Appendix G

Placer Ranch Specific Plan
Recycled Water Master Plan

PR PLACER RANCH
SPECIFIC PLAN

Recycled Water Master Plan

May 19, 2017

FINAL

Prepared for

Placer County
Community Development Resource Agency
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Placer Ranch Specific Plan
Recycled Water Master Plan

May 19, 2017

Prepared for

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SECTION 1 – INTRODUCTION

This Placer Ranch Recycled Water Master Plan (Master Plan) was prepared by HydroScience Engineers (HydroScience) for Mackay and Somps Civil Engineers, Inc. (Mackay and Somps) in support of the Placer Ranch development. This section summarizes the purpose, background, and scope for this Master Plan.

1.1 Purpose

This document will provide an evaluation of methods to supply and distribute recycled water to the Placer Ranch Specific Plan (Placer Ranch) located in Placer County, CA. The purpose of the Master Plan is to:

- Develop a demand summary for recycled water uses within Placer Ranch;
- Identify the required recycled water infrastructure to serve Placer Ranch with recycled water; and
- Determine oversizing requirements for pipelines within Placer Ranch to supply demands in the Sunset Industrial Area outside of Placer Ranch

1.2 Background

Placer Ranch is a 2,213± acre project located in unincorporated Placer County and the Sunset Industrial Area, south of the Western Regional Sanitary Landfill (WRSL), east of the Amoruso Ranch Specific Plan, and north of the City of Roseville's city limits. It is expected that the Placer Ranch development will be developed within the jurisdiction of Placer County. A map showing Placer Ranch and the vicinity is provided as **Figure 1-1**.

Placer Ranch is classified as a mixed-use development that includes various land use types including low, medium, and high-density residential housing, commercial areas, light industrial, schools, parks, open space, and satellite campus's for both the California State University, Sacramento and Sierra College. The Placer Ranch property is currently undeveloped rolling grassland and agricultural lands. The area has topographical elevations ranging from 90 to 145 ft., and generally slopes from east to west. The proposed land use plan for Placer Ranch, dated June 24, 2016, is shown in **Figure 1-2.**

The City of Roseville, who currently treats and produces recycled water at their two wastewater treatment plants, has stated that they will wholesale recycled water to another entity to retail to Placer Ranch. However, this is not a commitment or a will-serve letter from the City of Roseville, and the City and retailer will have to confirm the availability of recycled water, design details, delivery pressures, diurnal supply availability, and other considerations at the time the project is being designed. For the purpose of this document, it is assumed that all recycled water to Placer Ranch originates from the City of Roseville.

The recycled water retailer is expected to either be the Placer County Water Agency or Placer County. Coordination by the retailer with the City of Roseville will be required to finalize delivery pressures and delivery periods so as to not impact current recycled water customers.

It is anticipated that the existing City of Roseville North Zone Tank and Pump Station will supply recycled water to a storage tank at Placer Ranch at a nominal pressure during off-peak periods, which are typically between 6:00 am and 9:00 pm. The Placer Ranch Pump Station will pump out of the Placer Ranch Storage Tank to provide recycled water to customers within Placer Ranch and other portions of the Sunset Industrial Area.

1.3 Existing Documents

Several documents about the existing recycled water distribution systems and calculations of water demands were utilized in the development of the Placer Ranch RWMP. These documents included the following:

Placer County Water Agency (PCWA) 2015 Urban Water Management Plan (UWMP), adopted June 2, 2016 (June 2016): PCWA prepared the UWMP to comply with the Urban Water Management Planning Act to meet the water supply demands over the next 30 years. This plan provided the normal year reference crop evapotranspiration rate and precipitation rates to determine the irrigation demand.

South Placer Regional Wastewater and Recycled Water Systems Evaluation (June 2007 and various 2008 updates): This document, a regional planning update of the City's wastewater and recycled water system identified the current and buildout wastewater and recycled water flow projections. Within this document are technical memoranda (TMs) that provide more detailed information about their subject matter. This document is referred to in this text as RMC, 2007.

Placer Ranch Specific Plan – University Water Demand Estimate (July 2016): This document estimates the overall water demand for the proposed University to be located on the Placer Ranch Specific Plan. Using this method, the University's projected total, potable, and recycled water demand were recalculated and are shown in **Table 3-1**.

1.4 Report Organization

This Master Plan provides a description of the recycled water supply options and facilities required for Placer Ranch. The sections contained in this report are:

- Section 1 – Introduction
- Section 2 – Planning and Modeling Criteria
- Section 3 – Recycled Water Customers and Demands
- Section 4 – Recycled Water Supply
- Section 5 – Results and Recommendations
- Section 6 – References
- Appendices

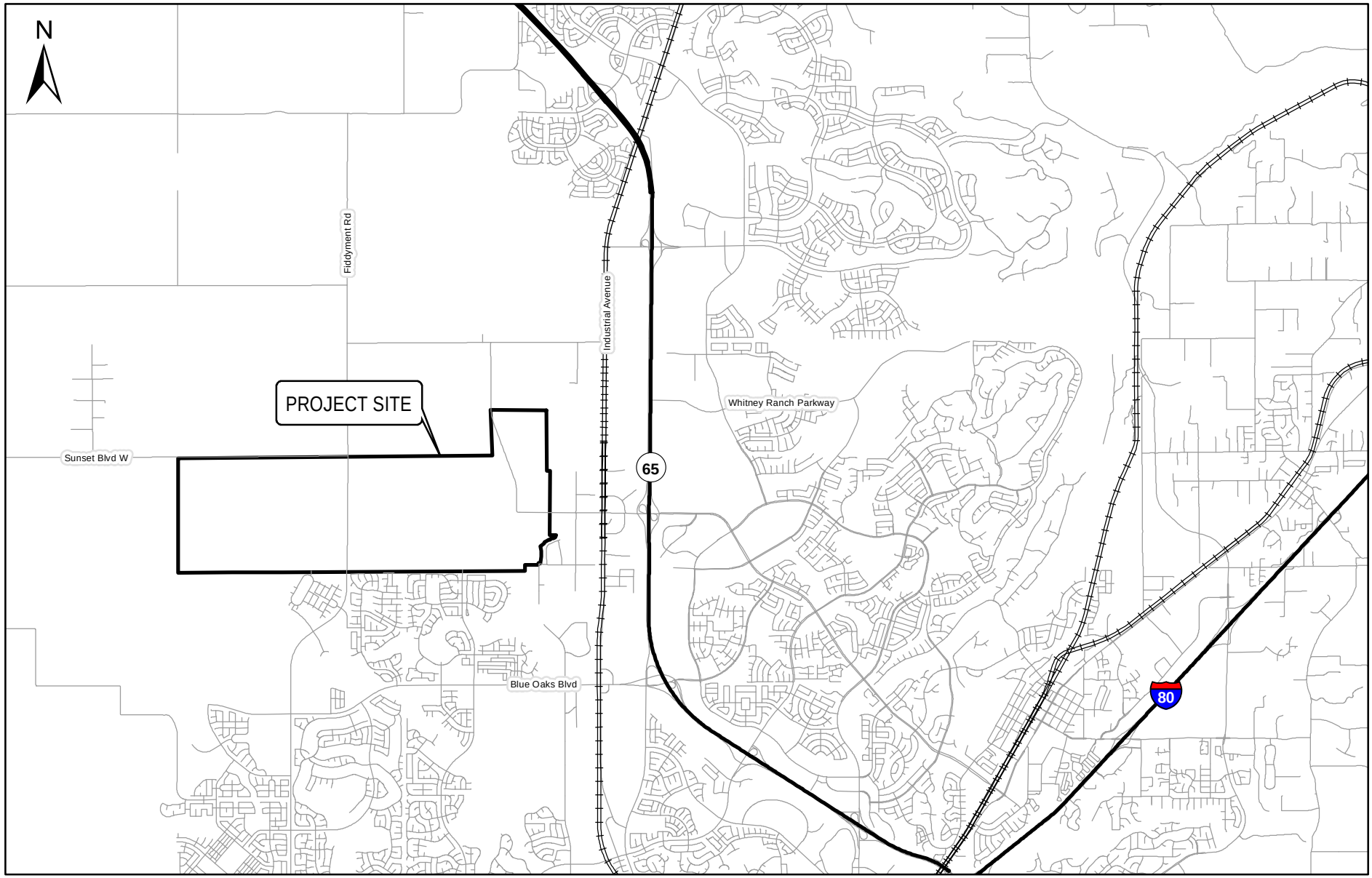

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FIGURE 1-1
MACKAY & SOMPS CIVIL ENGINEERS, INC.
PLACER RANCH RECYCLED WATER MASTER PLAN
PROJECT LOCATION MAP

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FIGURE 1-2
MACKAY & SOMPS CIVIL ENGINEERS
PLACER RANCH RECYCLED WATER MASTER PLAN
PLACER RANCH LAND USE PLAN

SECTION 2 – PLANNING AND MODELING CRITERIA

This section presents planning and modeling criteria and assumptions used to develop the recycled water demands.

2.1 Planning Criteria

The primary planning criteria to determine recycled water demands per acre of irrigated area are evapotranspiration (ET) rates and precipitation. Previous studies [(HydroScience, 2011) and (HydroScience, 2009)] have estimated standard evapotranspiration rates and rainfall for the County. A summary of how these criteria are used is included below.

ET Rates: ET is a measure of water usage by a particular plant or crop, and is a function of the net solar radiation, air temperature, wind speed, and vapor pressure in a particular location. Evapotranspiration rates for a specific crop in a specific location are calculated on a monthly basis by the following equation:

$$ET = ET_o * k_c$$

where:

ET_0 = *Normal year reference crop evapotranspiration rate for a given geographic location [California Department of Water Resources (DWR), California Irrigation Management Information System (CIMIS) database]*

k_c = *Crop coefficient for a given crop (University of California – Cooperative Extension, California Turfgrass Culture Leaflet)*

For this study, reference crop normal year evapotranspiration rates (ET_0) for the PCWA service area were obtained from the DWR CIMIS database at Fair Oaks Station 131 during 1998-2015 as provided in the PCWA 2015 UWMP, adopted June 2, 2016 (2016). Crop coefficients for cool weather turf grasses were obtained from the California Turfgrass Culture leaflet (University of California, 1997). Calculated ET rates and irrigation demands are shown in **Table 2-1**.

Precipitation: Monthly precipitation data for the Placer Ranch area was obtained from the Western Regional Climate Center (WRCC) at Rocklin, CA (Station 047516) from 1971-2000 as provided in the PCWA 2015 UWMP, adopted June 2, 2016 (2016).

Estimated Unit Irrigation Demands: Typical monthly unit irrigation demands for turf grasses are summarized in **Table 2-1** and were calculated using the following formula:

$$ID = \frac{(ET - Pe_p)l_r}{e_i}$$

where:

ID = *Irrigation demand in inches*

ET = *Evapotranspiration for turf grasses in the County*

P = *Average precipitation, DWR*

e_p = *Precipitation irrigation efficiency, 0.8. Assumes 20% of rainfall during growing season is lost to evaporation, runoff, etc.*

l_r = *Loss Rate, equal to 1.1. This assumes that approximately 10% of the applied water passes through the grass root zone and is lost.*

e_i = *Irrigation efficiency, equal to 0.8 - 0.9 depending on season. This assumes that 10 – 20% of the applied irrigation water is lost to the environment.*

Table 2-1: Typical Irrigation Demands for Placer Ranch Turf Grasses

Month	ET (Inches)	P (Inches)	ID (Inches)	ID (Feet)
January	1.12	3.65	0.00	0.00
February	1.70	3.09	0.00	0.00
March	3.29	2.89	0.41	0.03
April	4.49	1.56	3.03	0.25
May	6.36	0.29	6.29	0.52
June	7.40	0.26	7.39	0.62
July	7.95	0.31	7.91	0.66
August	7.05	0.05	7.25	0.60
September	5.17	0.37	4.97	0.41
October	3.37	1.83	1.60	0.13
November	1.63	3.84	0.00	0.00
December	1.05	3.21	0.00	0.00
Average			3.24	0.27
Total	**50.58**	**21.35**	**38.85**	**3.24**

As shown in **Table 2-1,** the total annual unit irrigation demand for grasses is estimated at 38.85 inches. A peak monthly irrigation demand of 7.91 inches is projected for July. The irrigation demand for a winter month is assumed to never fall below zero. For months during which the irrigation demand is positive, additional water is applied from the irrigation system. The typical season for irrigation demands stretches between April and October, with a small amount of irrigation necessary in March. No irrigation demands are projected between November and February.

2.2 Distribution System Modeling

The Placer Ranch recycled water hydraulic modeling was conducted using InfoWater by Innovyze, Inc. The Placer Ranch hydraulic model is a stand-alone model based on the land use plan identified in **Section 1.2**. Recycled water demands identified in **Section 3** were used to determine the required recycled water infrastructure.

A discussion of the modeling results is provided in **Section 4.**

2.3 Wholesaler/Retailer

The City of Roseville will serve as the recycled water wholesaler. Either Placer County or the Placer County Water Agency will serve as the recycled water retailer. It is expected that regardless of who serves as the recycled water retailer, Placer County and the City of Roseville will negotiate and execute a recycled water operations agreement per the Amended and Restated Agreement Regarding the Operation and Use of the South Placer Regional Wastewater Facilities dated October 1, 2012. This agreement is expected to be modeled similarly to other City agreements to provide recycled water outside of the City limits.

2.4 Modeling Criteria

To create and evaluate the Placer Ranch recycled water hydraulic model, a number of assumptions were required. These assumptions are summarized below:

Infrastructure criteria: The sizing of recycled water infrastructure requires modeling of recycled water use based on actual projected recycled water demands. Discussions with PCWA staff have indicated that this infrastructure will include the following requirements:

- Use of typical pipeline diameters, namely 6-inch, 8-inch, 12-inch, 18-inch, and 24-inches;
- All pipe velocities must remain below 5 ft/s;
- Provide recycled water storage equivalent to the peak day demand, plus a 20% factor of safety;
- Recycled water distribution system infrastructure was sized without including water conservation in case water conservation is not incorporated into the site design. This provides a significant factor of safety in case demands are higher than expected or additional demands are connected to the system.
- Construction of recycled water pumping facilities to maintain the minimum recycled water distribution system pressure for the July day demands; and
- The primary point of connection will be to connect to the existing City of Roseville recycled water distribution system at Woodcreek Oaks Boulevard. Optional future points of connection can be made to future recycled water pipeline(s) where the Placer Ranch Specific Plan meets the Amoruso Ranch Specific Plan, Sunset Industrial Area, and future extensions to the City of Lincoln from either Fiddyment Road or Foothills Boulevard.

Peak day demands: Peak day flows are estimated by applying peaking factors to calculated average day demands. Peak day flow rates account for seasonal variations in evapotranspiration rates. Based on the data shown in **Table 2-1**, the average monthly irrigation demand over the year is 3.24 inches. However, the peak monthly irrigation demand occurs in July and is 7.91 inches. Thus, the monthly peak demand factor is:

$$Factor = \frac{7.91\,in}{3.24\,in}$$

Peak Demand Factor = 2.44

It is assumed that peak day demand is essentially the same as peak monthly irrigation demand for facility planning purposes. This is reasonable because not all customers will be irrigating during the same period and the system is designed without accounting for recycled water conservation measures. It is further assumed that "true" peak day irrigation demand conditions (all customers irrigating on the same day) would rarely occur, and the cost of providing facilities to meet these demands is not justified. Therefore, a peak day demand factor of 2.44 times the average day demand is assumed.

Minimum Pressure: It is assumed that a minimum dynamic pressure during the peak hour of 60 psi would be maintained. This pressure set point was intended to eliminate the need to install booster pumps on individual recycled water services. The Placer Ranch recycled water distribution system was modeled using 60 psi as the target minimum pressure at the recycled water meter. Recycled water services also do not require backflow preventers to be installed, which further increases the pressure on the customer's side of the meter.

Since the SIA recycled water distribution system has not been conceptually laid out, HydroScience assumed that the minimum pressure at any node connecting to the SIA would be 70 psi. This would allow for some head losses and elevation change within the SIA recycled water distribution system, with the intent of having approximately 60 psi at each node. As the SIA distribution is further defined, the modeling for the SIA/Placer Ranch distribution system should be updated to reflect actual needs.

2.5 Summary of Assumptions

There are a number of assumptions built into the hydraulic model. These assumptions include:

- InfoWater software calculations, for this model, were based on the Hazen-Williams formula for pressure friction.
- The City of Roseville will wholesale recycled water to a retailer, and that retailer will be either Placer County or the Placer County Water Agency. One of those two agencies will retail recycled water within Placer Ranch and other portions of the Sunset Industrial Area.
- The total annual unit irrigation demand for grasses is estimated at 38.5 inches;
- All pipeline velocities must remain below 5 fps at the peak day flow;
- The minimum pressure in the Placer Ranch recycled water distribution system is 60 psi;
- The minimum pressure at the nodes connecting to the SIA will be 70 psi, with the intent of supplying 60 psi at each node in the future SIA recycled water distribution system;
- Pipeline diameters were limited to the nominal sizes that are typically available;
- A storage tank and pump station would be constructed within Placer Ranch. This new tank and pump station would receive recycled water from the City of Roseville during off peak periods, and in turn provide all of the storage and pumping required to reliably deliver recycled water to Placer Ranch and the SIA; and
- Tie-in to the City of Roseville's recycled water system will be at Woodcreek Oaks Blvd. Recycled water will be supplied by the City during off-peak hours at a minimum pressure of 20 psi.

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SECTION 3 – RECYCLED WATER CUSTOMERS AND DEMANDS

This section provides the market assessment for the recycled water customers and demands for the Placer Ranch land use plan. The demands are based on land use and associated acreage for each land use.

3.1 Market Assessment

Placer Ranch will use recycled water to irrigate all non-single family residential landscaping to maximize recycled water use. These land uses include all parks, paseos, streetscapes, schools, commercial, industrial, public facilities, campus park, and high-density residential land uses within Placer Ranch, as well as the University. Recycled water is not planned for irrigation use for single family parcels (LDR and MDR) due to the increased potential for cross-connection with the potable water system.

To estimate recycled water demands, HydroScience utilized the land use plan shown in **Figure 1-2**. HydroScience also determined the approximate percentage of irrigated area within each zoning area based on previous experience with other local recycled water projects. Non-irrigated areas were assumed to include hardscaped surfaces such as sidewalks, buildings, walkways, parking lots, and other non-irrigated areas. It was also assumed that the Placer Parkway was not irrigated. The streetscapes identified along other roads will be irrigated.

Table 3-1 contains a summary of the recycled water market assessment grouped by land use designation, and includes the percentage of each area irrigated with recycled water. These percentages were used to develop recycled water demands. The table shows the relative magnitude of the various customers within Placer Ranch that are likely to use recycled water both with and without the water conservation measures. A detailed breakdown of each individual site and demand is attached as **Appendix B**.

Recycled water will be supplied to all parcels with the exception of those parcels with LDR, LDR-A, or MDR land use designations. Combined, the other land use areas have an overall average annual recycled water demand of approximately 816 AFY, or 373 AFY with water conservation measures employed.

For a detailed breakdown of the individual water conservation measures proposed for Placer Ranch, and a summary of how the revised recycled water demands were calculated, the reader is referred to the Placer Ranch Water Conservation Plan (HydroScience, 2017). All recycled water infrastructure in Placer Ranch was sized without accounting for water conservation.

It is noted that the actual number of recycled water meter service connections may vary from the number of sites identified in the market assessment. This is due to variations in irrigation system design, the size of parcels, the phasing of construction, and/or the number of meters required.

Table 3-1: Recycled Water Market Assessment (Grouped by Land Use) – Placer Ranch

Land Use Designation		% Area Irrigated with Recycled Water	Total Area	Annual Demand[1]	Annual Demand with Water Cons.[1, 3]	Peak Day Demand[2]
			(Acres)	(AFY)	(AFY)	(MGD)
Low Density Residential	LDR	Not irrigated with recycled water	407.9	0	0	0
Low Density Residential – Age-Restricted	LDR-A	Not irrigated with recycled water	131.0	0	0	0
Medium Density Residential	MDR	Not irrigated with recycled water	132.3	0	0	0
High Density Residential	HDR	20%	93.0	60	33	0.07
General Commercial	GC	15%	25.6	12	6	0.01
Commercial Mixed Use	CMU	15%	48.8	24	11	0.02
Campus Park	CP	15%	395.5	192	87	0.19
University	UZ	24%	301.3	244	110	0.24
Public Facilities (Schools)	PF	40%	32.0	16	7	0.02
Public Facilities (County)	PF	15%	5.5	3	1	0.00
Parks and Recreation	PR	80%	72.6	188	85	0.18
Open Space Preserves	OS	0%	250.9	0	0	0.00
Placer Parkway	ROW	0%	158.5	0	0	0.00
Major Roadways & Landscape Corridors	ROW	15%	158.5	77	35	0.08
Total			**2,213.3**	**816**	**373**	**0.81**

Notes:
1. Annual recycled water demands were rounded off to the nearest AFY.
2. Peak day demand as shown accounts for water conservation, without water conservation the peak day demand is 1.78 MGD.
3. Additional information about how the water conservation demands were calculated in the Placer Ranch Water Conservation Plan (HydroScience, 2017).

3.2 Sunset Industrial Area Demands

Future demands for the Sunset Industrial Area were also included in the analysis based on demand calculations provided to HydroScience by PSOMAS on April 14, 2017. Demands for future SIA buildout were placed at nodes in the hydraulic model to ensure infrastructure is oversized to sufficiently supply the future SIA demands. The SIA demands and node locations and are as follows:

- Node J54 – Fiddyment Road, 327 AFY
- Node J128 – West of Fiddyment Road, 273 AFY
- Node J144 – Foothills Boulevard, 188 AFY
- Node J136 – Campus Park Boulevard at eastern border, 69 AFY
- Node J60 – Sunset Boulevard at eastern border, 78 AFY

Recycled water demands for the SIA total 935 AFY, while Placer Ranch demands total 816 AFY. It was noted that these demands do not include water conservation. Assuming that water conservation measures are employed in the other portions of the SIA similarly to Placer Ranch, the estimated max day demand in the rest of the SIA would total 427 AFY. The combined demand for Placer Ranch and the remainder of the SIA would total 800 AFY, or 2.09 MGD with a 20% factor of safety.

3.3 Supplemental Recycled Water Supply

Groundwater from an on-site well will be utilized as a supplemental recycled water supply should recycled water supplies be unavailable. The well would be located on or near Parcel PR-98 within the Placer Ranch Specific Plan. It is expected that the well capacity will exceed the Placer Ranch peak hour recycled water demand, and that the well will be connected to the recycled water storage tank via an air-gapped connection.

As stated in the Placer Ranch PWMP, this supplemental groundwater supply may also be hard plumbed to the potable water distribution system at the discretion of PCWA. This groundwater will have an air-gapped connection to the recycled water storage tank as required by California Title 17 standards.

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SECTION 4 – RECYCLED WATER SUPPLY

This section describes the methods that recycled water will be supplied to and distributed within Placer Ranch.

4.1 Recycled Water Distribution System

Distribution system pipelines were located primarily in proposed roadways with nodes extending to any land uses with recycled water demands. Additional pipelines were extended the edge of the project for future service the SIA and surrounding areas. The intent of the distribution system layout was to meet all recycled water demands while minimizing pipe lengths and diameters and maintaining pipe velocities below 5 ft/s. Pipeline sizes within Placer Ranch were optimized through iterations of up- and downsizing until all pipelines and nodes met the modeling design criteria described in **Section 2.2**. To be conservative, pipeline sizing was implemented without accounting for water conservation.

Once the layout was configured to meet all recycled water demands, the Placer Ranch recycled water distribution system was evaluated to determine whether further infrastructure improvements would be necessary to supply recycled water to Placer Ranch. Modeling showed that the 24-inch recycled water pipeline in Woodcreek Oaks Blvd supplying recycled water to the project has velocity of 3.1 ft/s, well within City and County velocity design criteria when set to refill the tank during off hours at a minimum supply pressure of 20 psi.

The main transmission pipeline supplying recycled water to Placer Ranch enters at Woodcreek Oaks Blvd and continues north on Woodcreek Oaks Blvd, east on College Park Drive, and then south to the PR-98 tank and pump station parcel. The transmission pipeline will supply recycled water during off-peak hours to the recycled water storage tank located at Parcel PR-98. Within Parcel PR-98, a new recycled water tank and pump station will be constructed to pump recycled water to the Placer Ranch recycled water distribution system at pressure.

The Placer Ranch distribution system is primarily comprised of a 30-inch pipeline from the tank site to College Park Dr, then 24 inch pipelines in each direction of College Park Dr. From these points, pipelines down size as demands decrease moving further away from the pump station. The University and the eastern half of Placer Ranch are looped to provide reliability and redundancy. The western half of Placer Ranch is not looped due to the lack of recycled water demand along Sunset Blvd west of Fiddyment Rd, and is supplied by 18-inch and 12-inch pipelines located on Campus Park Blvd, Maple Park Drive, and an interior unnamed street and Paseo. Additional smaller pipelines will extend from the primary distribution system pipeline locations to individual land uses within Placer Ranch.

Figure 4-1 shows the proposed alignment for the Placer Ranch distribution system. All pressures and pipeline velocities remain within City standards. Pipeline sizes and pumping requirements were optimized to maintain a minimum pressure of 60 psi at all nodes and a maximum velocity of 5 ft/s within pipe sections.

A summary of the pipeline infrastructure associated with the Placer Ranch distribution system is provided as **Table 4-1.** The table includes the pipe sizes and the total lengths of each pipe size required for the system.

Table 4-1: Summary of Recycled Water Pipeline Infrastructure

Pipe Size (Diameter)	Pipeline Total Length Placer Ranch Only (ft.)[1]	Pipeline Total Length with SIA Demands (ft.)[1]
6-inch	8,100	6,500
8-inch	4,500	3,500
12-inch	9,700	6,000
18-inch	2,800	7,200
24-inch	300	3,800
30-inch	0	300
Total[2]	**25,400**	**27,300**

Notes:
1. Pipeline lengths were rounded to the nearest 100.
2. Total pipeline lengths are not equal due to extra pipelines added to extend system to the edge of the Placer Ranch Project boundary.

Construction of the recycled water distribution system will generally coincide with the Placer Ranch Phasing Plan (see **Appendix C**), but may require advance construction of select infrastructure elements. Output data for the Placer Ranch recycled water hydraulic model runs can be found in **Appendix A**.

4.2 Storage Tank and Pump Station

A recycled water storage tank and pump station will be located in Placer Ranch within Parcel PR-98. From this storage tank, recycled water will be pumped out to recycled water demands within Placer Ranch. It is understood that oversizing of some infrastructure may be desired to serve other land uses, such as the remaining areas of the Sunset Industrial Area, and to potentially interconnect the recycled water distribution system with the City of Lincoln.

The on-site storage tank will be designed to have one max day of capacity, plus a 20% factor of safety. This tank was sized both with and without being oversized to serve other SIA demands.

Without oversizing: At the estimated max day recycled water demand of 0.81 MGD, the required recycled water storage would be 0.98 MG. A 0.98 MG storage tank can come in a variety of configurations. At this volume, the Placer Ranch recycled water storage tank is conceptually being planned to have a diameter of 73 feet, an operating height of 32 feet, a hard plumbed connection to the City recycled water distribution system connected by an altitude valve, meter, and an air gapped connection from an on-site groundwater well.

With oversizing: At the estimated max day recycled water demand of 1.74 MGD, the required recycled water storage would be 2.09 MG. At this volume, the Placer Ranch recycled water storage tank is conceptually being planned to have a diameter of 110 feet, an operating height of 30 feet, a hard plumbed connection to the City recycled water distribution system connected by an altitude valve, and an air gapped connection from an on-site groundwater well.

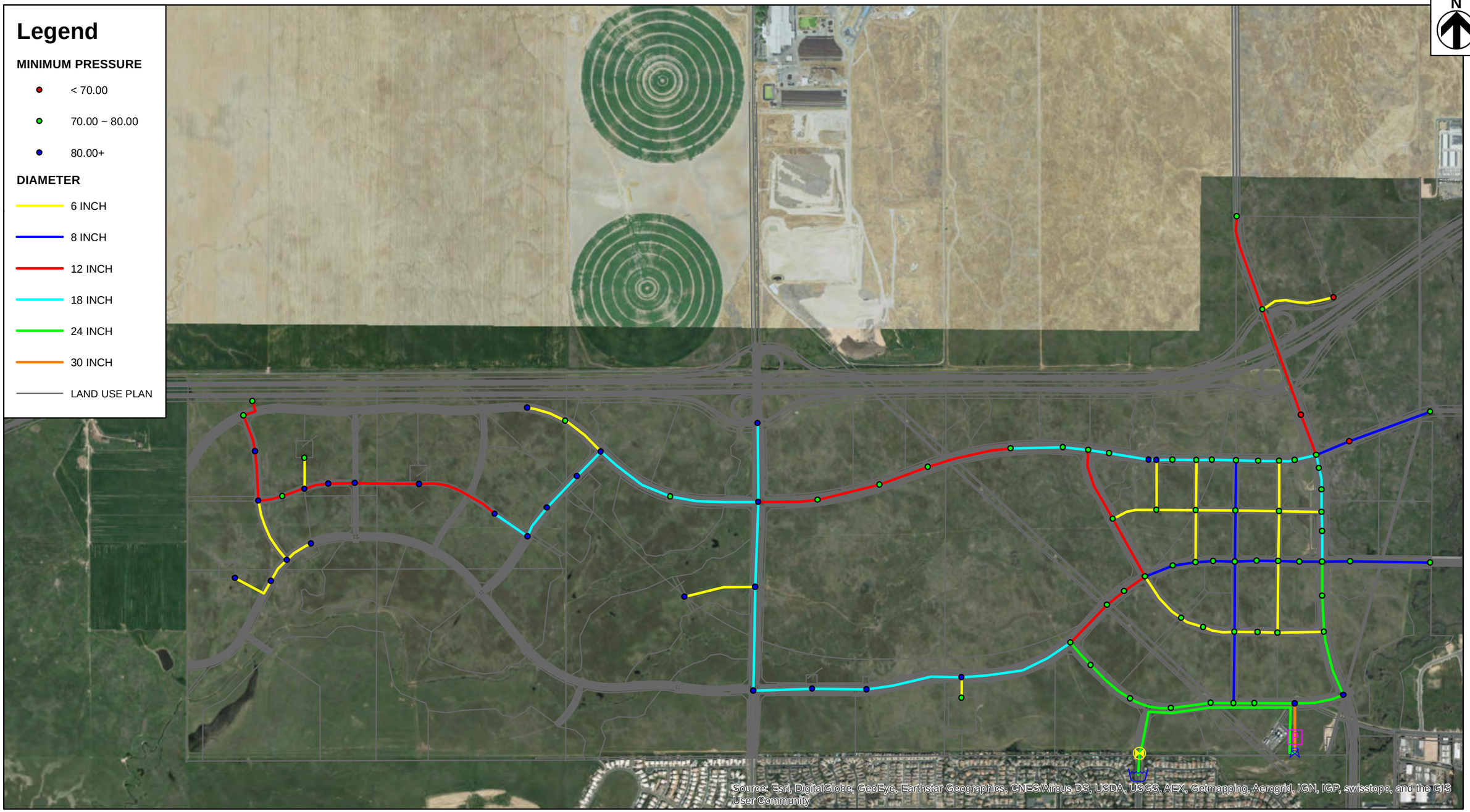

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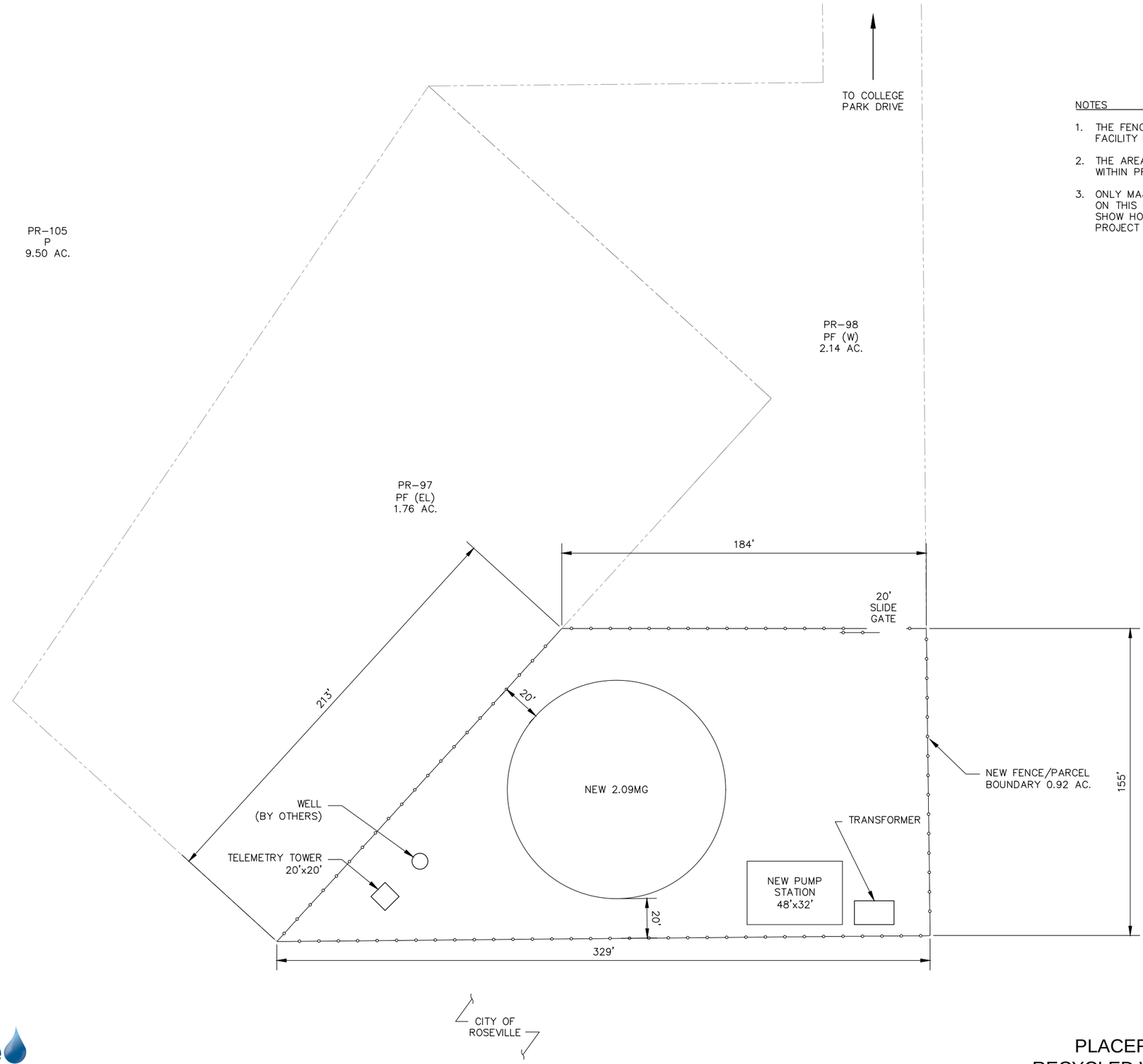
FIGURE 4-1
MACKAY AND SOMPS CIVIL ENGINEERS, INC.
PLACER RANCH RECYCLED WATER MASTER PLAN
RECYCLED WATER DISTRIBUTION SYSTEM



NOTES

1. THE FENCED IN AREA OF THE RECYCLED WATER FACILITY IS APPROXIMATELY 0.92 ACRE.
2. THE AREA NORTH OF THE NORTH FENCE LINE WITHIN PR-98 PARCEL IS 1.22 ACRES.
3. ONLY MAJOR ABOVEGROUND FEATURES ARE SHOWN ON THIS CONCEPTUAL SITE PLAN. THE INTENT IS TO SHOW HOW THE FACILITIES WOULD FIT WITHIN THE PROJECT SITE.

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FIGURE 4-2
MACKAY & SOMPS CIVIL ENGINEERS
PLACER RANCH RECYCLED WATER MASTER PLAN
RECYCLED WATER FACILITY - PRELIMINARY SITE PLAN

Coordination with the City of Roseville (wholesaler) will be required to finalize delivery pressures and delivery periods so as to not impact existing recycled water customers. It is anticipated that the existing north zone tank and pump station will supply recycled water to the Placer Ranch recycled water storage tank at a nominal pressure during off-peak periods, which are typically between 6:00 am and 9:00 pm . It is assumed that a new 18-inch (without oversizing) or 24-inch (with oversizing) recycled water pipeline will connect to the existing 24-inch recycled water pipeline terminus on Woodcreek Oaks Blvd, extend north on Woodcreek Oaks and west on College Park Drive to Parcel PR-98. This recycled water transmission pipeline will have no services off of it, and will only fill the Placer Ranch recycled water storage tank.

The Placer Ranch recycled water pump station must supply recycled water to Placer Ranch in accordance with the modeling criteria specified in **Section 2**. To supply these demands, this pump station must have a capacity of approximately 3,300 gpm and a total discharge head of approximately 145 ft without oversizing for the SIA, or 7,500 gpm at 170 TDH with oversizing for the SIA. The higher TDH requirement for the pump station when the SIA demands are added to the system both accounts for higher flow rates, but also to provide 70 psi at the boundary of the Placer Ranch project for supplying SIA demands. Once a distribution system for the SIA has been determined, it is recommended that this tie-in pressure be re-evaluated.

It is expected that the pump station facility will have four duty pumps and a standby pump. Two jockey pumps, one for reliability, should be designed into the pump station as well to convey lower flows during off-peak hours or seasonally when demands are lower. A preliminary site plan is provided as **Figure 4-2**.

4.3 Supply and Implementation

It should be noted that the recycled water supply for the project would be generated either at the Dry Creek or Pleasant Grove WWTPs, though the majority of the recycled water sources are assumed to be from the Dry Creek WWTP. This is because there is limited capacity to convey flows from the Pleasant Grove WWTP to the North Zone tank and pump station.

It is expected that there is ample capacity to wholesale recycled water to Placer Ranch for recycled water demands. Should additional reliability be required for the recycled water distribution system, the backup groundwater supply from the groundwater well located at PR-98 can be utilized.

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SECTION 5 – RESULTS AND RECOMMENDATIONS

This master plan identifies the requirements for and includes the following results and recommendations with respect to recycled water supply, operational storage and pumping, and recycled water infrastructure.

Placer Ranch may choose to design and construct the recycled water infrastructure to only serve Placer Ranch. Should this occur, a recycled water supply pipeline through Placer Ranch to the SIA would be required. This pipeline would fill a recycled water storage tank located within the SIA, and a separate pump station would pump out of that tank to a recycled water distribution system that would serve the SIA.

5.1 Recycled Water Supply and Demand

The following results and recommendations pertain to the recycled water supply and the Placer Ranch recycled water demand.

- **Recycled water supply:** Recycled water will be supplied by the wholesaler to the Placer Ranch recycled water storage tank during off-peak demand periods. Recycled water will be pumped out of the Placer Ranch recycled water storage tank by the on-site recycled water pump station and delivered to users within Placer Ranch at pressure. Should the recycled water supply be limited for any reason, groundwater from a well co-located at Parcel PR-98 with the recycled water storage tank and pump station will be supplied to the recycled water storage tank through an air-gapped connection.
- **Recycled water demand:** The intent of the recycled water system analysis was to maximize recycled water use through a semi-aggressive water use strategy. This strategy states that all non-potable uses of water for landscape irrigation of non-single family residences will be supplied with recycled water. Potential demands for the SIA may also be conveyed through Placer Ranch to the SIA.
- **Recycled water availability:** Since recycled water is being supplied by the wholesaler during off-peak periods, existing City of Roseville peak hour recycled water demands should not be affected, but additional coordination with the City of Roseville as well as the execution of a recycled water operations agreement per the Amended and Restated Agreement Regarding the Operation and Use of the South Placer Regional Wastewater Facilities dated October 1, 2012 will be required. Additionally, on-site recycled water storage will be 120% of one max day of demands, therefore it is expected that recycled water will be available from the wholesaler.

5.2 Operational Storage and Pumping

The following results and recommendations pertain to the operational storage and pumping requirements for Placer Ranch.

- **Construct a new recycled water storage tank:** A new recycled water storage tank will be constructed within Placer Ranch at Parcel PR-98. This storage tank will be designed to fill during off-peak periods and be drawn down during peak hour periods. This tank will have two supply pipelines – the primary supply is recycled water from the wholesaler,

and the backup supply is groundwater from a new on-site well. The size of the tank will depend on whether or not it is oversized to serve other portions of the SIA.

- **Construct a new recycled water pump station:** The new Placer Ranch Recycled Water Pump Station will pump out of the new Placer Ranch Recycled Water Storage Tank. The Placer Ranch recycled water pump station must be designed to supply the flow and TDH required for Placer Ranch and possibly other portions of the SIA.

5.3 Recycled Water Distribution

The following results and recommendations pertain to the distribution system designed to meet the recycled water demands and modeling criteria for Placer Ranch.

- **Distribution system:** Recycled water pipelines in Placer Ranch will be 6, 8, 12, 18, and 24-inches in diameter (30-inches with oversizing for SIA demands). Pipelines will be located either within the proposed streets or proposed paseos.
- **Modeling criteria:** All recycled water infrastructure was sized to meet the minimum 60 psi pressure requirement at every node (and 70 psi at SIA interties) and not exceed a 5 ft/s velocity during peak day within any on-site or off-site recycled water pipeline.

SECTION 6 – REFERENCES

1. HydroScience Engineers, Recycled Water Study for the West Roseville Specific Plan Area, May 2003 and updated 2004.
2. HydroScience Engineers, Placer Ranch Water Conservation Plan, May 2017.
3. MacKay & Somps Civil Engineers, Inc., Land Use Map - Placer, June 2016.
4. MacKay & Somps Civil Engineers, Inc., *Placer Ranch Sunset Industrial Area General Plan Land Use,* March 2015.
5. Placer County Water Agency, *2015 Urban Water Management Plan*, June 2016.
6. University of California – Cooperative Extension, California Turfgrass Culture: Using ET_0 (Reference Evapotranspiration) for Turfgrass Irrigation Efficiency, 1997.

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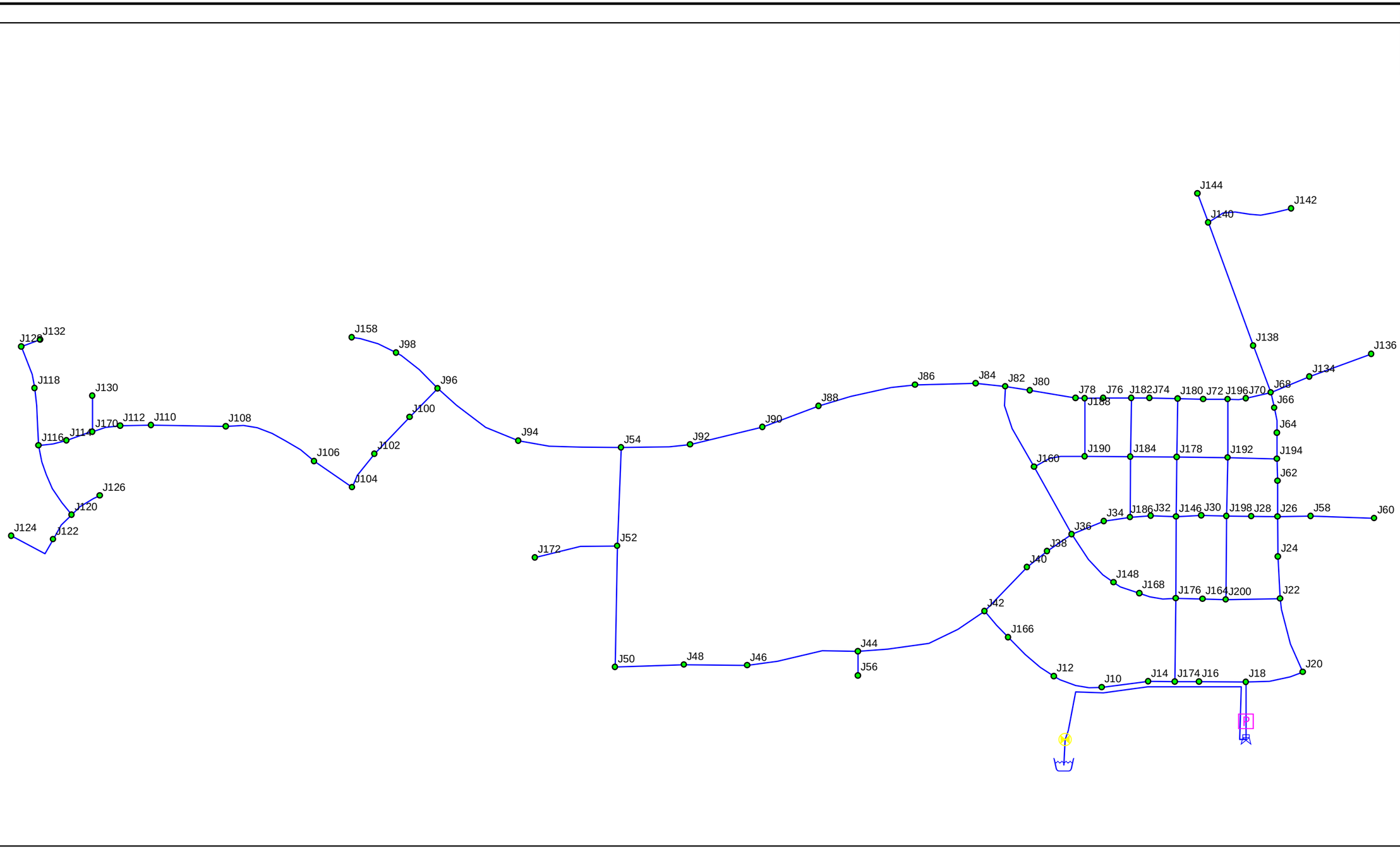
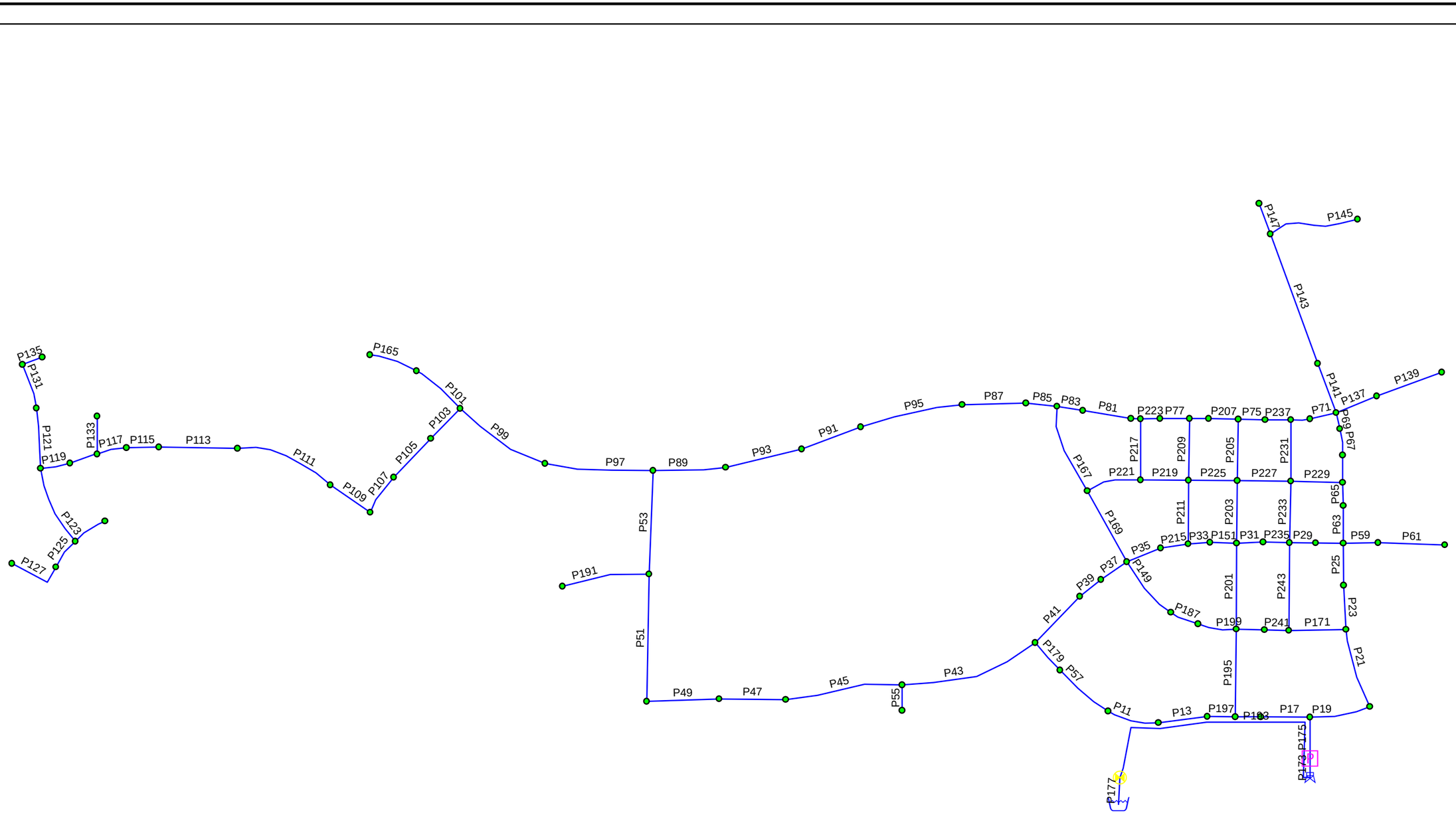
APPENDIX A

InfoWater Hydraulic Modeling Output Reports



APPENDIX A
MACKAY AND SOMPS CIVIL ENGINEERS, INC.
PLACER RANCH RECYCLED WATER MASTER PLAN
INFOWATER WATER MODEL - JUNCTION ID'S

HydroScience



HydroScience

APPENDIX A
MACKAY AND SOMPS CIVIL ENGINEERS, INC.
PLACER RANCH RECYCLED WATER MASTER PLAN
INFOWATER WATER MODEL - PIPE ID'S

PLACER RANCH RWMP - JUNCTION REPORT

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J10	3.87	118.00	300.46	79.06
J100	11.07	106.00	292.73	80.91
J102	30.51	103.00	292.55	82.13
J104	6.75	105.00	292.42	81.21
J106	45.63	106.00	292.27	80.71
J108	25.47	105.00	290.08	80.20
J110	3.87	93.00	288.47	84.70
J112	24.75	99.00	287.81	81.81
J114	98.91	103.00	286.67	79.58
J116	6.75	96.00	286.17	82.40
J118	7.47	92.00	285.22	83.72
J12	3.87	124.00	300.25	76.37
J120	3.87	95.00	286.13	82.82
J122	4.59	95.00	286.12	82.81
J124	16.11	97.00	286.11	81.94
J126	4.59	98.00	286.13	81.52
J128	25.47	100.00	284.50	79.94
J130	16.11	104.00	287.21	79.39
J132	1,166.44	104.00	284.07	78.02
J134	54.27	140.00	298.48	68.67
J136	385.53	134.00	297.02	70.64
J138	72.76	139.00	298.72	69.20
J14	31.59	119.00	300.65	78.71
J140	3.87	134.00	297.49	70.84
J142	55.71	136.00	297.35	69.91
J144	821.49	132.00	296.56	71.30
J146	3.87	130.00	299.63	73.50
J148	19.71	130.00	299.63	73.50
J158	66.64	105.00	290.86	80.54
J16	102.51	124.00	300.88	76.64
J160	3.87	119.00	299.06	78.02
J164	33.39	123.00	300.05	76.71
J166	3.87	119.00	300.01	78.43
J168	18.27	127.00	299.77	74.86
J170	3.87	102.00	287.22	80.26
J172	6.75	108.00	294.76	80.92
J174	0.00	127.00	300.77	75.29
J176	0.00	127.00	300.02	74.97
J178	0.00	131.00	299.37	72.95
J18	11.79	115.00	301.12	80.65
J180	0.00	128.00	299.10	74.14
J182	0.00	124.00	298.99	75.82
J184	0.00	125.00	299.21	75.49
J186	0.00	128.00	299.44	74.28
J188	0.00	114.00	298.88	80.11
J190	0.00	117.00	299.06	78.89
J192	0.00	124.00	299.57	76.07
J194	0.00	125.00	299.80	75.74
J196	0.00	131.00	299.19	72.88
J198	0.00	137.00	299.89	70.58

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J20	26.19	112.00	300.90	81.85
J200	0.00	122.00	300.11	77.17
J202	1,319.07	104.00	293.68	82.19
J22	3.87	126.00	300.61	75.66
J24	3.87	128.00	300.46	74.73
J26	3.87	129.00	300.32	74.23
J28	33.39	134.00	300.08	71.96
J30	24.75	138.00	299.74	70.08
J32	60.03	127.00	299.50	74.74
J34	54.99	125.00	299.42	75.58
J36	3.87	123.00	299.42	76.44
J38	25.47	122.00	299.52	76.92
J40	31.59	117.00	299.61	79.13
J42	210.04	116.00	299.86	79.67
J44	3.87	110.00	298.44	81.65
J46	4.59	104.00	297.30	83.76
J48	4.59	105.00	296.67	83.05
J50	3.87	103.00	295.97	83.62
J52	240.28	107.00	294.76	81.36
J54	3.87	104.00	293.93	82.30
J56	45.63	114.00	298.41	79.91
J58	29.79	123.00	299.87	76.64
J60	345.15	123.00	298.76	76.16
J62	18.27	124.00	300.00	76.26
J64	31.23	129.00	299.59	73.92
J66	3.87	134.00	299.38	71.66
J68	3.87	134.00	299.26	71.61
J70	18.27	130.00	299.22	73.32
J72	24.75	130.00	299.15	73.29
J74	68.67	126.00	299.03	74.97
J76	18.99	119.00	298.92	77.96
J78	16.11	113.00	298.85	80.53
J80	31.95	119.00	298.73	77.88
J82	3.87	120.00	298.66	77.41
J84	25.47	120.00	298.51	77.35
J86	647.55	118.00	298.20	78.08
J88	31.95	114.00	296.56	79.11
J90	42.03	116.00	295.62	77.83
J92	279.16	119.00	294.53	76.06
J94	98.19	109.00	293.36	79.88
J96	45.63	105.00	292.87	81.40
J98	221.31	109.00	290.97	78.85

PLACER RANCH RWMP - PIPE REPORT

ID	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)	Status
P101	256.34	6.00	130.00	287.95	3.27	1.90	7.39	Open
P103	187.17	18.00	130.00	1,502.29	1.89	0.14	0.75	Open
P105	236.48	18.00	130.00	1,491.21	1.88	0.17	0.74	Open
P107	189.58	18.00	130.00	1,460.70	1.84	0.13	0.71	Open
P109	215.11	18.00	130.00	1,453.95	1.83	0.15	0.70	Open
P11	233.34	24.00	130.00	3,503.50	2.48	0.21	0.88	Open
P111	456.91	12.00	130.00	1,408.31	4.00	2.18	4.78	Open
P113	348.75	12.00	130.00	1,382.84	3.92	1.61	4.62	Open
P115	144.22	12.00	130.00	1,378.97	3.91	0.66	4.60	Open
P117	132.76	12.00	130.00	1,354.21	3.84	0.59	4.44	Open
P119	133.36	12.00	130.00	1,235.31	3.50	0.50	3.75	Open
P121	268.80	12.00	130.00	1,199.38	3.40	0.95	3.55	Open
P123	364.12	6.00	130.00	29.17	0.33	0.04	0.11	Open
P125	144.95	6.00	130.00	20.71	0.23	0.01	0.06	Open
P127	254.57	6.00	130.00	16.11	0.18	0.01	0.04	Open
P129	160.45	6.00	130.00	4.59	0.05	0.00	0.00	Open
P13	218.50	24.00	130.00	3,507.37	2.49	0.19	0.88	Open
P131	205.08	12.00	130.00	1,191.91	3.38	0.72	3.51	Open
P133	168.67	6.00	130.00	16.11	0.18	0.01	0.04	Open
P135	127.09	12.00	130.00	1,166.44	3.31	0.43	3.37	Open
P137	194.57	8.00	130.00	439.81	2.81	0.78	3.99	Open
P139	468.09	8.00	130.00	385.53	2.46	1.46	3.13	Open
P141	233.12	12.00	130.00	953.84	2.71	0.54	2.32	Open
P143	610.70	12.00	130.00	881.08	2.50	1.22	2.00	Open
P145	405.62	6.00	130.00	55.71	0.63	0.14	0.35	Open
P147	529.55	12.00	130.00	821.49	2.33	0.93	1.76	Open
P149	301.17	6.00	130.00	-81.51	0.92	0.22	0.71	Open
P15	113.43	24.00	130.00	3,834.55	2.72	0.12	1.04	Open
P151	117.57	8.00	130.00	219.30	1.40	0.13	1.10	Open
P165	219.89	6.00	130.00	66.64	0.76	0.11	0.49	Open
P167	407.63	12.00	130.00	-599.81	1.70	0.40	0.98	Open
P169	359.57	12.00	130.00	602.25	1.71	0.36	0.99	Open
P17	218.55	24.00	130.00	3,937.07	2.79	0.24	1.10	Open
P171	252.71	6.00	130.00	141.69	1.61	0.50	1.99	Open
P173	86.96	30.00	130.00	7,319.88	3.32	0.10	1.17	Open
P175	181.50	30.00	130.00	7,319.88	3.32	0.21	1.17	Open
P177	118.45	24.00	130.00	0.00	0.00	0.00	0.00	Open
P179	163.40	24.00	130.00	3,495.75	2.48	0.14	0.88	Open
P185	126.20	6.00	130.00	-37.47	0.43	0.02	0.17	Open
P187	131.25	6.00	130.00	101.23	1.15	0.14	1.07	Open
P189	127.33	12.00	130.00	1,334.22	3.78	0.55	4.32	Open
P19	270.30	24.00	130.00	3,371.02	2.39	0.22	0.82	Open
P191	389.69	6.00	130.00	6.75	0.08	0.00	0.01	Open
P193	1,278.70	24.00	130.00	0.00	0.00	0.00	0.00	Open
P195	387.29	8.00	130.00	295.59	1.89	0.74	1.91	Open
P197	123.38	24.00	130.00	3,538.97	2.51	0.11	0.90	Open
P199	173.01	6.00	130.00	-119.50	1.36	0.25	1.45	Open
P201	380.65	8.00	130.00	213.56	1.36	0.40	1.05	Open
P203	278.30	8.00	130.00	199.57	1.27	0.26	0.92	Open
P205	272.55	8.00	130.00	206.62	1.32	0.27	0.98	Open

PLACER RANCH RWMP - PIPE REPORT

ID	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)	Status
P207	130.16	18.00	130.00	-1,243.68	1.57	0.07	0.53	Open
P209	273.87	6.00	130.00	-87.23	0.99	0.22	0.81	Open
P21	361.19	24.00	130.00	3,344.83	2.37	0.29	0.81	Open
P211	281.78	6.00	130.00	-86.50	0.98	0.22	0.80	Open
P213	85.53	18.00	130.00	-1,175.01	1.48	0.04	0.47	Open
P215	123.91	8.00	130.00	72.77	0.46	0.02	0.14	Open
P217	271.46	6.00	130.00	-79.86	0.91	0.19	0.69	Open
P219	212.47	6.00	130.00	-81.29	0.92	0.15	0.71	Open
P221	247.74	6.00	130.00	-1.43	0.02	0.00	0.00	Open
P223	86.06	18.00	130.00	-1,243.24	1.57	0.05	0.53	Open
P225	215.64	6.00	130.00	-82.02	0.93	0.16	0.72	Open
P227	237.09	6.00	130.00	-89.07	1.01	0.20	0.84	Open
P229	230.24	6.00	130.00	-98.46	1.12	0.23	1.01	Open
P23	195.49	24.00	130.00	3,199.26	2.27	0.15	0.75	Open
P231	273.05	6.00	130.00	-116.58	1.32	0.38	1.39	Open
P233	271.50	6.00	130.00	-107.19	1.22	0.32	1.19	Open
P235	117.79	8.00	130.00	-233.95	1.49	0.15	1.24	Open
P237	113.44	18.00	130.00	-1,061.81	1.34	0.04	0.39	Open
P239	121.51	18.00	130.00	2,396.13	3.02	0.22	1.77	Open
P241	107.76	6.00	130.00	70.87	0.80	0.06	0.55	Open
P243	390.01	6.00	130.00	70.83	0.80	0.21	0.55	Open
P249	429.53	18.00	130.00	1,319.07	1.66	0.25	0.59	Open
P25	185.74	24.00	130.00	3,195.39	2.27	0.14	0.74	Open
P27	122.25	8.00	130.00	303.71	1.94	0.25	2.01	Open
P29	115.63	8.00	130.00	-270.31	1.73	0.19	1.62	Open
P31	117.65	8.00	130.00	209.19	1.34	0.12	1.01	Open
P33	96.80	8.00	130.00	159.27	1.02	0.06	0.61	Open
P35	162.43	8.00	130.00	17.78	0.11	0.00	0.01	Open
P37	139.16	12.00	130.00	-506.83	1.44	0.10	0.72	Open
P39	119.75	12.00	130.00	-532.31	1.51	0.09	0.79	Open
P41	284.80	12.00	130.00	-563.90	1.60	0.25	0.88	Open
P43	634.28	18.00	130.00	2,721.81	3.43	1.42	2.25	Open
P45	523.17	18.00	130.00	-2,672.30	3.37	1.14	2.17	Open
P47	294.37	18.00	130.00	2,667.71	3.36	0.64	2.16	Open
P49	320.96	18.00	130.00	2,663.12	3.36	0.69	2.16	Open
P51	563.00	18.00	130.00	2,659.24	3.35	1.21	2.15	Open
P53	460.73	18.00	130.00	2,412.21	3.04	0.83	1.80	Open
P55	112.45	6.00	130.00	45.63	0.52	0.03	0.24	Open
P57	281.10	24.00	130.00	3,499.63	2.48	0.25	0.88	Open
P59	154.02	8.00	130.00	374.95	2.39	0.46	2.97	Open
P61	434.01	8.00	130.00	345.15	2.20	1.11	2.55	Open
P63	166.69	18.00	130.00	2,512.86	3.17	0.32	1.94	Open
P65	103.96	18.00	130.00	2,494.58	3.15	0.20	1.91	Open
P67	117.21	18.00	130.00	2,364.89	2.98	0.20	1.73	Open
P69	73.31	18.00	130.00	2,361.02	2.98	0.13	1.73	Open
P71	119.62	18.00	130.00	963.50	1.21	0.04	0.33	Open
P73	85.96	18.00	130.00	-945.23	1.19	0.03	0.32	Open
P75	119.69	18.00	130.00	-1,037.06	1.31	0.05	0.38	Open
P77	130.38	18.00	130.00	-1,262.24	1.59	0.07	0.54	Open
P79	43.07	18.00	130.00	-1,323.10	1.67	0.03	0.59	Open

	ID	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)	Status
	P81	216.79	18.00	130.00	1,306.99	1.65	0.13	0.58	Open
	P83	115.55	18.00	130.00	1,275.03	1.61	0.06	0.55	Open
	P85	138.38	18.00	130.00	1,870.97	2.36	0.16	1.12	Open
	P87	283.70	18.00	130.00	1,845.49	2.33	0.31	1.09	Open
	P89	322.26	12.00	130.00	844.80	2.40	0.60	1.85	Open
	P91	279.95	12.00	130.00	1,165.99	3.31	0.94	3.37	Open
	P93	346.53	12.00	130.00	1,123.95	3.19	1.09	3.15	Open
	P95	460.68	12.00	130.00	1,197.94	3.40	1.63	3.54	Open
	P97	480.78	18.00	130.00	1,934.06	2.44	0.57	1.19	Open
	P99	453.67	18.00	130.00	1,835.87	2.31	0.49	1.08	Open

APPENDIX B

Placer Ranch Recycled Water Market Assessment Table by Parcel

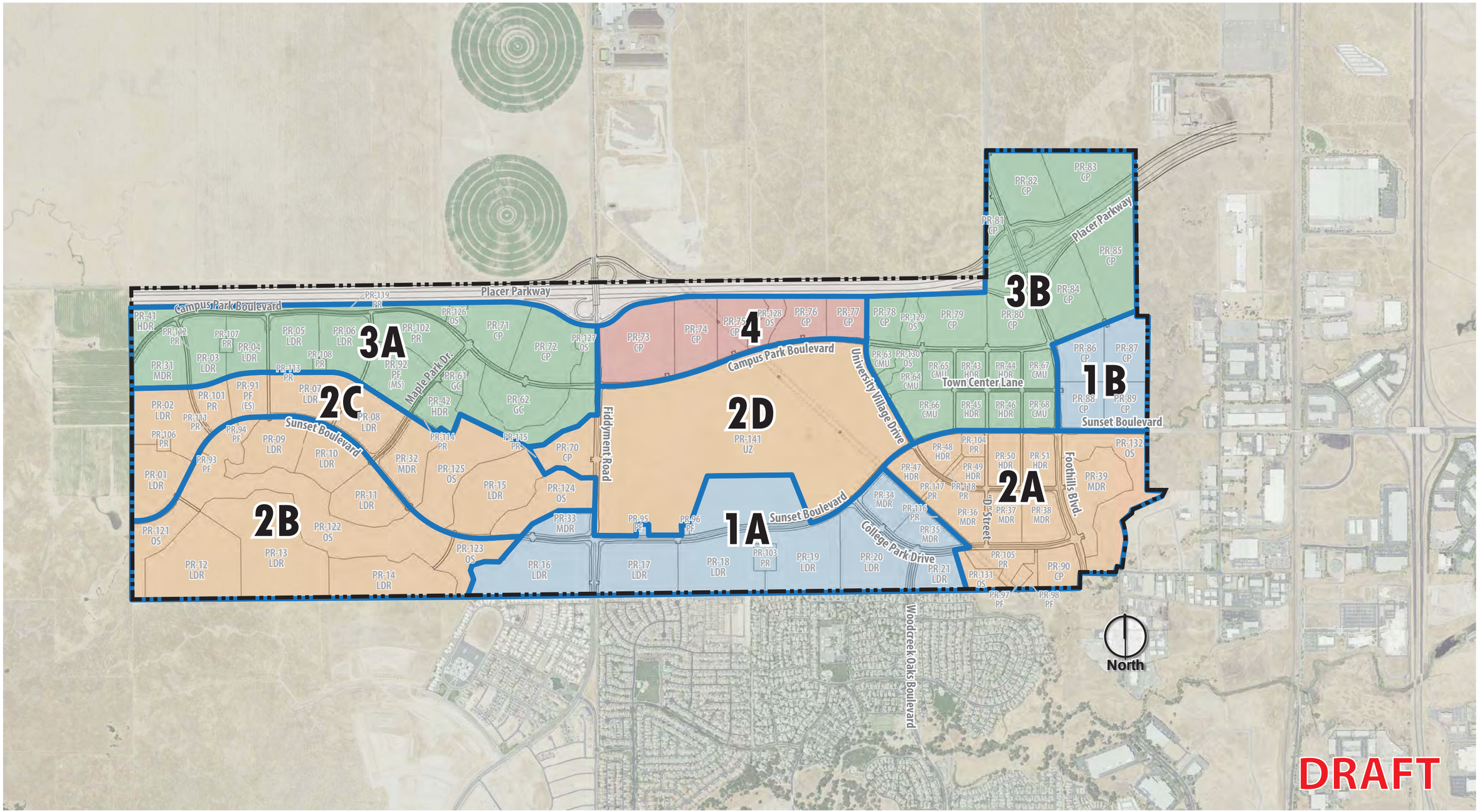
Placer Ranch

									Recycled Water							Recycled Water with Water Conservation		
No.	ID	Land Use	Total Area	Dwelling Units	Density	Impervious Surface	Impervious Surface	Irrigated Percentage	Irrigated with RW	RW Irrigated	Annual Demand	Average Day Demand (24 Hours)	Peak Day Demand (24 Hours)	Peak Day Demand (9 Hours)	Peak Hour Delivery Demand	Water Conservation Factor	Reduced Demand with Water Conservation	Reduced Demand with Water Conservation
			(Acres)	(du)	(du/ac)	(%)	(Acres)	(%)		(Acres)	(AFY)	(GPD)	(GPD)	(GPM)	(GPM)	% reduction	(AFY)	(MGD)
1	PR-01	LDR	21.12	106	5	60%	12.67	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
2	PR-02	LDR	26.32	132	5	60%	15.79	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
3	PR-03	LDR	16.03	80	5	60%	9.62	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
4	PR-04	LDR	13.93	70	5	60%	8.36	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
5	PR-05	LDR	18.01	90	5	60%	10.81	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
6	PR-06	LDR	18.38	92	5	60%	11.03	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
7	PR-07	LDR	21.36	107	5	60%	12.82	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
8	PR-08	LDR	17.64	88	5	60%	10.58	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
9	PR-09	LDR	20.7	104	5	60%	12.42	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
10	PR-10	LDR	19.83	99	5	60%	11.90	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
11	PR-11	LDR	20.47	102	5	60%	12.28	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
12	PR-15	LDR	32.65	163	5	60%	19.59	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
13	PR-16	LDR	36.75	184	5	60%	22.05	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
14	PR-17	LDR	26.29	131	5	60%	15.77	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
15	PR-18	LDR	29.98	150	5	60%	17.99	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
16	PR-19	LDR	30.49	152	5	60%	18.29	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
17	PR-20	LDR	27.87	139	5	60%	16.72	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
18	PR-21	LDR	10.04	50	5	60%	6.02	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
19	PR-12	LDR	42.58	234	5.5	60%	25.55	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
20	PR-13	LDR	57.49	316	5.5	60%	34.49	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
21	PR-14	LDR	30.95	170	5.5	60%	18.57	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
22	PR-31	MDR	17.9	143	8	60%	10.74	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
23	PR-32	MDR	18.68	149	8	60%	11.21	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
24	PR-33	MDR	7.88	63	8	60%	4.73	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
25	PR-34	MDR	11.48	92	8	60%	6.89	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
26	PR-35	MDR	9.74	78	8	60%	5.84	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
27	PR-36	MDR	15.18	121	8	60%	9.11	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
28	PR-37	MDR	11.33	91	8	60%	6.80	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
29	PR-38	MDR	12.92	103	8	60%	7.75	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
30	PR-39	MDR	27.17	217	8	60%	16.30	40%	no	0.0	0.0	0	0	0	0	0.0%	0	0
31	PR-41	HDR	8.16	163	20	80%	6.53	20%	yes	1.6	5.3	4,720	11,517	21	86	45.0%	2.9	0.00633
32	PR-42	HDR	10.23	205	20	80%	8.18	20%	yes	2.0	6.6	5,918	14,439	27	107	45.0%	3.6	0.00794
33	PR-43	HDR	7.19	161	20	80%	5.75	20%	yes	1.4	4.7	4,159	10,148	19	75	45.0%	2.6	0.00558
34	PR-44	HDR	7.9	175	20	80%	6.32	20%	yes	1.6	5.1	4,570	11,150	21	83	45.0%	2.8	0.00613
35	PR-45	HDR	7.2	161	20	80%	5.76	20%	yes	1.4	4.7	4,165	10,162	19	75	45.0%	2.6	0.00559
36	PR-46	HDR	7.9	175	20	80%	6.32	20%	yes	1.6	5.1	4,570	11,150	21	83	45.0%	2.8	0.00613
37	PR-47	HDR	8.39	185	20	80%	6.71	20%	yes	1.7	5.4	4,853	11,842	22	88	45.0%	3.0	0.00651
38	PR-48	HDR	7.72	171	20	80%	6.18	20%	yes	1.5	5.0	4,466	10,896	20	81	45.0%	2.8	0.00599
39	PR-49	HDR	5.66	129	20	80%	4.53	20%	yes	1.1	3.7	3,274	7,989	15	59	45.0%	2.0	0.00439
40	PR-50	HDR	11.43	245	20	80%	9.14	20%	yes	2.3	7.4	6,612	16,133	30	120	45.0%	4.1	0.00887
41	PR-51	HDR	11.24	241	20	80%	8.99	20%	yes	2.2	7.3	6,502	15,865	29	118	45.0%	4.0	0.00873
42	PR-52	HDR	0	0	20	80%	0.00	20%	yes	0.0	0.0	0	0	0	0	45.0%	0.0	0.00000
43	PR-61	GC	3.56		0	85%	3.03	15%	yes	0.5	1.7	1,544	3,769	7	28	55.0%	0.8	0.00170
44	PR-62	GC	22.07		0	85%	18.76	15%	yes	3.3	10.7	9,575	23,363	43	173	55.0%	4.8	0.01051
45	PR-63	CMU	4.06		0	85%	3.45	15%	yes	0.6	2.0	1,761	4,298	8	32	55.0%	0.9	0.00193
46	PR-64	CMU	6.09		0	85%	5.18	15%	yes	0.9	3.0	2,642	6,447	12	48	55.0%	1.3	0.00290
47	PR-65	CMU	7.92		0	85%	6.73	15%	yes	1.2	3.8	3,436	8,384	16	62	55.0%	1.7	0.00377
48	PR-66	CMU	15.68		0	85%	13.33	15%	yes	2.4	7.6	6,803	16,598	31	123	55.0%	3.4	0.00747
49	PR-67	CMU	7.55		0	85%	6.42	15%	yes	1.1	3.7	3,276	7,992	15	59	55.0%	1.7	0.00360
50	PR-68	CMU	7.5		0	85%	6.38	15%	yes	1.1	3.6	3,254	7,939	15	59	55.0%	1.6	0.00357
51	PR-70	CP	15.52		0	85%	13.19	15%	yes	2.3	7.5	6,733	16,429	30	122	55.0%	3.4	0.00739
52	PR-71	CP	21.52		0	85%	18.29	15%	yes	3.2	10.5	9,336	22,781	42	169	55.0%	4.7	0.01025
53	PR-72	CP	26.08		0	85%	22.17	15%	yes	3.9	12.7	11,315	27,608	51	205	55.0%	5.7	0.01242
54	PR-73	CP	35.24		0	85%	29.95	15%	yes	5.3	17.1	15,289	37,304	69	277	55.0%	7.7	0.01679
55	PR-74	CP	19.62		0	85%	16.68	15%	yes	2.9	9.5	8,512	20,769	38	154	55.0%	4.3	0.00935
56	PR-75	CP	14.42		0	85%	12.26	15%	yes	2.2	7.0	6,256	15,265	28	113	55.0%	3.2	0.00687
57	PR-76	CP	12.86		0	85%	10.93	15%	yes	1.9	6.2	5,579	13,613	25	101	55.0%	2.8	0.00613
58	PR-77	CP	10.98		0	85%	9.33	15%	yes	1.6	5.3	4,764	11,623	22	86	55.0%	2.4	0.00523
59	PR-78	CP	10.38		0	85%	8.82	15%	yes	1.6	5.0	4,503	10,988	20	82	55.0%	2.3	0.00494
60	PR-79	CP	23.75		0	85%	20.19	15%	yes	3.6	11.5	10,304	25,141	47	187	55.0%	5.2	0.01131
61	PR-80	CP	17.58		0	85%	14.94	15%	yes	2.6	8.5	7,627	18,610	34	138	55.0%	3.8	0.00837
62	PR-81	CP	4.49		0	85%	3.82	15%	yes	0.7	2.2	1,948	4,753	9	35	55.0%	1.0	0.00214
63	PR-82	CP	26.92		0	85%	22.88	15%	yes	4.0	13.1	11,679	28,497	53	212	55.0%	5.9	0.01282
64	PR-83	CP	26.39		0	85%	22.43	15%	yes	4.0	12.8	11,449	27,936	52	207	55.0%	5.8	0.01257
65	PR-84	CP	25.74		0	85%	21.88	15%	yes	3.9	12.5	11,167	27,248	50	202	55.0%	5.6	0.01226
66	PR-85	CP	33.93		0	85%	28.84	15%	yes	5.1	16.5	14,720	35,918	67	267	55.0%	7.4	0.01616
67	PR-86	CP	13.84		0	85%	11.76	15%	yes	2.1	6.7	6,004	14,651	27	109	55.0%	3.0	0.00659
68	PR-87	CP	18.26		0	85%	15.52	15%	yes	2.7	8.9	7,922	19,330	36	144	55.0%	4.0	0.00870
69	PR-88	CP	13.17		0	85%	11.19	15%	yes	2.0	6.4	5,714	13,941	26	104	55.0%	2.9	0.00627
70	PR-89	CP	13.42		0	85%	11.41	15%	yes	2.0	6.5	5,822	14,206	26	105	55.0%	2.9	0.00639
71	PR-90	CP	11.42		0	85%	9.71	15%	yes	1.7	5.6	4,954	12,089	22	90	55.0%	2.5	0.00544
72	PR-91	PF	10.65		0	85%	9.05	15%	yes	1.6	5.2	4,620	11,274	21	84	55.0%	2.3	0.00507
73	PR-92	PF	21.31		0	85%	18.11	15%	yes	3.2	10.4	9,245	22,558	42	168	55.0%	4.7	0.01015
74	PR-93	PF	0.23		0	85%	0.20	15%	yes	0.0	0.1	100	243	0	2	55.0%	0.1	0.00011
75	PR-94	PF	0.54		0	85%	0.46	15%	yes	0.1	0.3	234	572	1	4	55.0%	0.1	0.00026
76	PR-95	PF	0.55		0	85%	0.47	15%	yes	0.1	0.3	239	582	1	4	55.0%	0.1	0.00026
77	PR-96	PF	0.26		0	85%	0.22	15%	yes	0.0	0.1	113	275	1	2	55.0%	0.1	0.00012
78	PR-97	PF	1.76		0	85%	1.50	15%	yes	0.3	0.9	764	1,863	3	14	55.0%	0.4	0.00084
79	PR-98	PF	2.14		0	85%	1.82	15%	yes	0.3	1.0	928	2,265	4	17	55.0%	0.5	0.00102
80	PR-101	PR	9.13		0	20%	1.83	80%	yes	7.3	23.7	21,125	51,546	95	383	55.0%	10.6	0.02320
81	PR-102	PR	20.85		0	20%	4.17	80%	yes	16.7	54.0	48,243	117,714	218	874	55.0%	24.3	0.05297
82	PR-103	PR	4		0	20%	0.80	80%	yes	3.2	10.4	9,255	22,583	42	168	55.0%	4.7	0.01016
83	PR-104	PR	3.61		0	20%	0.72	80%	yes	2.9	9.4	8,353	20,381	38	151	55.0%	4.2	0.00917
84	PR-105	PR	9.5		0	20%	1.90	80%	yes	7.6	24.6	21,981	53,635	99	398	55.0%	11.1	0.02414
85	PR-106	PR	1.21		0	20%	0.24	80%	yes	1.0	3.1	2,800	6,831	13	51	55.0%	1.4	0.00307
86	PR-107	PR	1.21		0	20%	0.24	80%	yes	1.0	3.1	2,800	6,831	13	51	55.0%	1.4	0.00307
87	PR-108	PR	1.21		0	20%	0.24	80%	yes	1.0	3.1	2,800	6,831	13	51	55.0%	1.4	0.00307
88	PR-111	PR	0.57		0	20%	0.11	80%	yes	0.5	1.5	1,319	3,218	6	24	55.0%	0.7	0.00145
89	PR-112	PR	0.63		0	20%	0.13	80%	yes	0.5	1.6	1,458	3,557	7	26	55.0%	0.7	0.00160
90	PR-113	PR	1.77		0	20%	0.35	80%	yes	1.4	4.6	4,095	9,993	19	74	55.0%	2.1	0.00450
91	PR-114	PR	0.59		0	20%	0.12	80%	yes	0.5	1.5	1,365	3,331	6	25	55.0%	0.7	0.00150
92	PR-115	PR	0.62		0	20%	0.12	80%	yes	0.5	1.6	1,435	3,500	6	26	55.0%	0.7	0.00158
93	PR-116	PR	5.31		0	20%	1.06	80%	yes	4.2	13.8	12,286	29,979	56	223	55.0%	6.2	0.01349
94	PR-117	PR	0.77		0	20%	0.15	80%	yes	0.6	2.0	1,782	4,347	8	32	55.0%	0.9	0.00196
95	PR-118	PR	0.77		0	20%	0.15	80%	yes	0.6	2.0	1,782	4,347	8	32	55.0%	0.9	0.00196
96	PR-119	PR	10.87		0	20%	2.17	80%	yes	8.7	28.2	25,151	61,369	114	456	55.0%	12.7	0.02762
97	PR-121	OS	16.69		0	100%	16.69	0%	no	0.0	0.0	0	0	0	0	0.0%	0	0
98	PR-122	OS	71.55		0	100%	71.55	0%	no	0.0	0.0	0	0	0	0	0.0%	0	0
99	PR-123	OS	14.49		0	100%	14.49	0%	no	0.0	0.0	0	0	0	0	0.0%	0	0
100	PR-124	OS	22.26		0	100%	22.26	0%	no	0.0	0.0	0	0	0	0	0.0%	0	0
101	PR-125	OS	58.31		0	100%	58.31	0%	no	0.0	0.0	0	0	0	0	0.0%	0	0
102	PR-126	OS	3.03		0	100%	3.03	0%	no	0.0	0.0	0	0	0	0	0.0%	0	0
103	PR-127	OS	6.96		0	100%	6.96	0%	no	0.0	0.0	0	0	0	0	0.0%	0	0
104	PR-128	OS	7.04		0	100%	7.04	0%	no	0.0	0.0	0	0	0	0	0.0%	0	0
105	PR-129	OS	5.7		0	100%	5.70	0%	no	0.0	0.0	0	0	0	0	0.0%	0	0
106	PR-130	OS	3.24		0	100%	3.24	0%	no	0.0	0.0	0	0	0	0	0.0%	0	0
107	PR-131	OS	7.04		0	100%	7.04	0%	no	0.0	0.0	0	0	0	0	0.0%	0	0
108	PR-132	OS	34.55		0	100%	34.55	0%	no	0.0	0.0	0	0	0	0	0.0%	0	0
109	PR-141	UZ (Univ)	301.27		0	75%	225.96	25%	yes	75.3	244.0	217,814	531,467	984	3,947	55.0%	109.8	0.23916
110	PR-200	Placer Pkwy	158.51		0	95%	150.58	5%	no	0.0	0.0	0	0	0	0	55.0%	0.0	0.00000
111	PR-201	ROW/LSE	158.46		0	85%	134.69	15%	yes	23.8	77.0	68,747	167,742	311	1,246	55.0%	34.7	0.07548
	Subtotal		**2,213**	**5,827**		**-**	**1,685**	**-**	**-**	**252**	**816**	**728,532**	**1,777,617**	**3,292**	**13,200**	**N/A**	**373**	**0.8**

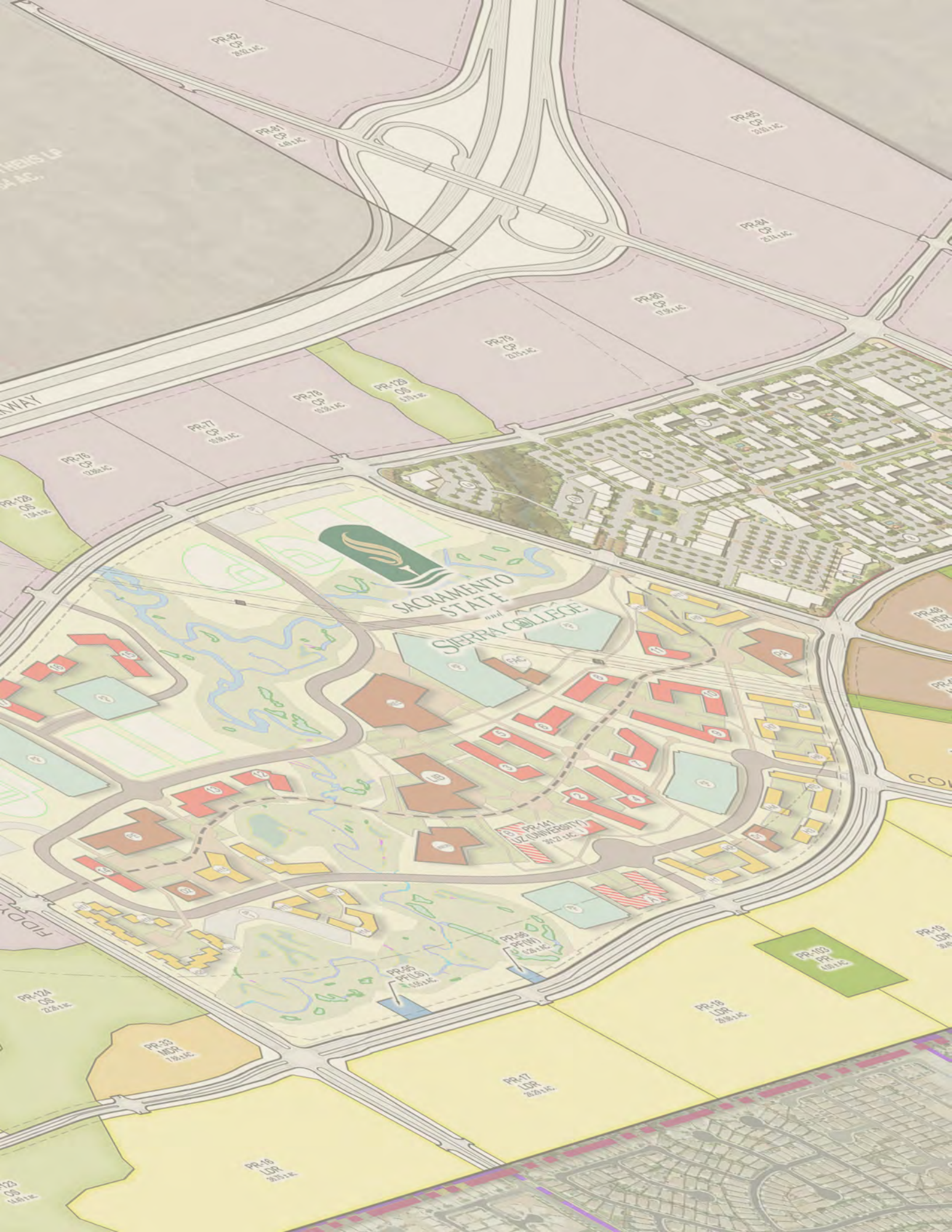
		TOTALS										**TOTALS**						
		LDR	407.86	2039.00	5	60%	245	40%	no	0	0	0	0	0	0	0.0%	0	0.00
		LDR-A	131.02	720.00	5.5	60%	79	40%	no	0	0	0	0	0	0	0.0%	0	0.00
		MDR	132.28	1057.00	8	60%	79	40%	no	0	0	0	0	0	0	0.0%	0	0.00
		HDR	93.02	2011.00	20	80%	74	20%	yes	19	60	53,808	131,292	243	975	45.0%	33	0.07
		GC	25.63	0.00		85%	22	15%	yes	4	12	11,119	27,131	50	201	55.0%	6	0.01
		CMU	48.80	0.00		85%	41	15%	yes	7	24	21,172	51,659	96	384	55.0%	11	0.02
		CP	395.53	0.00		85%	336	25%	yes	59	192	171,598	418,699	775	3,109	55.0%	87	0.19
		UZ	301.27	0.00		75%	226	25%	yes	75	244	217,814	531,467	984	3,947	55.0%	110	0.24
		PF	31.96	0.00		60%	27	40%	yes	5	16	13,866	33,832	63	251	55.0%	7	0.02
		PF	5.48	0.00		85%	5	15%	yes	1	3	2,377	5,801	11	43	55.0%	1	0.00
		PR	72.62	0.00		20%	15	80%	yes	58	188	168,030	409,994	759	3,045	55.0%	85	0.18
		OS	250.9	0.00		100%	251	0%	no	0	0	0	0	0	0	0.0%	0	0.00
		ROW	158.51	0.00		95%	151	5%	no	0	0	0	0	0	0	55.0%	0	0.00
		ROW	158.46	0.00		85%	135	15%	yes	24	77	68,747	167,742	311	1,246	55.0%	35	0.08
Total			**2,213**	**5,827**			**1,685**			252	**816**	**728,532**	**1,777,617**	**3,292**	**13,200**	**N/A**	**373**	**0.813**

APPENDIX C

Placer Ranch Phasing Plan



Placer Ranch Specific Plan
Phasing Plan - April 7, 2017


SACRAMENTO STATE
and
SIERRA COLLEGE
PR-82 CP 26.6 ± AC
PR-81 CP 4.6 ± AC
PR-85 CP 24.8 ± AC
PR-84 CP 21.7 ± AC
PR-80 CP 17.9 ± AC
PR-79 CP 23.5 ± AC
PR-129 OS 3.7 ± AC
PR-78 CP 10.9 ± AC
PR-77 CP 10.9 ± AC
PR-76 CP 12.8 ± AC
PR-128 OS 19.4 ± AC
PR-141 UZ (UNIVERSITY) 30.2 ± AC
PR-66 PF(LW) 6.8 ± AC
PR-65 PF(LW) 6.8 ± AC
PR-124 OS 20.8 ± AC
PR-23 MDR 11.8 ± AC
PR-16 LDR 39.3 ± AC
PR-17 LDR 39.6 ± AC
PR-19 LDR 39.8 ± AC
PR-103 PF 4.8 ± AC
PR-49 MDR
PR-19 LDR