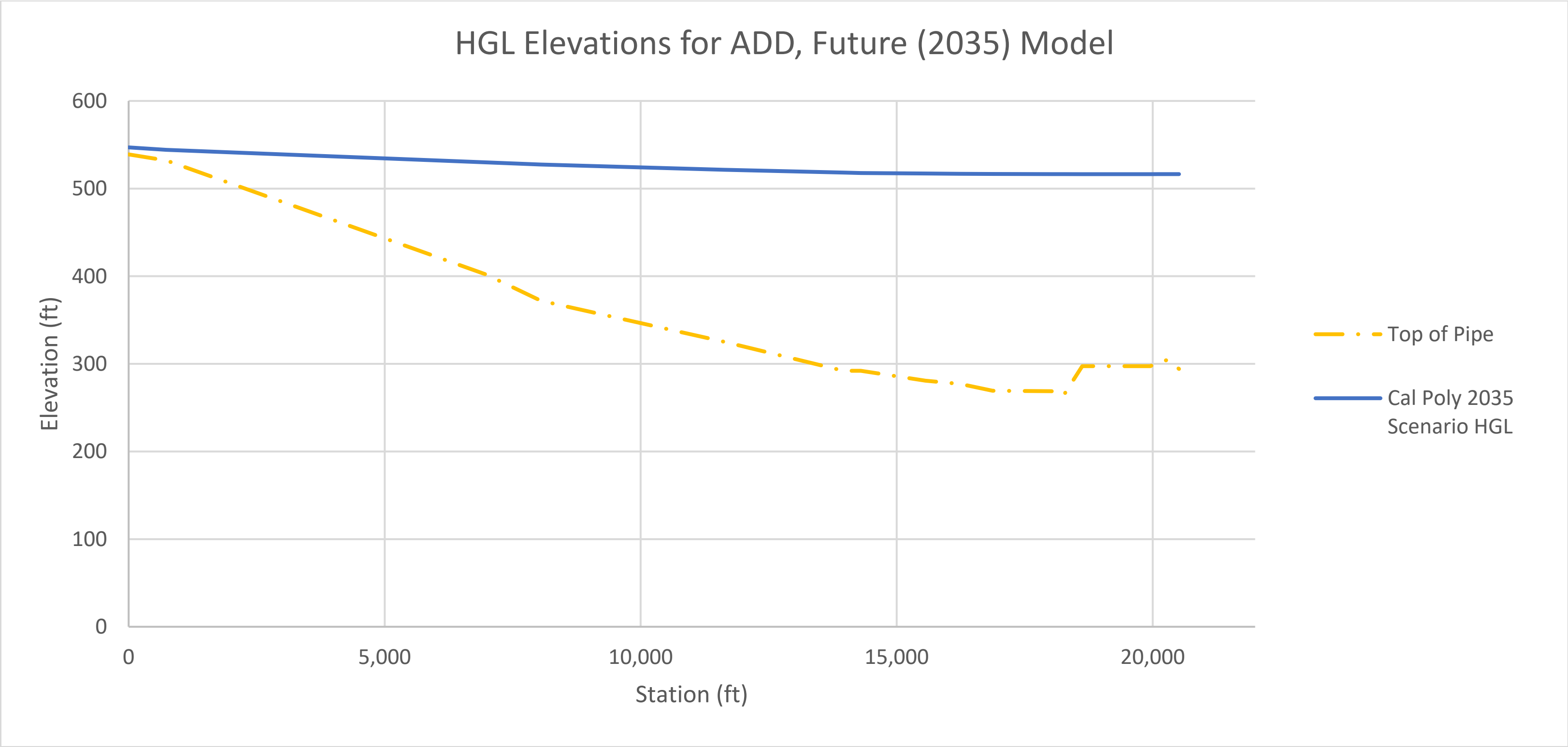


HGL Elevations for ADD, Base (2015) Model
600
500
400
300
200
100
0
Elevation (ft)
0
5,000
10,000
15,000
20,000
Station (ft)
Top of Pipe
Cal Poly 2025 Scenario HGL

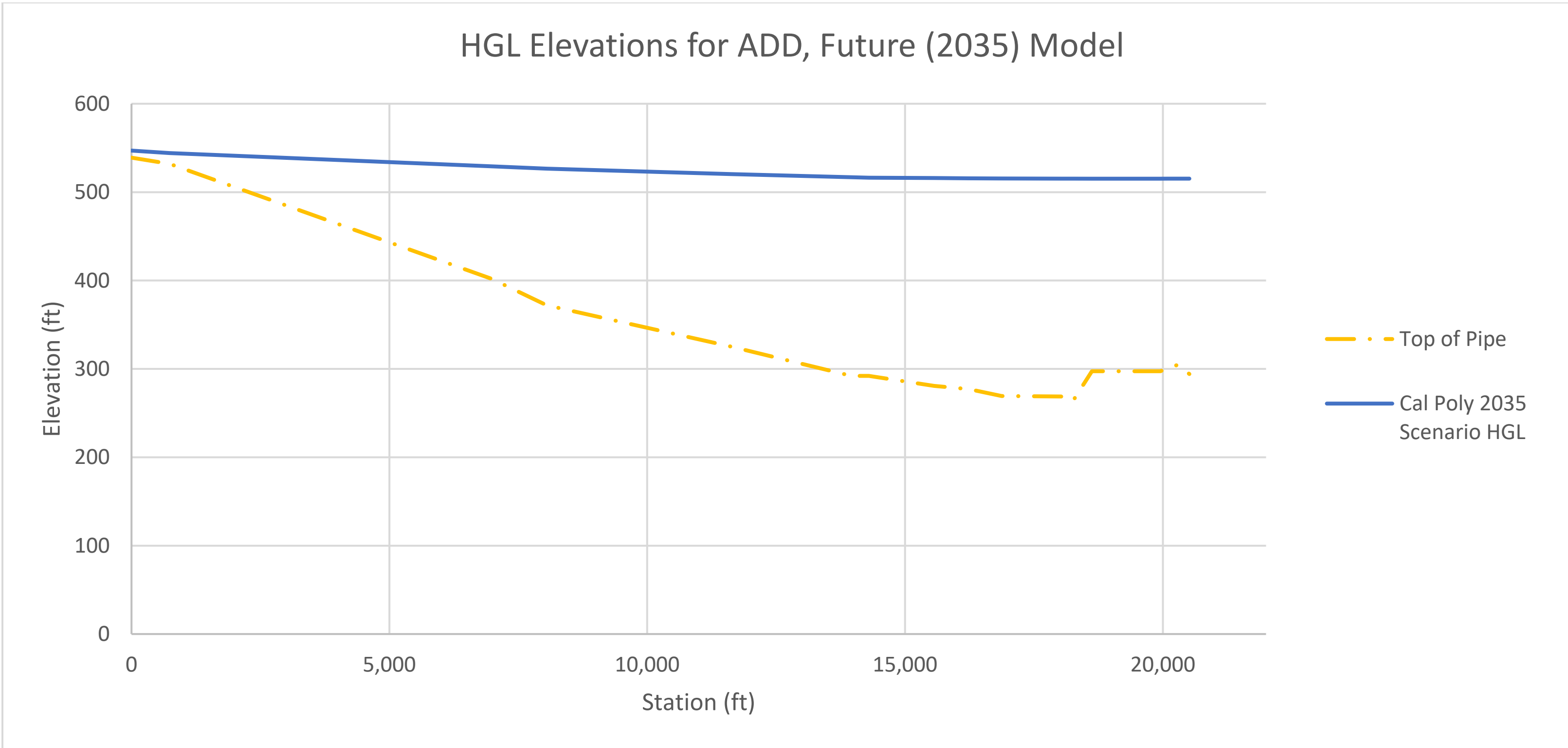


HGL Elevations for PDD, Base (2015) Model
600
500
400
300
200
100
0
Elevation (ft)
0
5,000
10,000
15,000
20,000
Station (ft)
Top of Pipe
Cal Poly 2025 Scenario HGL

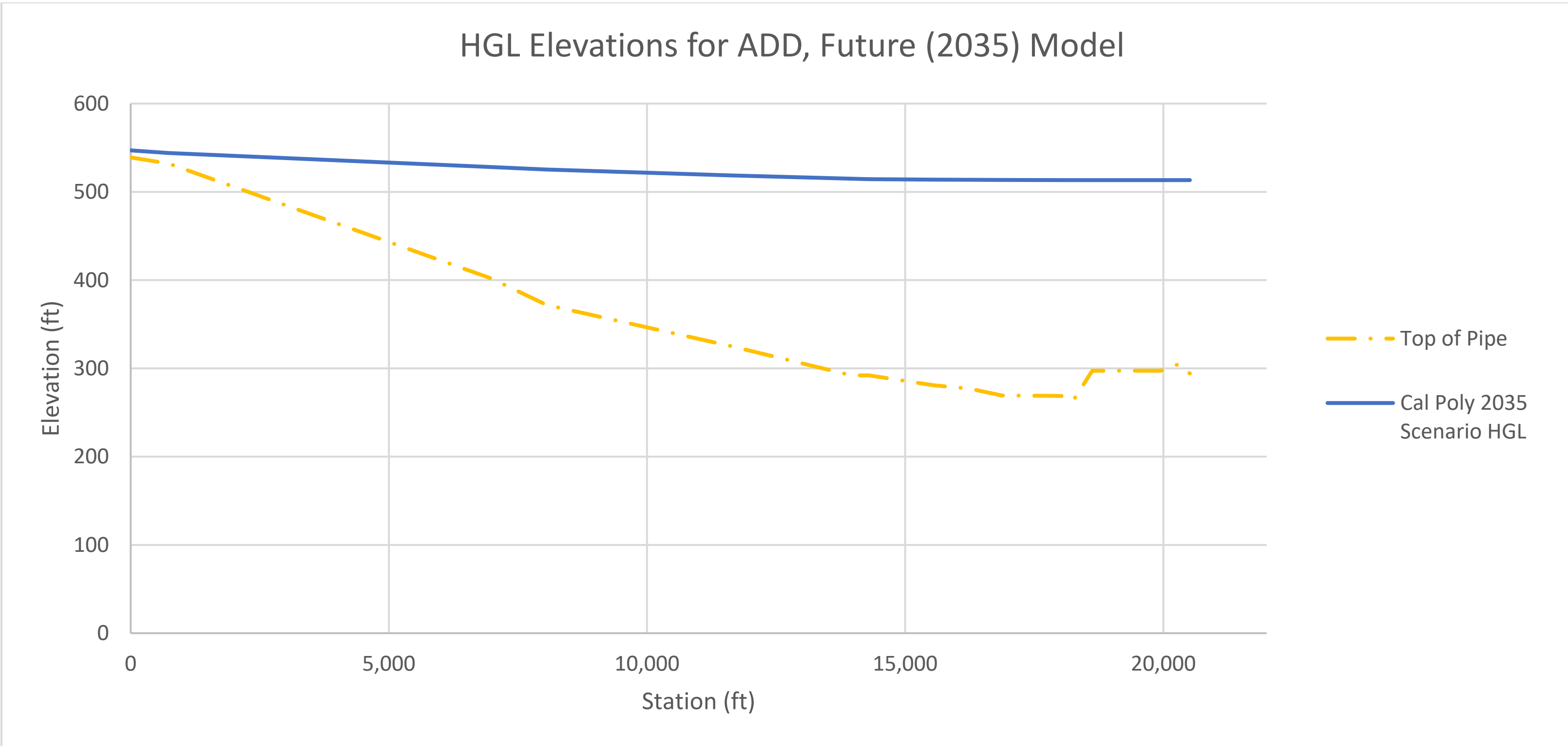

HGL Elevations for PDD, Base (2015) Model
600
500
400
300
200
100
0
Elevation (ft)
0
5,000
10,000
15,000
20,000
Station (ft)
Top of Pipe
Cal Poly 2025 Scenario HGL



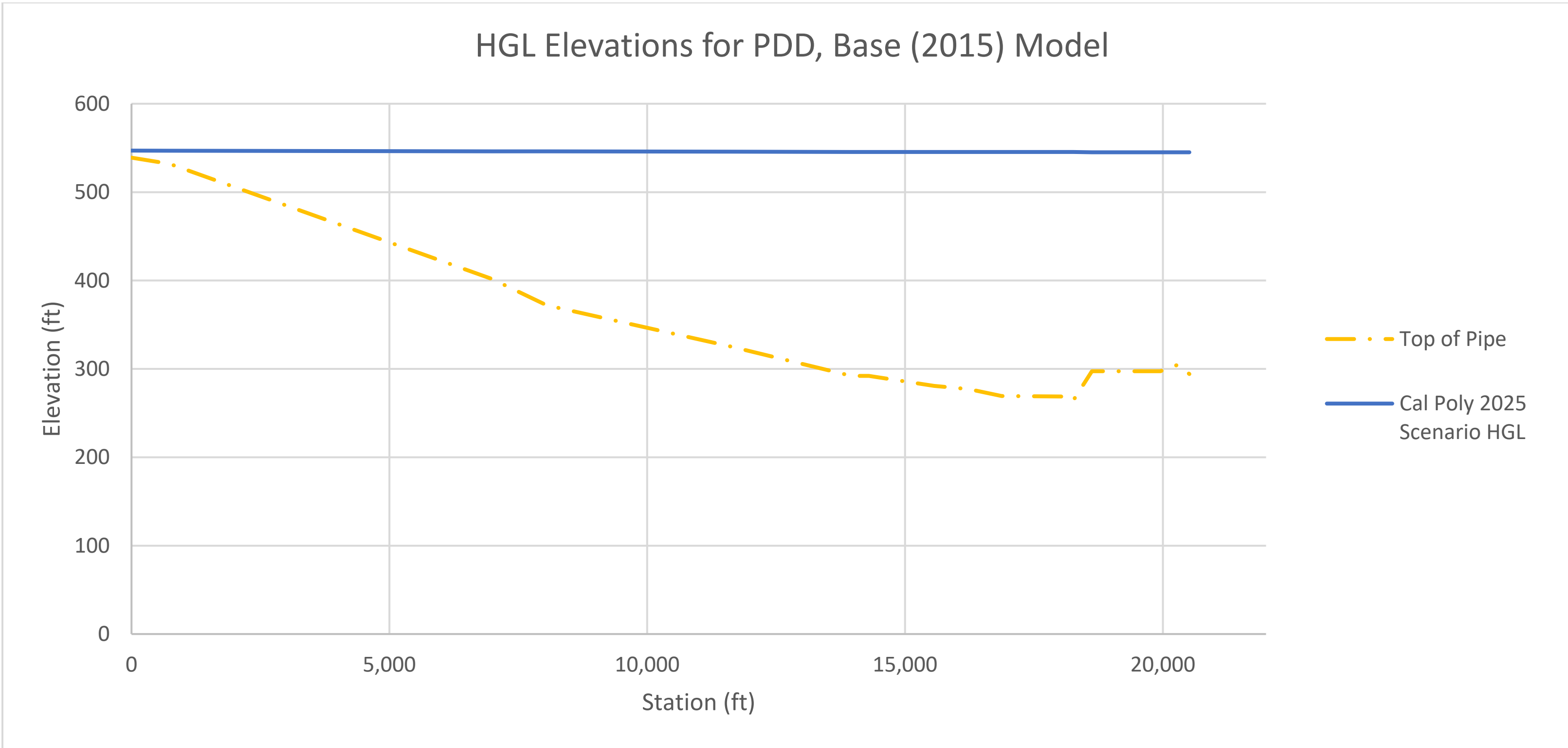
HGL Elevations for ADD, Future (2035) Model
600
500
400
300
200
100
0
Elevation (ft)
0
5,000
10,000
15,000
20,000
Station (ft)
Top of Pipe
Cal Poly 2035 Scenario HGL

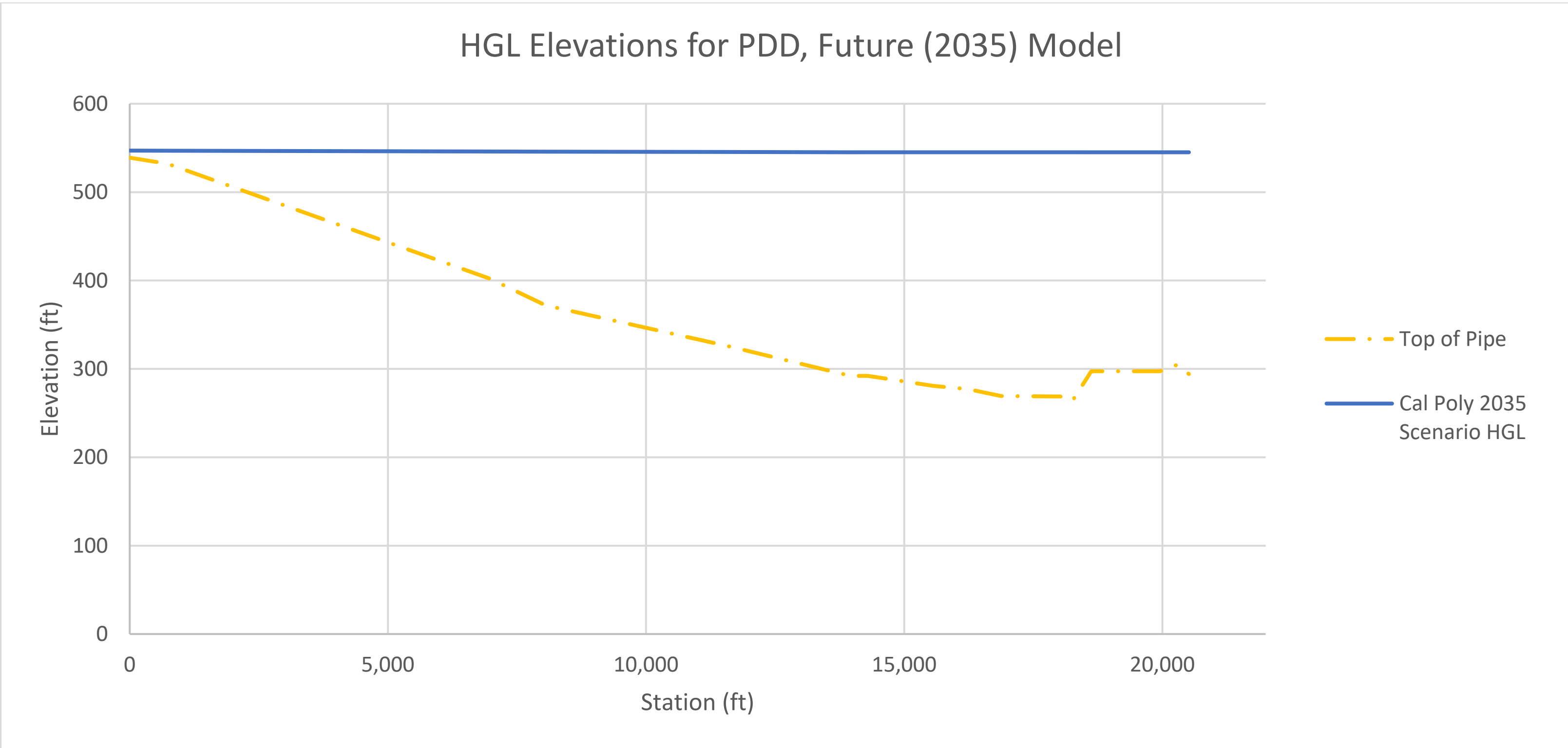


HGL Elevations for ADD, Future (2035) Model
600
500
400
300
200
100
0
Elevation (ft)
0
5,000
10,000
15,000
20,000
Station (ft)
Top of Pipe
Cal Poly 2035 Scenario HGL



HGL Elevations for ADD, Future (2035) Model
600
500
400
300
200
100
0
Elevation (ft)
0
5,000
10,000
15,000
20,000
Station (ft)
Top of Pipe
Cal Poly 2035 Scenario HGL


HGL Elevations for PDD, Base (2015) Model
600
500
400
300
200
100
0
Elevation (ft)
0
5,000
10,000
15,000
20,000
Station (ft)
Top of Pipe
Cal Poly 2025 Scenario HGL



HGL Elevations for PDD, Future (2035) Model
600
500
400
300
200
100
0
Elevation (ft)
0
5,000
10,000
15,000
20,000
Station (ft)
Top of Pipe
Cal Poly 2035 Scenario HGL